

DTC P2A01 OR P2A04

Circuit Description

Heated oxygen sensors (HO2S) are used for fuel control and post catalyst monitoring. Each HO2S compares the oxygen content of the surrounding air with the oxygen content in the exhaust stream. The HO2S must reach operating temperature to provide an accurate voltage signal. Heating elements inside the HO2S minimize the time required for the sensors to reach operating temperature. The powertrain control module (PCM) supplies the HO2S with a reference, or bias, voltage of about 450 mV. When the engine is first started the PCM operates in open loop, ignoring the HO2S voltage signal. Once the HO2S reaches operating temperature and closed loop is achieved, the HO2S generates a voltage within a range of 0-1,000 mV that fluctuates above and below bias voltage. High HO2S voltage indicates a rich exhaust stream; low HO2S voltage indicates a lean exhaust stream.

The HO2S bank 1 sensor 2 and HO2S bank 2 sensor 2 are used for catalyst monitoring. This diagnostic runs once per ignition cycle. This diagnostic consists of two tests, a passive test and an intrusive test. During the passive test, if the HO2S bank 1 sensor 2 or HO2S bank 2 sensor 2 voltage transitions less than 349 mV and greater than 710 mV, the DTC will pass for this ignition cycle. If the DTC does not pass during the passive test, the intrusive test will begin. During the intrusive test, the control module will force the air-to-fuel ratio rich and/or lean. The control module then waits for a predicted response from the HO2S. If the HO2S voltage transitions less than 349 mV or greater than 710 mV, the DTC will pass for this ignition cycle. If the control module does not receive the expected response from the HO2S, DTC P2A01 will set for HO2S bank 1 sensor 2 or DTC P2A04 will set for HO2S bank 2 sensor 2.

DTC Descriptors

This diagnostic procedure supports the following DTCs:

- DTC P2A01 HO2S Performance Bank 1 Sensor 2
- DTC P2A04 HO2S Performance Bank 2 Sensor 2

Conditions for Running the DTC

DTCs P0101, P0102, P0103, P0106, P0107, P0108, P0112, P0113, P0117, P0118, P0128, P0131, P0132, P0133, P0134, P0135, P0137, P0138, P0140, P0141, P0151, P0152, P0153, P0154, P0155, P0157, P0158, P0160, P0161, P0200, P0442, P0443, P0446, P0449, P0455, P0496, P1133, P1134, P1153, P1154 are not set.

Passive Test

- The engine is running.
- The Engine Run Time parameter is less than 13.5 minutes.
- The above conditions are met for 2 seconds.
- This diagnostic runs one time per drive cycle once the above conditions are met.

Intrusive Test

- The Engine Run Time parameter is more than 13.5 minutes.
- The Ignition 1 Signal parameter is between 10-18 volts.
- The Engine Speed parameter is between 900-5,000 RPM.
- The MAF Sensor parameter is between 5-100 g/s.
- The Vehicle Speed parameter is between 24-131 km/h (15-82 mph).
- The Short Term FT Bank 1 and Bank 2 parameter is between -4 and +4 percent.

- The maximum number of intrusive attempts is less than 100.
- The above conditions are met for 3 seconds.
- This diagnostic runs one time per drive cycle once the above conditions are met.

Conditions for Setting the DTC

1. The PCM detects that the HO2S bank 1 sensor 2 or HO2S bank 2 sensor 2 did not transition less than 349 mV and greater than 710 mV during the passive test.
2. One of the following tests fail:

Lean Intrusive Test

- The PCM detects that the HO2S bank 1 sensor 2 or HO2S bank 2 sensor 2 is greater than 349 mV for 60 seconds.
- The HO2S bank 1 sensor 1 and HO2S bank 2 sensor 1 is less than 300 mV.

Rich Intrusive Test

- The PCM detects that the HO2S bank 1 sensor 2 or HO2S bank 2 sensor 2 is less than 710 mV for 60 seconds.
- The HO2S bank 1 sensor 1 and HO2S bank 2 sensor 1 is greater than 600 mV.

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.

Test Description

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

2: If the voltage does not change more than the specified value, the condition is present.

DTC P2A01 or P2A04

Step	Action	Value(s)	Yes	No
<p>Schematic Reference: Engine Controls Schematics Connector End View Reference: Engine Controls Connector End Views or Powertrain Control Module</p>				

(PCM) Connector End Views

1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to Step 2	Go to Diagnostic System Check - Vehicle
2	<ol style="list-style-type: none"> 1. Start the engine. 2. Allow the engine to reach operating temperature. Refer to Scan Tool Data List . 3. Operate the engine at 1,500 RPM for 30 seconds. 4. While observing the affected HO2S voltage parameter with a scan tool, quickly cycle the throttle from closed throttle to wide open throttle, 3 times. <p>Did the HO2S voltage parameter change more than the specified value?</p>	200 mV	Go to Step 3	Go to Step 4
3	<ol style="list-style-type: none"> 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. <p>Did the DTC fail this ignition?</p>	-	Go to Step 4	Go to Testing for Intermittent Conditions and Poor Connections
4	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the affected heated oxygen sensor (HO2S). 3. Turn ON the ignition, with the engine OFF. 4. Observe the HO2S voltage parameter with a scan tool. <p>Is the HO2S voltage parameter less than the specified value?</p>	100 mV	Go to Step 6	Go to Step 5
5	<p>Observe the HO2S voltage parameter with a scan tool.</p> <p>Is the HO2S voltage parameter more than the specified value?</p>	800 mV	Go to Step 7	Go to Step 8
6	<p>Test the HO2S high signal circuit for a short to ground. Refer to the following procedures:</p> <ul style="list-style-type: none"> • Heated Oxygen Sensor (HO2S) Wiring Repairs • Circuit Testing • Wiring Repairs <p>Did you find and correct the condition?</p>	-	Go to Step 20	Go to Step 9

