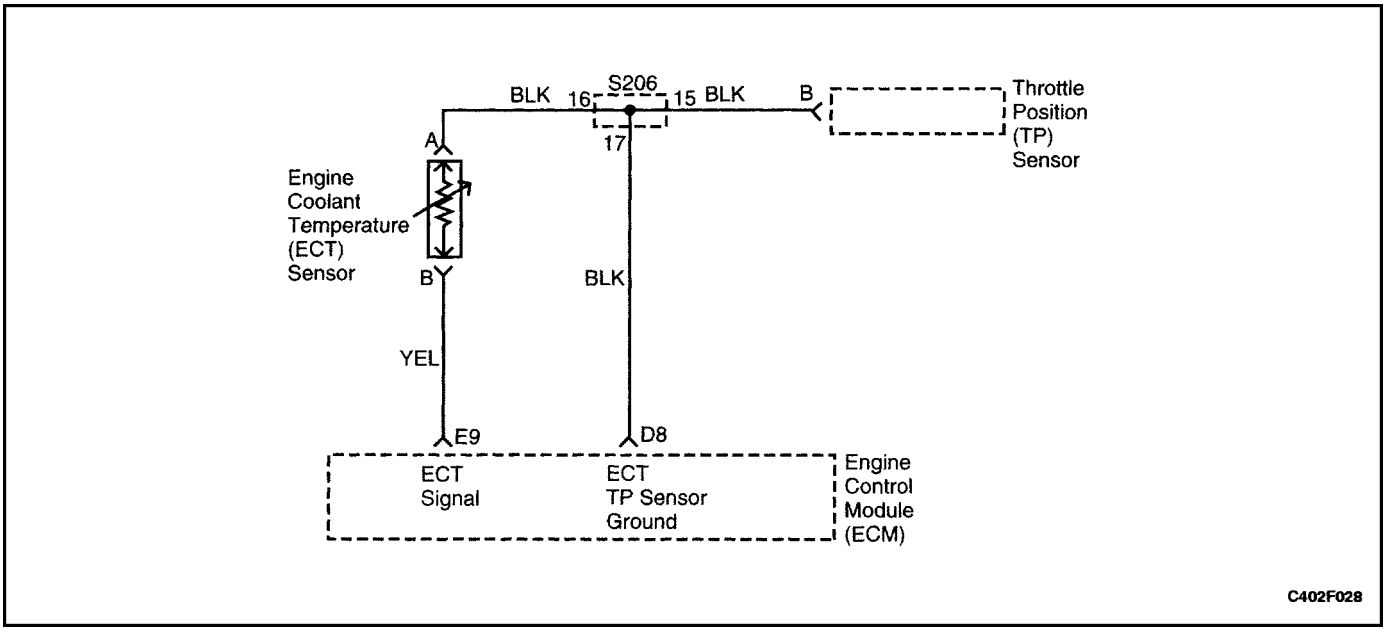


DIAGNOSTIC TROUBLE CODE (DTC) P0125

ENGINE COOLANT TEMPERATURE INSUFFICIENT FOR CLOSED LOOP FUEL CONTROL

Circuit Description

When the vehicle is first started, it operates in Open Loop, ignoring the oxygen sensor (O2S 1) signal and calculating the fuel/air ratio based on inputs from the Engine Coolant Temperature (ECT), throttle position (TP), and manifold absolute pressure (MAP) sensors only. The engine control module (ECM) will begin using the O2S 1 signal for controlling fuel delivery (Closed Loop) when the following conditions are met:

- The engine has run a minimum amount of time based on ECT at engine start up.
- The O2S has a varying voltage output showing that it is hot enough to operate properly.
- The ECT has increased a minimum amount based on ECT at engine start up.

Conditions for Setting the DTC

- If ambient temperature is greater than 10˚C (50˚F) the time for coolant to reach a stabilized closed loop value (22˚C [72˚F]) is less than or equal to 2 minutes.
- If ambient temperature is between –7˚C (20˚F) and 10˚C (50˚F) the time for coolant to reach a stabilized closed loop value (22˚C [72˚F]) is less than or equal to 5 minutes.
- If ambient temperature is between –37˚C (–35˚F) and 7˚C (20˚F) the time for coolant to reach a stabilized closed loop value (20˚C [68˚F]) is less than or equal to 15 minutes.
- Engine running.
- DTCs P0106, P0107, P0108, P0112, P0113, P0117, P0118, P0121, P0122, P0123, P0201, P0202, P0203, P0204, P0351, P0352, P0502 and P1627 are not set.
- Maximum start–up coolant temperature is 40˚C (104˚F).
- If the ambient temperature is less than or equal to 7˚C (20˚F) the accumulated airflow is greater than 800 grams and accumulated idle time is less than 90 seconds.
- If ambient temperature is between –7˚C (20˚F) and 10˚C (50˚F) the accumulated airflow is greater than 820 grams and accumulated idle time is less than 225 seconds.
- If ambient temperature is between –20˚C (–4˚F) and 7˚C (20˚F) the accumulated airflow is greater than 2700 grams and accumulated idle time is less than 675 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns on.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

When DTC P0125 is set, a skewed ECT sensor or a stuck open thermostat is indicated.

An intermittent may be caused by a poor connection, rubbed–through wire insulation or a wire broken inside the insulation.

Check for a poor connection or damaged ECM harness. Inspect the ECT sensor signal circuit and ground circuit terminals for the following conditions:

- Improper mating.
- Broken locks.
- Improperly formed.
- Damaged terminals.
- Poor terminal–to–wire connection.
- Damaged harness.

Perform an intermittent test. If the connections and the harness check OK, monitor a Digital Voltmeter (DVM) connected between ECT sensor signal circuit and ground circuit terminals while moving the related connectors and the wiring harness. If a fault is induced, the resistance reading will change. This may help to isolate the location of the malfunction.

Use the Temperature vs. Resistance table to evaluate the possibility of a skewed sensor.

