

P0420

DTC P0420

CIRCUIT DESCRIPTION

The three-way catalytic converter (TWC) reduces emissions of hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx). The catalyst within the converter promotes a chemical reaction, which oxidizes the HC and CO that are present in the exhaust gas. This process converts these chemicals into water vapor and carbon dioxide (CO₂), and will reduce the NOx, by converting them into nitrogen. The [catalytic converter](#) also stores oxygen. The powertrain control module (PCM) monitors this process using heated oxygen sensor (HO₂S) bank 1 sensor 2 and HO₂S bank 2 sensor 2, located in the exhaust stream after the TWC. These sensors are referred to as the catalyst monitor sensors. The catalyst monitor sensors produce an output signal the PCM uses to indicate the oxygen storage capacity of the catalyst. This determines the catalysts ability to effectively convert the exhaust emissions.

If the catalyst is functioning correctly, the HO₂S bank 1 sensor 2 and HO₂S bank 2 sensor 2 signals will be far less active than the signals that are produced by HO₂S bank 1 sensor 1 and HO₂S bank 2 sensor 1. This indicates that the TWC oxygen storage capacity is at an acceptable threshold. When the response time of the catalyst monitor sensors are close to that of the fuel control sensors, the ability of the catalyst to store oxygen may be below an acceptable threshold.

The PCM performs this diagnostic test at idle. When the conditions for running this DTC are met, the following occurs:

- The air-to-fuel ratio transitions from lean to rich.
- The air-to-fuel ratio transitions from rich to lean, opposite the first air-to-fuel ratio transition.
- The PCM captures the response time of the front and the rear HO₂S when the air-to-fuel ratio transitions occur. The HO₂S response time changes from less than **300 mV** to more than **600 mV** , and from more than **600 mV** to less than **300 mV** .
- The PCM measures the time necessary for the rear HO₂S voltage to cross a reference lean-to-rich threshold, and the time necessary for the front HO₂S voltage to cross the same lean-to-rich threshold. The difference between the front HO₂S time and the rear HO₂S time indicates the oxygen storage capacity of the catalyst. If the PCM detects that this time difference is less than a predetermined value, DTC P0420 for bank 1 or DTC P0430 for bank 2 sets.

DTC DESCRIPTORS

This diagnostic procedure supports the following DTCs:

- DTC P0420 Catalyst System Low Efficiency Bank 1
- DTC P0430 Catalyst System Low Efficiency Bank 2

CONDITIONS FOR RUNNING THE DTC

- DTCs P0053, P0054, P0059, P0060, P0068, P0101, P0102, P0103, P0106, P0107, P0108, P0112, P0113, P0116, P0117, P0118, P0120, P0128, P0131, P0132, P0133, P0134, P0135, P0137, P0138, P0140, P0141, P0151, P0152, P0153, P0154, P0155, P0157, P0158, P0160, P0161, P0171, P0172, P0174, P0175, P0200, P0220, P0300, P0325, P0327, P0332, P0335, P0336, P0341, P0342, P0343, P0351-P0358, P0442, P0443, P0446, P0449, P0452, P0453, P0455, P0496, P0500, P0506, P0507, P1125, P1133, P1134, P1153, P1154, P1258, P1516, P2101, P2108, P2120, P2121, P2125, P2135, P2A01, P2A04, U0107 are not set.
- The engine has been running for more than **10 minutes** .
- The intake air temperature (IAT) is between **-20 to +85°C (-4 and +185°F)** .
- The barometric pressure (BARO) is more than **70 kPa** .
- The engine coolant temperature (ECT) is more than **70-120°C (158-248°F)** .
- Since the end of the last idle period, the engine speed has been more than **900 RPM for 45 seconds** .
- The engine must be at a stable [idle speed](#), within **200 RPM** of desired idle.

- The battery voltage is more than **11 volts** .
- The Closed Loop fuel control is enabled.
- This diagnostic attempts one test during each valid idle period once the above conditions have been met. This diagnostic attempts up to 12 tests during each drive cycle.

CONDITIONS FOR SETTING THE DTC

- The PCM determines that the oxygen storage capability of the TWC has degraded to less than a calibrated threshold.
- This diagnostic may conclude in as few as one test attempt. However, this diagnostic may require as many as 18 test attempts, which would require at least 3 drive cycles. Each test attempt concludes within **1.5 minutes** .