7	<p>IMPORTANT: The sensor may be damaged if the circuit is shorted to a voltage source.</p> <p>Test the HO2S high signal circuit for a short to voltage. Refer to the following procedures:</p> <ul style="list-style-type: none"> • Heated Oxygen Sensor (HO2S) Wiring Repairs • Circuit Testing • Wiring Repairs <p>Did you find and correct the condition?</p>	-		Go to Step 20	Go to Step 17
8	<p>Measure the voltage from the low signal circuit of the HO2S harness connector on the engine harness side to a good ground with a DMM. Refer to Circuit Testing .</p> <p>Is the voltage more than the specified value?</p>	2 V		Go to Step 10	Go to Step 11
9	<p>Test the HO2S high signal circuit for a short to the HO2S low signal circuit. Refer to the following procedures:</p> <ul style="list-style-type: none"> • Heated Oxygen Sensor (HO2S) Wiring Repairs • Circuit Testing • Wiring Repairs <p>Did you find and correct the condition?</p>	-		Go to Step 20	Go to Step 17
10	<p>Test the HO2S low signal circuit for a short to voltage. Refer to the following procedures:</p> <ul style="list-style-type: none"> • Heated Oxygen Sensor (HO2S) Wiring Repairs • Circuit Testing • Wiring Repairs <p>Did you find and correct the condition?</p>	-		Go to Step 20	Go to Step 17
11	<ol style="list-style-type: none"> 1. Connect a 3-amp fused jumper wire between the high signal circuit of the HO2S harness connector on the engine harness side and a good ground. 2. Observe the HO2S voltage parameter with a scan tool. <p>Is the HO2S voltage parameter less than the specified value?</p>	100 mV		Go to Step 12	Go to Step 14
	<ol style="list-style-type: none"> 1. Remove the jumper wire from the previous step. 2. Connect a 3-amp fused jumper wire between 				

12	<p>the high signal circuit of the HO2S harness connector on the engine harness side and the low signal circuit of the HO2S harness connector on the engine harness side.</p> <p>3. Observe the HO2S voltage parameter with a scan tool.</p> <p>Is the HO2S voltage parameter less than the specified value?</p>	100 mV		Go to Step 15	Go to Step 13
13	<p>Test the HO2S low signal circuit for an open or high resistance. Refer to the following procedures:</p> <ul style="list-style-type: none"> • Heated Oxygen Sensor (HO2S) Wiring Repairs • Circuit Testing • Wiring Repairs <p>Did you find and correct the condition?</p>	-		Go to Step 20	Go to Step 17
14	<p>Test the HO2S high signal circuit for an open or high resistance. Refer to the following procedures:</p> <ul style="list-style-type: none"> • Heated Oxygen Sensor (HO2S) Wiring Repairs • Circuit Testing • Wiring Repairs <p>Did you find and correct the condition?</p>	-		Go to Step 20	Go to Step 17
15	<p>1. The HO2S may be detecting a rich exhaust condition, a lean exhaust condition, or the HO2S may be contaminated. Inspect for the following conditions:</p> <p>NOTE: Refer to Silicon Contamination of Heated Oxygen Sensors Notice in Cautions and Notices.</p> <ul style="list-style-type: none"> • A silicon contaminated HO2S • Any water intrusion into the HO2S connector • An exhaust leak between the HO2S and the engine • Any vacuum leaks • Engine oil contaminated with fuel • An incorrect fuel pressure-Refer to Fuel System Diagnosis . • Any lean or rich fuel injectors-Refer to Fuel Injector Balance Test with Tech 2 . 	-			

	<ul style="list-style-type: none"> An inaccurate mass air flow (MAF) sensor-Refer to Scan Tool Data List . <p>2. Repair any of the above or similar engine conditions as necessary.</p> <p>Did you find and correct the condition?</p>		Go to Step 20	Go to Step 16
16	<p>Test for shorted terminals and for poor connections at the HO2S. Refer to the following procedures in Wiring Systems:</p> <ul style="list-style-type: none"> Heated Oxygen Sensor (HO2S) Wiring Repairs Testing for Intermittent Conditions and Poor Connections Connector Repairs <p>Did you find and correct the condition?</p>	-	Go to Step 20	Go to Step 18
17	<p>Test for shorted terminals and for poor connections at the powertrain control module (PCM). Refer to the following procedures:</p> <ul style="list-style-type: none"> Heated Oxygen Sensor (HO2S) Wiring Repairs Testing for Intermittent Conditions and Poor Connections Connector Repairs <p>Did you find and correct the condition?</p>	-	Go to Step 20	Go to Step 19
18	<p>Replace the affected HO2S. Refer to Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 2 or Heated Oxygen Sensor (HO2S) Replacement Bank 2 Sensor 2 .</p> <p>Did you complete the replacement?</p>	-	Go to Step 20	-
19	<p>Replace the PCM. Refer to Control Module References for replacement, setup, and programming.</p> <p>Did you complete the replacement?</p>	-	Go to Step 20	-
20	<ol style="list-style-type: none"> Clear the DTCs with a scan tool. 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 2	Go to Step 21
21	<p>Observe the Capture Info with a scan tool.</p> <p>Are there any DTCs that have not been diagnosed?</p>	-	Go to Diagnostic Trouble Code (DTC) List -	

Vehicle

System OK

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