Test Description

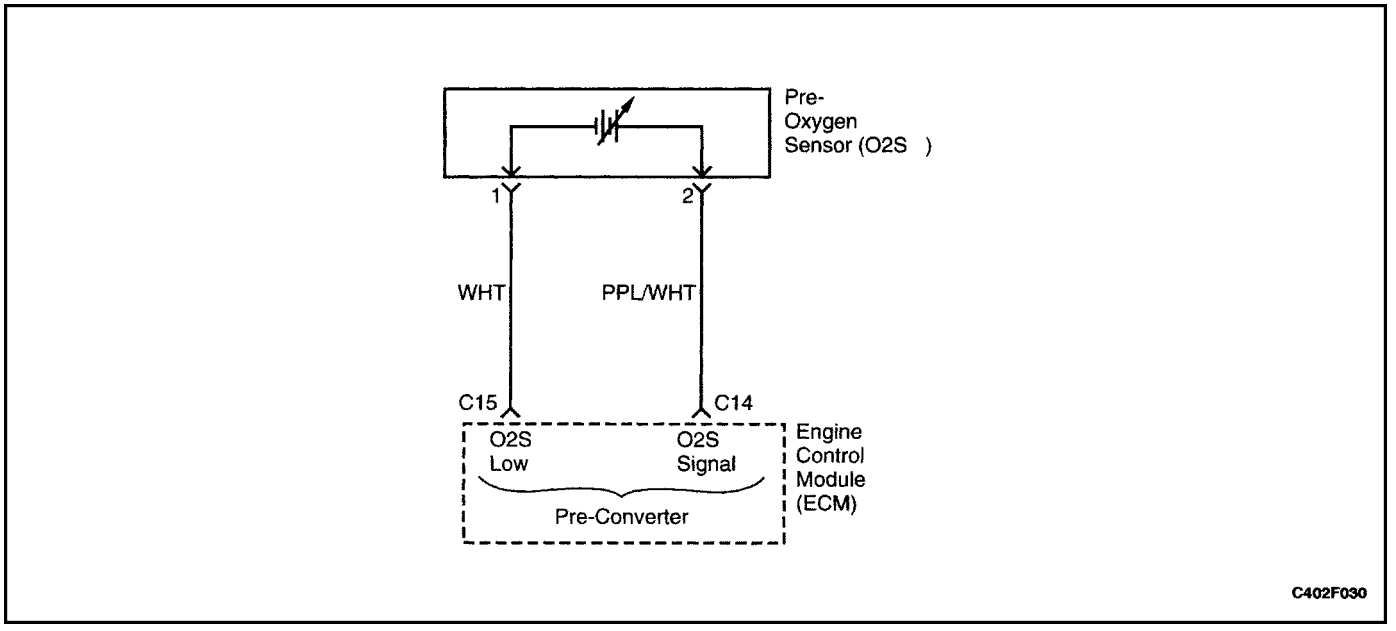
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (OBD II) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. The engine must be allowed to cool fully before the ECT and Idle Air Temperature (IAT) sensors will read close to the ambient temperature in order to check for a possible skewed sensor.
3. Measure the engine coolant temperature with a thermometer to determine the actual value the ECT sensor should be. Take into consideration if the engine has been run and the engine coolant has been warmed without opening the thermostat.
5. This step simulates a DTC P0118. If the ECM senses the change, the ECM and wiring are OK.
6. The ECT sensor, ECM and wiring have checked OK at this point. Check for a proper thermostat and cooling fan operation.
8. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0125 Engine Coolant Temperature Insufficient For Closed Loop Fuel Control

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Allow the engine to cool fully to ambient temperature. 2. Turn the ignition switch ON, with the engine OFF and Install a scan tool. 3. Compare the Engine Coolant Temperature (ECT) sensor reading to the Intake Air Temperature (IAT) sensor readings. Are the temperature readings close?		Go to *Step 4*	Go to *Step 3*
3	1. Disconnect the ECT sensor electrical connector. 2. Using a Digital Voltmeter (DVM), measure the resistance across the ECT sensor terminals A and B. 3. Check the ECT sensor value to actual coolant temperature using the Temperature vs. Resistance table. Does the ECT sensor accurately reflect the actual engine coolant temperature?		Go to *Step 4*	Go to *Step 9*

Step	Action	Value(s)	Yes	No
4	Disconnect the ECT sensor electrical connector. Is the ECT sensor value less than the specified value?	–30˚C (–22˚F)	Go to *Step 5*	Go to *Step 8*
5	Jumper the ECT sensor signal circuit terminal B and the sensor ground circuit terminal A together at the ECT sensor connector. Is the ECT sensor value greater than the specified value?	266˚F (130˚C)	Go to *Step 6*	Go to *Step 7*
6	Check for proper cooling system operation and repair as necessary. Is a repair necessary?		Go to *Step 10*	Go to ”Diagnostic Aids”
7	Check the ECT sensor electrical connector terminals A and B and engine control module (ECM) electrical connector terminals E9 and D8 for poor connectors or malfunctioning terminals and repair as necessary. Is a repair necessary?		Go to *Step 10*	Go to *Step 8*
8	Replace the ECM. Is the action complete?		Go to *Step 10*	
9	Replace the ECT sensor. Is the action complete?		Go to *Step 10*	
10	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?		Go to *Step 11*	Go to *Step 2*
11	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0131

O2 BANK 1 SENSOR 1 LOW VOLTAGE

Circuit Description

The engine control module (ECM) supplies a voltage of about 0.45 volts between terminals C15 and C14 (if measured with a 10 megohm digital voltmeter, this may read as low as 0.32 volts). The Oxygen Sensor (O2S 1) varies the voltage within a range of about 1 volt if the exhaust is rich, down through about 0.10 volts if the exhaust is lean.

The sensor is like an open circuit and produces no voltage when it is below 315˚C (600˚F). An open sensor circuit or cold sensor causes Open Loop operation.

If the O2S 1 pigtail wiring, connector, or terminal is damaged, the entire O2S 1 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the O2S 1 wire(s). Any attempt to repair the wires, connector or terminals could result in the obstruction of the air reference and degrade the O2S 1 performance. Refer to ”Oxygen Sensor” in this section.

Conditions for Setting the DTC

- O2S 1 voltage is less than 0.1 volts or less than 0.4 volts in Power Enrichment (PE).
- Closed loop stoichiometry.
- Engine coolant temperature (ECT) is greater than 60˚C (140˚F).
- Air/fuel ratio is between 14.5:1 and 14.8:1.
- Throttle position (TP) sensor is between 5% and 50%.
- No related malfunctions.
- Delay 2 seconds.
- After conditions met.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns on.
- The vehicle will operate in Open Loop.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

Fuel pressure – The system will be lean if the fuel pressure is too low. It may be necessary to monitor the fuel pressure while driving the vehicle at various road speeds and/or loads to confirm. Refer to”Fuel System Diagnosis” in this section.

Manifold Absolute Pressure (MAP) sensor – An output that causes the ECM to sense a lower than normal manifold pressure (high vacuum) can cause the system to go lean. Disconnecting the MAP sensor will allow the ECM to substitute a fixed (default) value for the MAP sensor. If the lean condition is gone when the sensor is disconnected, substitute a known good sensor and recheck.

Fuel contamination – Water, in even small amounts near the in–tank fuel pump inlet can be delivered to the injector. The water causes a lean exhaust and can set DTC P0131.

Sensor harness – The O2S sensor pigtail may be mispositioned and contacting the exhaust manifold.

Engine misfire – A misfiring cylinder will result in unburned oxygen in the exhaust, which could cause DTC P0131 to set. Refer to DTC P0300 Engine Misfire in this section.

Cracked Oxygen sensor – A cracked O2S or poor ground at the sensor could cause DTC P0131. Refer to"Symptoms Diagnosis" in this section.

Plugged fuel filter – A plugged fuel filter can cause a lean condition and cause a DTC P0131 to set.

Plugged Oxygen Sensor – A plugged reference port on the O2S will indicate a lower–than–normal voltage output from the O2S.