ACTION TAKEN WHEN THE DTC SETS

- The [control module](#) illuminates the malfunction indicator lamp (MIL) when the diagnostic runs and fails.
- The [control module](#) records the operating conditions at the time the diagnostic fails. The control module stores this information in the Freeze Frame/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

- The catalyst test may abort due to a change in the engine load. Do not change the engine load, ensure the AC is OFF, the coolant fan is not cycling, while a catalyst test is in progress.
- Driving the vehicle under the conditions outlined in the Inspection/Maintenance (I/M) section can verify whether the fault is present.
- These conditions may cause a [catalytic converter](#) to degrade. Inspect for the following conditions:
 - An engine misfire
 - High engine oil or high coolant consumption
 - Retarded spark timing
 - A weak or poor spark
 - A lean fuel mixture
 - A rich fuel mixture
- A damaged [oxygen sensor](#) or wiring harness.
- If an intermittent condition cannot be duplicated, the information included in Freeze Frame data can be useful in determining the vehicle operating conditions when the DTC was set.
- The catalyst may have been temporarily contaminated with a chemical from a fuel additive, fuel contamination or any of the above conditions.

If the condition is determined to be intermittent, refer to Intermittent Conditions. [See: Initial Inspection and Diagnostic Overview\Diagnostic Strategies\Intermittent Conditions](#)

TEST DESCRIPTION

Step	Action	Values	Yes	No
1	Did you perform the Diagnostic System Check – Vehicle?	—	Go to Step 2	Go to Diagnostic System Check - Vehicle in Vehicle DTC Information
2	Review the DTC information on the scan tool. Are any other DTCs set?	—	Go to Diagnostic Trouble Code (DTC) List - Vehicle in Vehicle DTC Information	Go to Step 3
3	<ol style="list-style-type: none"> Start and idle the engine. Allow the engine to reach operating temperature. Increase the engine speed to 2,000 RPM for 2 minutes. Ensure Closed Loop operation is enabled. Return the engine to a stabilized idle. Observe the HO2S 2 voltage parameter on the scan tool for the applicable bank. <p>Is the applicable HO2S 2 voltage parameter transitioning below the first specified value and above the second specified value?</p>	300 mV 600 mV	Go to Step 5	Go to Step 4
4	<ol style="list-style-type: none"> Clear the DTCs with a scan tool. 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 DTC P0420 or P0430 set?</p>	—	Go to Step 5	Go to Diagnostic Aids
5	<p>Important</p> <p>Verify that the three-way catalytic converter (TWC) is a high quality part that meets the OEM specifications.</p> <p>Visually and physically inspect the TWC for the following conditions:</p> <ul style="list-style-type: none"> Physical damage Severe discoloration caused by excessive temperatures Internal rattles caused by loose catalyst substrate Restrictions—Refer to Restrictions Exhaust in Exhaust System. <p>Did you find and correct the condition?</p>	—	Go to Step 10	Go to Step 6
6	<p>Visually inspect the exhaust system for the following conditions:</p> <ul style="list-style-type: none"> Leaks—Refer to Exhaust Leakage in Exhaust System. Physical damage Loose or missing hardware The heated oxygen sensor (HO2S) 2 for the applicable bank for proper torque <p>Did you find and correct the condition?</p>	—	Go to Step 10	Go to Step 7

Steps 1-6

Step	Action	Values	Yes	No
7	<p>Visually inspect the HO2S 2 at the applicable bank for the following conditions:</p> <ul style="list-style-type: none"> The pigtail and wiring harness contacting the exhaust or any ground. Road damage <p>Did you find a condition?</p>	—	Go to Step 8	Go to Step 9
8	<p>Replace the applicable HO2S 2 sensor.</p> <p>Did you complete the replacement?</p>	—	Go to Step 10	—
9	<p>Notice</p> <p>In order to avoid damaging the replacement three-way catalytic converter, correct the engine misfire or mechanical fault before replacing the three-way catalytic converter.</p> <p>Replace the TWC.</p> <p>Did you complete the replacement?</p>	—	Go to Step 10	—
10	<ol style="list-style-type: none"> Clear the DTCs with a scan tool. Turn OFF the ignition for 30 seconds. Start the engine. Caution <p>Refer to Road Test Caution in Service Precautions.</p> <p>Important</p> <p>A new catalyst may fail this test due to out-gassing of the internal matting. If this occurs, operate the vehicle at highway speeds for approximately one hour and test again.</p> <p>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 2	Go to Step 11
11	<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 in Vehicle DTC Information	System OK

Steps 7-11

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

- A [catalytic converter](#) which has been discolored may be due to an engine running rich, lean or had a previous misfire. Verifying the fuel trim percentages may be of assistance in determining if such a condition exists.
- This steps inspects for conditions than can cause the TWC efficiency to appear degraded.