Test Description

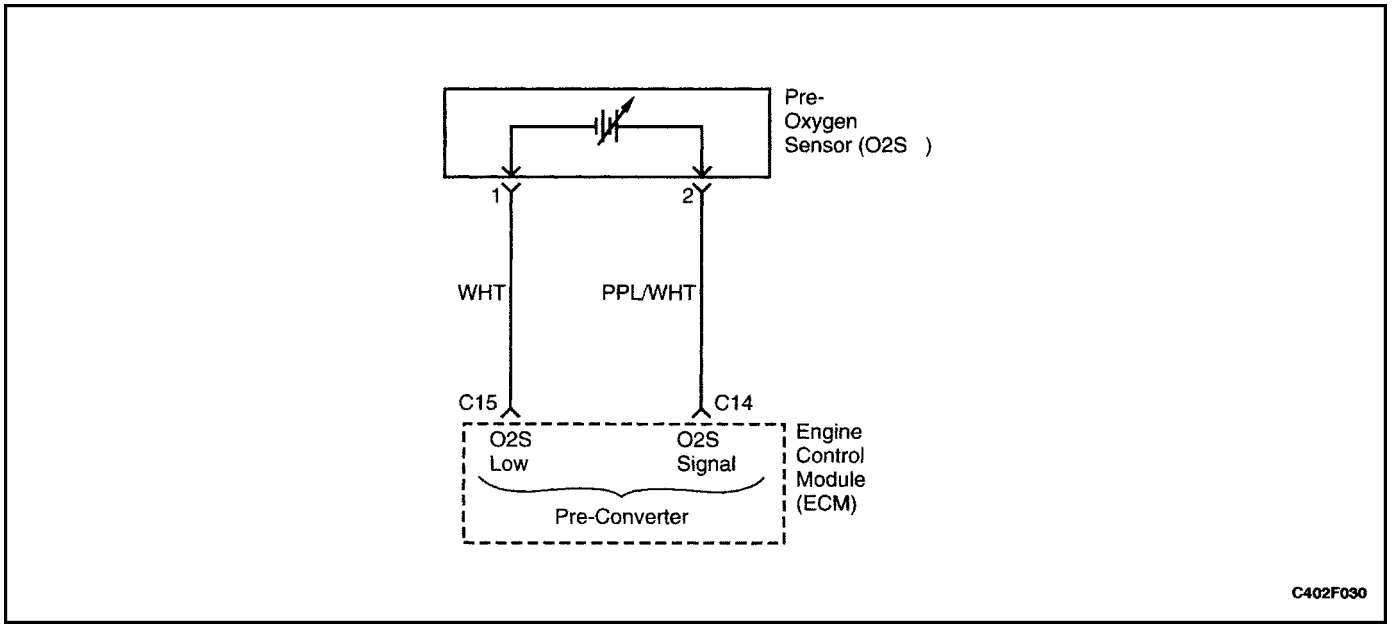
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (OBD II) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step determines if DTC P0131 is the result of a hard failure or an intermittent condition. It may be necessary to operate the vehicle within the Freeze Frame conditions and Conditions for Setting the DTC in order to duplicate the malfunction detected by the ECM.
4. This step simulates DTC P0134. If the ECM senses the change, the ECM and the wiring are OK.
6. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
8. If no malfunctions have been found at this point and no additional DTCs were set, refer to "Diagnostic Aids" for additional checks and information.

DTC P0131 O2 Bank 1 Sensor 1 Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Turn the ignition ON, with the engine OFF. 2. Install a scan tool. 3. Engine at operating temperature. Does the Oxygen Sensor (O2S 1) voltage remain below the specified value?	44 mv	Go to *Step 4*	Go to *Step 3*
3	1. Review the Freeze Frame data and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions and Conditions For Setting The DTC as noted? Does the O2S 1 voltage stay below the specified value?	44 mV	Go to *Step 4*	Go to *Step 7*
4	1. Turn the ignition switch ON, with the engine OFF. 2. Disconnect the O2S 1 electrical connector. Does the scan tool indicate the O2S 1 voltage within the specified values?	407–509 mV	Go to "Diagnostic Aids"	Go to *Step 5*
5	Check the O2S 1 sensor signal circuit, terminal 2 for a short to ground and repair as necessary. Is a repair necessary.		Go to *Step 7*	Go to *Step 6*
6	Replace the engine control module (ECM). Is the repair complete?		Go to *Step 7*	

Step	Action	Value(s)	Yes	No
7	1. If disconnected, reconnect the O2S 1 electrical connector. 2. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 3. Start the engine and idle at normal operating temperature. 4. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?		Go to *Step 8*	Go to *Step 2*
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0132
O2 BANK 1 SENSOR 1 HIGH VOLTAGE

Circuit Description

The engine control module (ECM) supplies a voltage of about 0.45 volts between terminals C15 and C14 (if measured with a 10 megohm digital voltmeter, this may read as low as 0.32 volts). The Oxygen Sensor (O2S 1) varies the voltage within a range of about 1 volt if the exhaust is rich, down through about 0.10 volts if the exhaust is lean.

The sensor is like an open circuit and produces no voltage when it is below 315˚C (600˚F). An open sensor circuit or cold sensor causes Open Loop operation.

If the O2S 1 pigtail wiring, connector, or terminal is damaged, the entire O2S 1 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the O2S 1 wire(s). Any attempt to repair the wires, connector, or terminals could result in the obstruction of the air reference and degrade the O2S 1 performance. Refer to ”Oxygen Sensor” in this section.

Conditions for Setting the DTC

- O2S 1 voltage is less than 0.952 volts or greater than 0.448 volts in Decel Fuel Cutoff (DFCO) mode.
- Closed loop stoichiometry.
- Engine coolant temperature (ECT) is greater than 60˚C (140˚F).
- Air/fuel ratio is between 14.5:1 and 14.8:1.
- Throttle Position (TP) sensor is between 0% and 95%.
- No related malfunctions.
- 2 second delay in decel for DFCO.
- 2 second delay for closed loop..

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns on.
- The vehicle will operate in Open Loop.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

The DTC P0132 or rich exhaust is most likely caused by one of the following items:

Fuel pressure – System will go rich if fuel pressure is too high. The ECM can compensate for some increase, but if it gets too high, a DTC P0132 will be set.

Leaking injector – A leaking or malfunctioning injector can cause the system to go rich causing a DTC P0132.

Manifold absolute pressure (MAP) sensor – An output that causes the ECM to sense a higher than normal manifold pressure (low vacuum) can cause the system to go rich. Disconnecting the MAP sensor will allow the ECM to substitute a fixed value for the MAP sensor. Substitute a different a MAP sensor, if the rich condition is gone while the sensor is disconnected.

Pressure regulator – Check for a leaking fuel pressure regulator diaphragm by checking for the presence of liquid fuel in the vacuum line to the regulator.

TP sensor – An intermittent TP sensor output will cause the system to go rich due to a false indication of the engine accelerating.

O2S 1 contamination – Inspect the O2S 1 for silicone contamination from fuel or the use of improper room temperature vulcanizing (RTV) sealant. The sensor may have a white powdery coating which may result in a high but false voltage signal (rich exhaust indication). The ECM will then reduce the amount of fuel delivered to the engine, causing a severe surge or driveability problem.

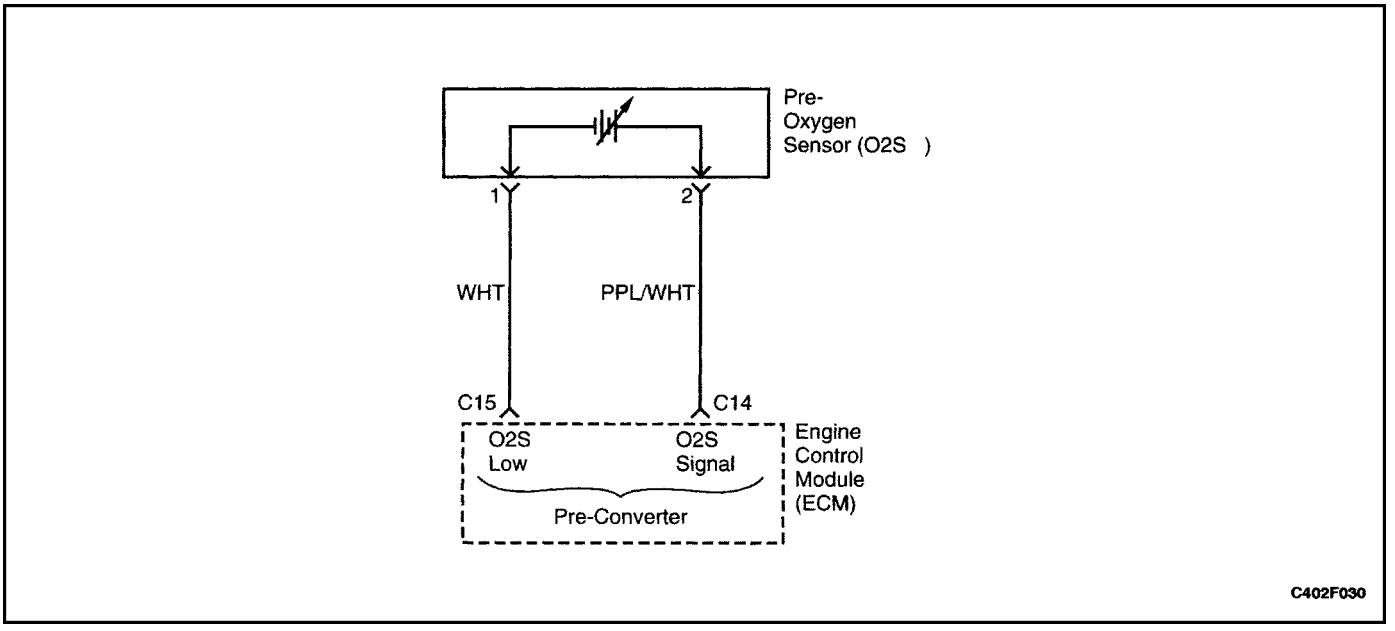
Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. On–Board Diagnostic (OBD II) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step determines if DTC P0132 is the result of a hard failure or an intermittent condition. It may be necessary to operate the vehicle within the Freeze Frame conditions and Conditions for Setting the DTC in order to duplicate the malfunction detected by the ECM.
4. This step simulates a DTC P0131. If the ECM senses the change, the ECM and the wiring are OK.
6. The replacement ECM must be programmed. Refer to the latest Techline procedure for ECM reprogramming.
8. If no malfunctions have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” for additional checks and information.

DTC P0132 O2 Bank 1 Sensor 1 High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. With the ignition ON and the engine OFF, install a scan tool. 2. Engine at operating temperature. Does the oxygen sensor (O2S 1) voltage remain above the specified value?	1042 mv	Go to *Step 4*	Go to *Step 3*
3	1. Review the Freeze Frame data and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions and Conditions For Setting The DTC as noted? Does the O2S 1 voltage stay Above the specified value?	1042 mv	Go to *Step 4*	Go to *Step 8*
4	1. Disconnect the O2S 1 electrical connector. 2. Jumper the O2S 1 electrical connector (engine control module [ECM] side) to ground. Does the scan tool indicate the O2S 1 voltage below the specified value?	500 mV (0.50 v)	Go to ”Diagnostic Aids”	Go to *Step 5*
5	Check the O2S 1 sensor signal circuit, terminal 2 for a short to voltage and repair as necessary. Is a repair necessary.		Go to *Step 7*	Go to *Step 6*
6	Replace the ECM. Is the action complete?		Go to *Step 7*	
7	1. If disconnected, reconnect the O2S 1 electrical connector. 2. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 3. Start the engine and idle at normal operating temperature. 4. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?		Go to *Step 8*	Go to *Step 2*
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0133
O2 BANK 1 SENSOR 1 SLOW RESPONSE

Circuit Description

The engine control module (ECM) continuously monitors the Oxygen Sensor (O2S 1) activity for 100 seconds. During the monitor period, the ECM counts the number of times that the O2S 1 switches from rich to lean and from lean to rich and adds the amount of time it took to complete all switches. With this information, an average time for all switches can be determined. If the average time to switch is too slow, a DTC P0133 will set.

If the O2S 1 pigtail wiring, connector, or terminal is damaged, the entire O2S 1 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the O2S 1 wire(s). Any attempt to repair the wires, connector, or terminals could result in the obstruction of the air reference and degrade O2S 1 performance.

Conditions for Setting the DTC

- DTCs P0106, P0107, P0108, P0117, P0118, P0121, P0122, P0123, P0131, P0132, P0134, P0171, P0172, P0201, P0202, P0203, P0204, P0300, P0336, P0337, P0351, P0352, P0402, P0404, P0405, P0406, P0443, P0506, P0507, P1404, P1441, and P1627 are not set.
- Closed loop stoichiometry.
- Engine Coolant Temperature (ECT) is greater than 72˚C (162˚F).
- Engine run time is greater than 120 seconds.
- Purge D.C. is greater than 0%.
- The rpm is between 1600 and 4000.
- Airflow is between 9 and 40 g/sec.
- No delay after conditions met.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns on.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

DTC P0133 or slow response is most likely caused by one of the following items:

- D Fuel pressure – The system will go rich if fuel pressure is too high. The ECM can compensate for some increase, but if it gets too high, a DTC P0133 may set. Refer to ”Fuel System Diagnosis” in this section.
- Leaking injector – A leaking or malfunctioning injector can cause the system to go rich.
- Manifold absolute pressure (MAP) sensor – An output that causes the ECM to sense a higher than normal manifold pressure (low vacuum) can cause the system to go rich. Disconnecting the MAP sensor will allow the ECM to set a fixed value for the MAP sensor. Substitute a different MAP sensor if the rich condition is gone while the sensor is disconnected.

- Pressure regulator – Check for a leaking fuel pressure regulator diaphragm by checking for the presence of liquid fuel in the vacuum line to the pressure regulator.
- Throttle Position (TP) sensor – An intermittent TP sensor output can cause the system to go rich due to a false indication of the engine accelerating.
- O2S 1 contamination – Inspect O2S 1 for silicone contamination from fuel or use of improper room temperature vulcanizing (RTV) sealant. The sensor may have a white powdery coating, resulting in a high but false voltage signal (rich exhaust indication). The ECM will then reduce the amount of fuel delivered to the engine causing a severe surge or driveability problem.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

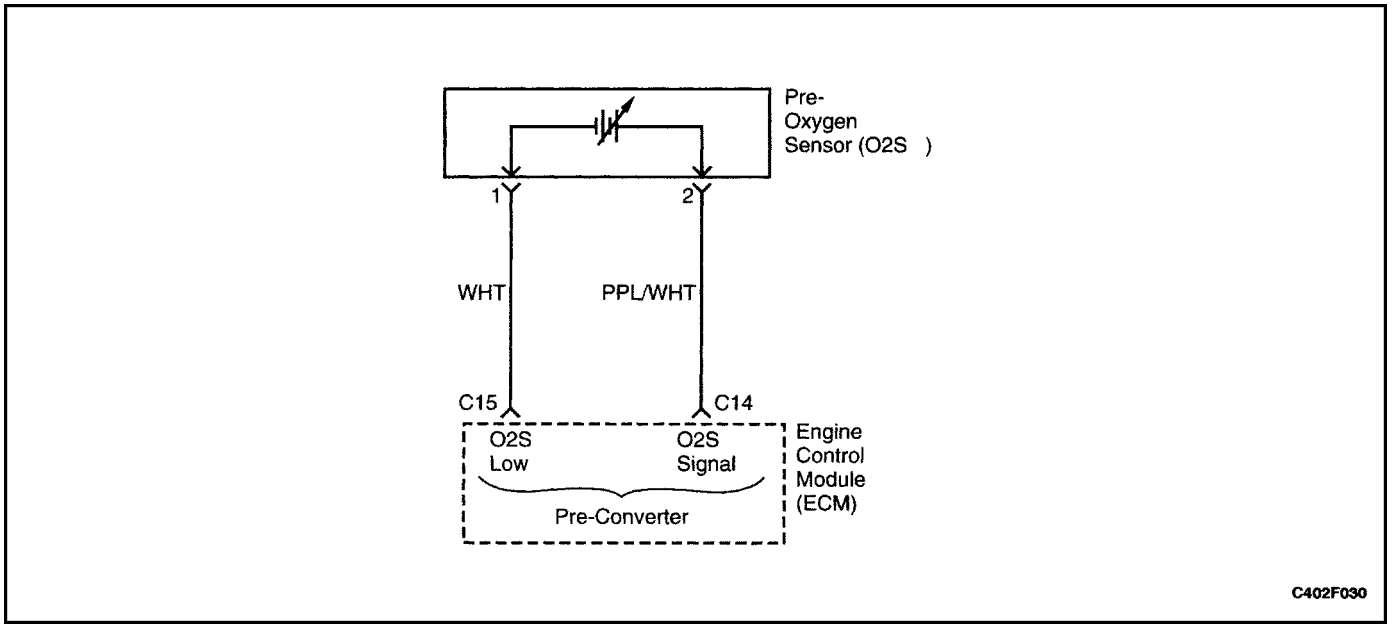
1. The On–Board Diagnostic (OBD II) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
16. The replacement ECM must be programmed. Refer to the latest Techline procedure for ECM reprogramming.
18. no malfunctions have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” for additional checks and information.

DTC P0133 O2 Bank 1 Sensor 1 Slow Response

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool. 2. Are any Diagnostic Trouble Codes (DTCs) set? Are any additional Diagnostic Trouble Codes (DTCs) set?		Go to ”Applicable DTC table”	Go to *Step 3*
3	1. Start the engine and idle at normal operating temperature. 2. Operate the vehicle within the specified parameters under Conditions for Setting the DTC. 3. Monitor the LEAN/RICH AVG. (ms), RICH/LEAN AVG. (ms), and RICH/LEAN TO LEAN/RICH RATIO BANK 1 SENSOR 1 (greater than, less than). Do the parameters show averages less than the specified values or ratios less than or greater than the specified values?	249 ms 249 ms 0.4 3.4	Go to *Step 4*	Go to *Step 7*
4	1. Visually/physically inspect the following items: • Oxygen sensor (O2S 1) is securely installed. • Corrosion on the terminals. • Terminal tension (at O2S 1 and at the engine control module [ECM]). • O2S1 ground circuit for a good connection. • Damaged wiring. Is a problem found in any of the above areas?		Go to *Step 9*	Go to *Step 5*
5	Check the exhaust manifold for a leak near the engine. Repair as necessary. Is a leak found?		Go to *Step 3*	Go to *Step 6*

Step	Action	Value(s)	Yes	No
6	1. Ignition OFF. 2. Disconnect the O2S 1 at the sensor. 3. Using the scan tool, monitor the O2S 1 voltage. Does the scan tool voltage indicate the voltage below the specified value?	407–509 mv	Go to *Step 7*	Go to *Step 10*
7	1. Jumper the O2S 1 high circuit (ECM side) signal circuit, terminal C14 to ground. 2. Using the scan tool, monitor the O2S 1 voltage. Does the scan tool voltage indicate the voltage below the specified value?	200 mv	Go to *Step 8*	Go to *Step 11*
8	Replace the O2S 1. Is the action complete?		Go to *Step 17*	
9	Repair the condition as necessary. Is the repair complete?		Go to *Step 17*	
10	Repair the O2S 1 sensor signal circuit for a short to ground. Is the repair complete?		Go to *Step 17*	
11	1. Remove the jumper wire. 2. Using a digital voltmeter (DVM) measure the voltage between the O2S 1 high signal circuit, terminal 2 and ground. Does the O2S 1 voltage measure above the specified value?	407 mv	Go to *Step 12*	Go to *Step 13*
12	1. Ignition OFF. 2. Disconnect the ECM connectors and check the O2S 1 low circuit, terminal C15 for continuity. 3. If the O2S 1 low circuit measures over the stated value, repair the open or poor connection as necessary. Is an O2S 1 low circuit problem found and corrected?	5 Ω	Go to *Step 17*	Go to *Step 14*
13	1. Ignition OFF. 2. Disconnect the ECM connectors and check the O2S 1 low circuit, terminal C15 for continuity. 3. If the O2S 1 low circuit measures over the stated value, repair the open or poor connection as necessary. Is an O2S 1 low circuit problem found and corrected?	5 Ω	Go to *Step 17*	Go to *Step 15*
14	Check the O2S 1 sensor low circuit terminal C15 connection at the ECM and then replace the terminal if necessary. Does the terminal require replacement?		Go to *Step 17*	Go to *Step 16*
15	Check the O2S 1 sensor signal circuit terminal C14 connection at the ECM and replace the terminal if necessary. Does the terminal require replacement?		Go to *Step 17*	Go to *Step 16*
16	Replace the ECM. Is the action complete?		Go to *Step 17*	

Step	Action	Value(s)	Yes	No
17	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?		Go to *Step 18*	Go to *Step 2*
18	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0134

O2 BANK 1 SENSOR 1 NO ACTIVITY

Circuit Description

The engine control module (ECM) supplies a voltage of about 0.45 volts between terminals C14 and C15 (if measured with a 10 megohm digital voltmeter, this may read as low as 0.32 volts). The Oxygen Sensor (O2S 1) varies the voltage within a range of about 1 volt if the exhaust is rich, down through about 0.10 volts if the exhaust is lean.

The sensor is like an open circuit and produces no voltage when it is below 315˚C (600˚F). An open sensor circuit or cold sensor causes Open Loop operation.

If the O2S 1 pigtail wiring, connector, or terminal is damaged, the entire O2S 1 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the O2S 1 wire(s). Any attempt to repair the wires, connector, or terminals could result in the obstruction of the air reference and degrade the O2S 1 performance. Refer to"Oxygen Sensor" in this section.

Conditions for Setting the DTC

- O2S 1 voltage is between 374 mV and 522 mV.
- Engine run time is greater than 60 seconds.
- No related malfunctions.
- Oxygen sensor nat heated.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns on.
- The vehicle will operate in Open Loop.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

Normal scan tool voltage varies between 150 mV to 850 mV (0.15 volts to 0.85 volts) while in Closed Loop. If DTC P0134 is intermittent, refer to "Intermittents" in this section.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

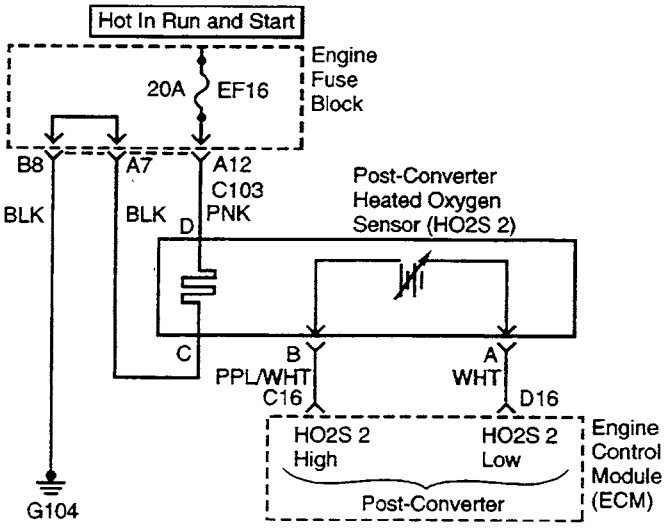
1. The On–Board Diagnostic (OBD II) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference..
2. During engine warm–up, the O2S 1 should warm up, and its voltage output should vary between 150 mv and 850 mv. When the O2S 1 voltage varies, the engine will go into Closed Loop. This determines if the O2S 1 is operating properly.
4. This will determine if the sensor is malfunctioning or the wiring or ECM is the cause of the DTC P0134.

6. Use only a high impedance digital voltmeter (DVM) for this test. The test checks the continuity of the O2S 1 signal and the ground circuits; if the ground circuit is open, the ECM voltage on the circuit will be over 0.6 volts (600 mv).

DTC P0134 O2 Bank 1 Sensor 1 No Activity

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Run the engine to above the specified operating temperature. 2. Install a scan tool. 3. Operate the engine above the specified rpm for 2 minutes. Does the scan tool indicate CLOSED LOOP?	80˚C (176˚F) 1200 rpm	Go to *Step 3*	Go to *Step 4*
3	1. Turn the ignition ON, with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions For Setting The DTC as noted? Does the scan tool indicate CLOSED LOOP?		Go to *Step 12*	Go to *Step 4*
4	Disconnect the O2S 1 electrical connector and jumper the O2S 1 sensor low circuit, terminal 1 to ground. Is the O2S 1 voltage below the specified value and does the scan tool indicate the Heated oxygen sensor (HO2S 2) voltage within the specified value?	500 mv 0.5 v	Go to *Step 5*	Go to *Step 6*
5	Check the O2S harness electrical connector for malfunctioning terminals or poor connection and repair as necessary. Is the repair complete?		Go to *Step 12*	Go to *Step 6*
6	1. Turn the ignition switch ON with the engine OFF. 2. Remove the jumper wire. 3. Using a digital voltmeter (DVM), measure the voltage between the O2S 1 sensor signal circuit, terminal C14 and the ground. Does the O2S 1 voltage measure above the specified value?	600 mv (0.6 v)	Go to *Step 10*	Go to *Step 7*
7	Does the O2S 1 voltage measure below the specified value?	300 mv (0.3 v)	Go to *Step 11*	Go to *Step 8*
8	Replace the ECM. Is the action complete?		Go to *Step 12*	
9	Replace the O2S 1 sensor. Is the action complete?		Go to *Step 12*	
10	Check the O2S 1 sensor ground circuit, terminal C15 for an open or poor connection and repair as necessary. Is a repair necessary?		Go to *Step 12*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
11	Check the O2S 1 sensor signal circuit, terminal C14 for an open or poor connection and repair as necessary. Is a repair necessary?		Go to *Step 12*	Go to *Step 8*
12	1. If disconnected, reconnect the O2S 1 electrical connector. 2. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 3. Start the engine and idle at normal operating temperature. 4. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?		Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0137
O2 BANK 1 SENSOR 2 LOW VOLTAGE

Circuit Description

In order to control emissions, a catalytic converter is used to convert harmful emissions into harmless water vapor and carbon dioxide.

The engine control module (ECM) has the ability to monitor this process by using a Heated Oxygen Sensor (HO2S 2). The HO2S 2, located in the exhaust stream past the catalytic converter, produces an output signal which indicates the storage capacity of the catalyst; this in turn indicates the catalyst's ability to convert exhaust emissions effectively. If the catalyst is functioning properly, the HO2S 2 signal will be far less active than the signal produced by the Oxygen Sensor (O2S 1).

If the HO2S 2 pigtail wiring, connector, or terminal is damaged, the entire HO2S 2 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the HO2S 2 wire(s). Any attempt to repair the wires, connector, or terminals could result in the obstruction of the air reference and degrade the HO2S 2 performance.

Conditions for Setting the DTC

- O2S 2 voltage is less than 0.05 volt or less than 0.4 volt in Power Enrichment (PE) mode.
- Closed Loop stoichiometry.
- Engine coolant temperature (ECT) is greater than 60˚C (140˚F).
- Air/fuel ratio is between 14.5:1 and 14.8:1.
- Throttle position (TP) sensor is between 5% and 50% or in PE mode.
- 2 second delay after the conditions have been met.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns on.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

An intermittent may be caused by rubbed–through wire insulation or a wire contacting the exhaust.

Check for the following conditions:

- Exhaust system – Inspect the exhaust system for leaks. Check the exhaust between the three–way catalytic converter and the flange for leaks, corrosion, or for loose or missing hardware and repair as necessary.
- Poor connection or damaged harness – Ensure that the HO2S 2 pigtail is not contacting the exhaust. Check for the following conditions:
  - Improper mating
  - Broken locks
  - Improperly formed
  - Damaged terminals
  - Poor terminal–to–wire connection

- Damaged harness
- Intermittent test – Observe the HO2S 2 on the scan tool while moving related connections and the wiring harness with the ignition ON. If the failure is induced, the HO2S 2 display will change. This may help isolate the location of the malfunction.

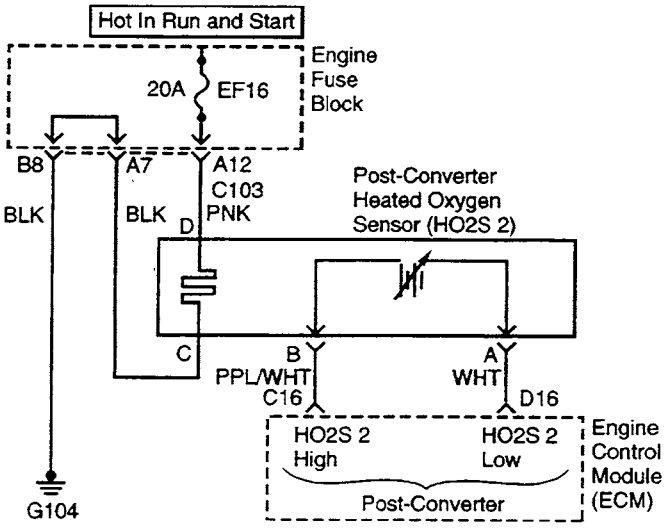
Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board diagnostic (OBD II) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step determines if DTC P0137 is the result of a hard failure or an intermittent condition.
4. Jumping the HO2S 2 high circuit, terminal B to ground is necessary to allow the ECM to display the supplied bias voltage. If the voltage is between 0.35 and 0.55 volts, then the wiring and the are OK.
6. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for reprogramming.

DTC P0137 O2 Bank 1 Sensor 2 Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition ON, with the engine OFF. 2. Install a scan tool. Is the heated oxygen sensor (HO2S 2) voltage less than the specified value?	200 mv (0.20 v)	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition ON with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions For Setting The DTC as noted? Is the HO2S 2 voltage less than the specified value?	400 mV (0.40 v)	Go to *Step 4*	Go to *Step 8*
4	1. Disconnect the HO2S 2 electrical connector 2. Connect a jumper wire between HO2S 2 terminal B and ground. Does the scan tool indicate that the HO2S 2 voltage is within the specified value?	350 mV–550 mV (0.35 v–0.55 v)	Go to *Step 7*	Go to *Step 5*
5	1. Turn the ignition switch OFF. 2. Disconnect the engine control module (ECM) electrical connectors and check the HO2S 2 high circuit, terminal C16 for a short to ground or short to the HO2S 2 low circuit terminal D16 and repair as necessary. Is a repair necessary?		Go to *Step 8*	Go to *Step 6*
6	Replace the ECM. Is the action complete?		Go to *Step 8*	
7	Replace the HO2S 2. Is the repair complete?		Go to *Step 8*	
8	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for Setting the DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has ran and passed?		Go to *Step 9*	Go to *Step 2*
9	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0138

O2 BANK 1 SENSOR 2 HIGH VOLTAGE

Circuit Description

In order to control emissions, a catalytic converter is used to convert harmful emissions into harmless water vapor and carbon dioxide.

The engine control module (ECM) has the ability to monitor this process by using a Heated Oxygen Sensor (HO2S 2). The HO2S 2, located in the exhaust stream past the catalytic converter, produces an output signal which indicates the storage capacity of the catalyst. This in turn indicates the catalyst's ability to convert exhaust emissions effectively. If the catalyst is functioning properly, the HO2S 2 signal will be far less active than the signal produced by the Oxygen Sensor (O2S 1).

If the HO2S 2 pigtail wiring, connector, or terminal is damaged, the entire HO2S 2 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the HO2S 2 wire(s). Any attempt to repair the wires, connector, or terminals could result in the obstruction of the air reference and degrade the HO2S 2 performance.

Conditions for Setting the DTC

- HO2S voltage is above than 0.952 volt or above than 0.478 volt in Decel Fuel Cutoff (DFCO) mode.
- Closed loop stoichiometry.
- Engine coolant temperature (ECT) is greater than 60˚C (140˚F).
- Air/fuel ratio is between 14.5:1 and 14.8:1.
- Throttle Position (TP) sensor is between 0% and 95% or in Decel Fuel Cutoff (DFCO) mode.
- 2 second delay in DFCO.
- 0.2 second delay after conditions are met in closed loop.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns on.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

Check for the following conditions:

- Rich exhaust – An overly rich exhaust may load the catalyst, causing high HO2S 2 signal voltages.
- Silicone contamination – A false rich condition may be caused by silicone contamination of the HO2S 2. This will be indicated by a powdery white deposit on the sensor.
- Faulty HO2S 2 – If HO2S 2 is internally shorted, the HO2S 2 voltage displayed on a scan tool will be over volt. Disconnect the HO2S 2 and jumper the sensor low circuit to engine ground; if the displayed voltage goes from over 1000 mv to around 450 mv, replace the HO2S 2.

- Intermittent test – Observe HO2S 2 on Tech 1 while moving related connectors and the wiring harness with the key in the ON position. If the failure is induced, the HO2S 2 display will change. This may help isolate the location of the malfunction.

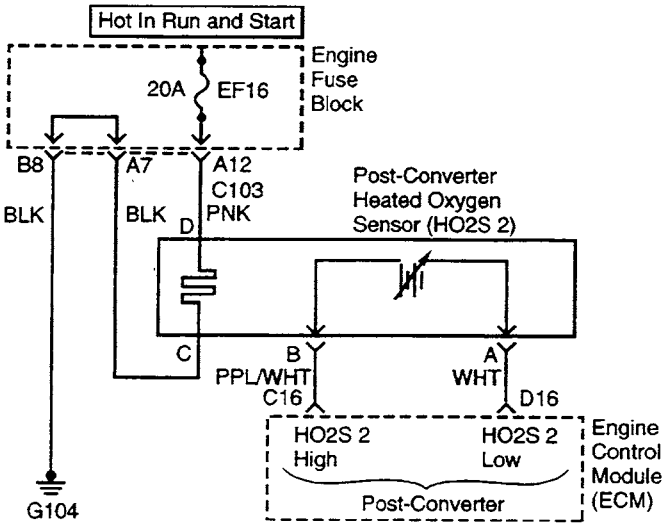
Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (OBD II) System Check prompts the technician to complete some basic checks and to store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step determines if DTC P0138 is the result of a hard failure or an intermittent condition.
5. Disconnecting the HO2S 2 and jumpering the sensor signal circuit and the sensor low circuit to ground should cause the scan tool to display HO2S 2 voltage below 100 mv (0.1 v). If the signal voltage is still high, the ECM is malfunctioning.
8. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0138 O2 Bank 1 Sensor 2 High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition ON, with the engine OFF. 2. Install a scan tool. Is the heated oxygen sensor (HO2S 2) voltage above the specified value?	1042 mv (1.042 v)	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition ON, with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions For Setting The DTC as noted. Is the HO2S 2 voltage above the specified value?	1042 mv (1.042 v)	Go to *Step 4*	Go to *Step 9*
4	1. Turn the ignition OFF. 2. Disconnect the HO2S 2 electrical connector. 3. Disconnect the Engine Control Module (ECM) electrical connector. 4. With a digital voltmeter (DVM) connected to ground, probe the HO2S 2 high signal circuit, terminal C16. Does the DVM indicate a voltage of the specified value?	0 v (±0.5 v)	Go to *Step 5*	Go to *Step 6*
5	1. Reconnect the ECM electrical connectors. 2. Turn the ignition switch ON, with the engine OFF. 3. Jumper the high and low circuits at the HO2S 2 electrical connector, terminals A and B to ground. Does the scan tool indicate the HO2S 2 voltage below the specified value?	100 mV (0.10 v)	Go to *Step 7*	Go to *Step 8*
6	Repair the short to voltage in the HO2S 2 high circuit. Is the action complete?		Go to *Step 9*	
7	Replace the HO2S 2. Is the repair complete?		Go to *Step 9*	
8	Replace the ECM. Is the repair complete?		Go to *Step 9*	
9	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?		Go to *Step 10*	Go to *Step 2*
10	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0140

O2 BANK 1 SENSOR 2 NO ACTIVITY

Circuit Description

In order to control emissions, a catalytic converter is used to convert harmful emissions into harmless water vapor and carbon dioxide.

The engine control module (ECM) has the ability to monitor this process by using a Heated Oxygen Sensor (HO2S 2). The HO2S 2, located in the exhaust stream past the catalytic converter, produces an output signal which indicates the storage capacity of the catalyst. This in turn indicates the catalyst's ability to convert exhaust emissions effectively. If the catalyst is functioning properly, the HO2S 2 signal will be far less active than the signal produced by the Oxygen Sensor (O2S 1).

If the HO2S 2 pigtail wiring, connector, or terminal is damaged, the entire HO2S 2 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the HO2S 2 wire(s). Any attempt to repair the wires, connector, or terminals could result in the obstruction of the air reference and degrade the HO2S 2 performance.

Conditions for Setting the DTC

- HO2S voltage is between 0.422 and 0.478 volts.
- Engine run time is greater than 60 seconds.
- Oxygen sensor heated.
- Closed loop stoichiometry.
- No related malfunctions.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns on.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

An intermittent may be caused by a rubbed–through wire insulation or a wire contacting the exhaust.

Check for the following conditions:

- A poor connection or a damaged harness – Inspect the harness for a short to ground in the sensor signal circuit. Ensure that the HO2S 2 pigtail is not contacting the exhaust. Check for the following conditions:
  - Improper mating
  - Broken locks
  - Improperly formed
  - Damaged terminals
  - Poor terminal–to–wire connection
  - Damaged harness
- Intermittent test – Observe HO2S 2 on the scan tool while moving the related connections and the wiring harness with the ignition ON. If the failure is induced, the HO2S 2 display will change. This may help isolate the location of the malfunction.

Test Description

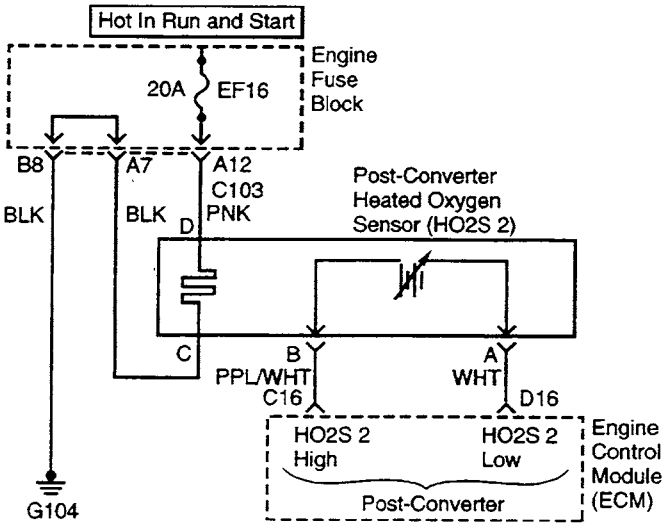
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (OBD II) System Check prompts the technician to complete some basic checks and to store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step determines if DTC P0140 is the result of a hard failure or an intermittent condition.
4. Disconnecting the HO2S 2 and jumpering the sensor signal circuit and the sensor low circuit to ground will determine if the ECM or wiring or HO2S 2 is malfunctioning.
6. Determines which circuit the malfunction is in. If the sensor signal circuit and the sensor low circuit are OK, then the ECM connection or ECM is malfunctioning.
10. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0140 O2 Bank 1 Sensor 2 No Activity

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool with the engine above normal specified operating temperature. 2. Run the engine above the specified rpm for two minutes. Does the scan tool display a heated oxygen sensor (HO2S 2) voltage between the specified value?	80˚C (176˚F) 1200 rpm 425 mv – 460 mv (0.425 v – 0.460 v)	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition ON with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions For Setting The DTC as noted? Does the scan tool display the HO2S 2 voltage steady around the specified value?	425 mv – 460 mv (0.425 v – 0.460 v)	Go to *Step 4*	Go to *Step 11*
4	1. Turn the ignition on, with the engine OFF. 2. Disconnect the HO2S 2 electrical connector. 3. Jumper the HO2S 2 high and low circuits, terminals A and B to ground. Does the scan tool indicate the HO2S 2 voltage below the specified value?	100 mv (0.10 v)	Go to *Step 5*	Go to *Step 6*
5	1. Turn the ignition OFF. 2. Check for a malfunctioning connection at the HO2S 2 engine control module [ECM] side) and repair as necessary. Is a repair necessary?		Go to *Step 11*	Go to *Step 7*
6	1. Turn the ignition switch OFF. 2. Remove the jumpers and reconnect the HO2S 2 electrical connector. 3. Disconnect the ECM connector. 4. Probe the HO2S 2 low circuit, terminal D16 with a test light to B+. Does the test light illuminate?		Go to *Step 8*	Go to *Step 9*
7	Replace the HO2S 2 Sensor. Is the repair complete?		Go to *Step 11*	

Step	Action	Value(s)	Yes	No
8	Check for an open in the HO2S 2 high circuit or poor connection and repair as necessary. is a repair necessary?		Go to *Step 11*	Go to *Step 10*
9	Repair the open in the HO2S 2 low circuit. Is the repair complete?		Go to *Step 11*	
10	Replace the ECM. Is the repair complete?		Go to *Step 11*	
11	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?		Go to *Step 12*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0141

O2 BANK 1 SENSOR 2 HEATER

Circuit Description

In order to control emissions, a catalytic converter is used to convert harmful emissions into harmless water vapor and carbon dioxide.

The engine control module (ECM) has the ability to monitor this process by using a Heated Oxygen Sensor (HO2S 2). The HO2S 2, located in the exhaust stream past the catalytic converter, produces an output signal which indicates the storage capacity of the catalyst; this in turn indicates the catalyst's ability to convert exhaust emissions effectively. If the catalyst is functioning properly, the HO2S 2 signal will be far less active than the signal produced by the Oxygen Sensor (O2S 1).

If the HO2S 2 pigtail wiring, connector, or terminal is damaged, the entire HO2S 2 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the HO2S 2 wire(s). Any attempt to repair the wires, connector, or terminals could result in the obstruction of the air reference and degrade the HO2S 2 performance.

Conditions for Setting the DTC

- Engine coolant temperature (ECT) is less than –40˚C (–40˚F).
- Intake Air Temperature (IAT) less than –40˚C (–40˚F).
- Ignition voltage is between 11 and 16 volts.
- Average airflow is less than 16 g/sec.
- Test between 400 mv and 500 mv.
- Throttle position (TP) sensor is greater than 40% with a 0.4 second delay.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns on.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

An intermittent may be caused by a rubbed–through wire insulation or a wire contacting the exhaust.

Check for a poor connection or a damaged harness – inspect the harness connectors for the following conditions:

- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection
- Damaged harness

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (OBD II) System Check prompts the technician to complete some basic checks and to store the freeze frame and failure

records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.

2. This step determines if DTC P0141 is the result of a hard failure or an intermittent condition. With the ignition ON, engine OFF, the HO2S 2 voltage displayed on the scan tool should change within several minutes towards 0 or 1 volt, indicating that the heater is working properly.
3. Probing terminal D of the HO2S 2 connector verifies if voltage is available to the HO2S 2 heater.
4. If voltage is available at the connector, it becomes a good voltage source to check for a ground at terminal C.
5. Determines if voltage is not available at the HO2S due to an open O2 fuse or open ignition feed circuit. If the fuse is open, determine if it was due to a short in the ignition feed circuit before replacing the fuse.

DTC P0141 O2 Bank 1 Sensor 2 Heater

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	**Notice :** If the engine has just been operating, allow the engine to cool for about one–half hour before proceeding. 1. Turn the ignition switch ON with the engine OFF. 2. Install a scan tool. Does the Heated Oxygen Sensor (HO2S 2) voltage gradually change towards the specified voltage?	0 v or 1 v	Go to *Step 13*	Go to *Step 3*
3	1. Disconnect the HO2S 2 electrical connector. 2. With a test light connected to ground, probe the ignition feed circuit, terminal D of the connector. 3. With a test light connected to ground, probe the HO2S ignition feed circuit, terminal D of the connector. Does the test light illuminate?		Go to *Step 4*	Go to *Step 5*
4	Connect a test light between the ignition feed and ground circuits, terminals D and C of the connector. Does the test light illuminate?		Go to *Step 6*	Go to *Step 6*
5	Inspect the fuse in the Instrument Panel (I/P) fuse block. Is the fuse open?		Go to *Step 8*	Go to *Step 9*
6	Check the connections at the HO2S 2 connector and repair as necessary. Is a repair necessary?		Go to *Step 13*	Go to *Step 10*
7	Check the connections at the HO2S 2 connector and repair as necessary. Is a repair necessary?		Go to *Step 13*	Go to *Step 11*
8	1. Check for a short to ground in the HO2S 2 ignition feed circuit and repair as necessary? 2. Replace open fuse. Is the action complete?		Go to *Step 13*	
9	Check the connections at the HO2S 2 connector and repair as necessary. Is a repair necessary?		Go to *Step 13*	Go to *Step 12*

Step	Action	Value(s)	Yes	No
10	Replace the HO2S 2 sensor. Is the action complete?		Go to *Step 13*	
11	Repair the open in the ground circuit. Is the action complete?		Go to *Step 13*	
12	Repair the open in the ignition feed circuit. Is the action complete?		Go to *Step 13*	
13	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?		Go to *Step 14*	Go to *Step 2*
14	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK