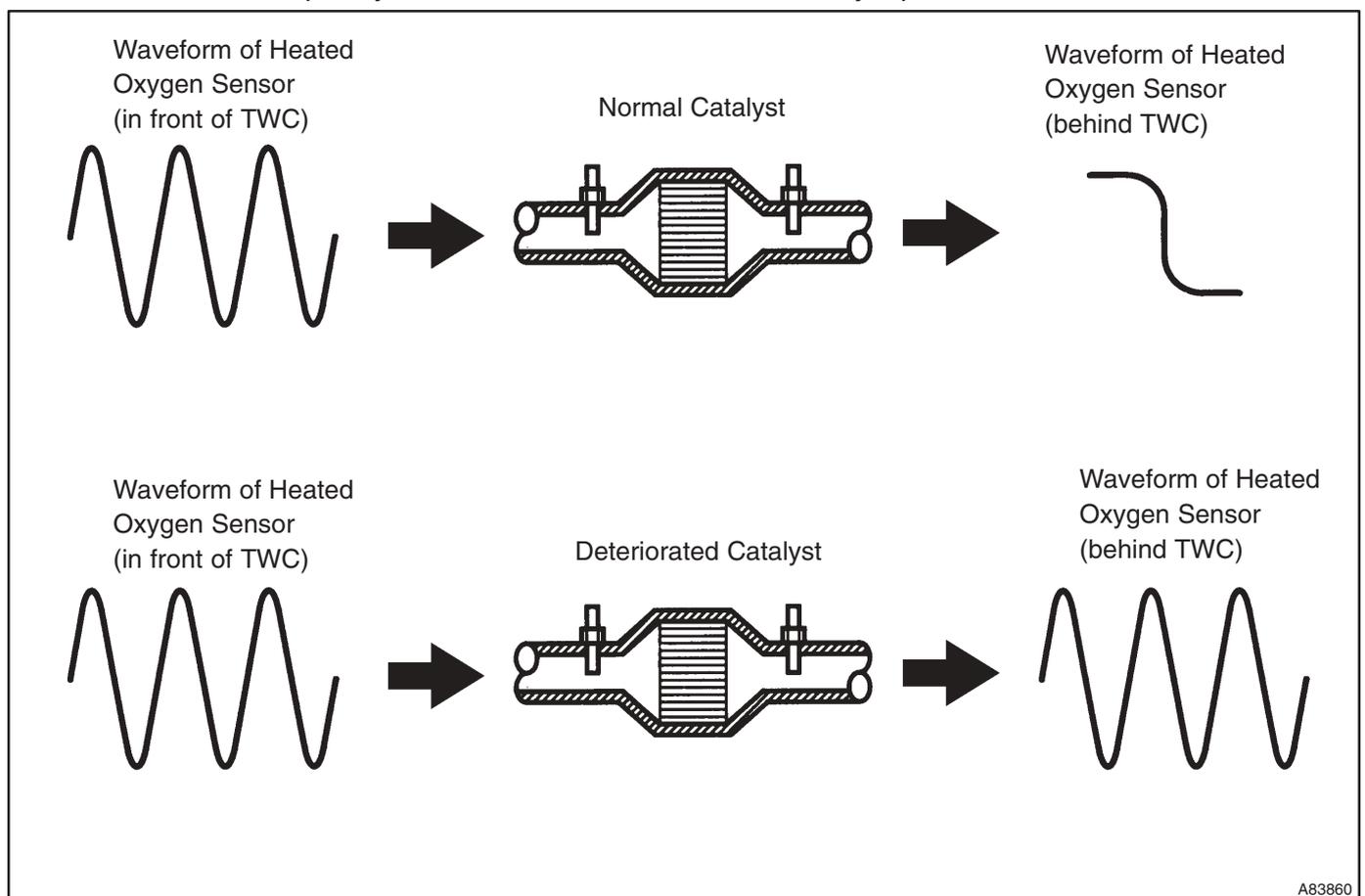


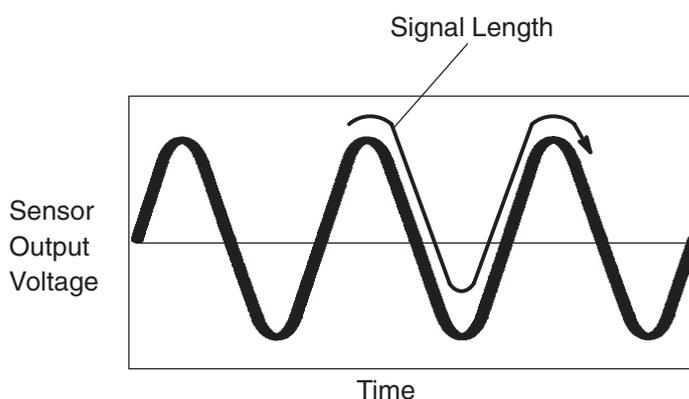
DTC	P0420	CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)
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CIRCUIT DESCRIPTION

This vehicle has two Heated Oxygen (O₂) sensors. One is located in front of the Three-Way Catalyst Converter (TWC), and the other is mounted behind the TWC. Each signal output of the sensors is converted into a waveform inside the ECM. The front O₂ sensor is used to monitor the air-fuel ratio by the ECM, and whose signal prompts the ECM to perform air-fuel ratio feedback control. As a result, the air-fuel ratio is balanced, and the waveform of the front O₂ sensor oscillates between rich and lean regularly.

To determine whether or not the catalyst performance has deteriorated, the ECM compares the waveforms of the front and rear O₂ sensors. While the catalyst is functioning normally, the waveform of the rear O₂ sensor fluctuates between rich and lean more slowly than the front O₂ sensor's waveform. When the rear O₂ sensor's waveform frequently fluctuates, it indicates that the catalyst performance deteriorates.



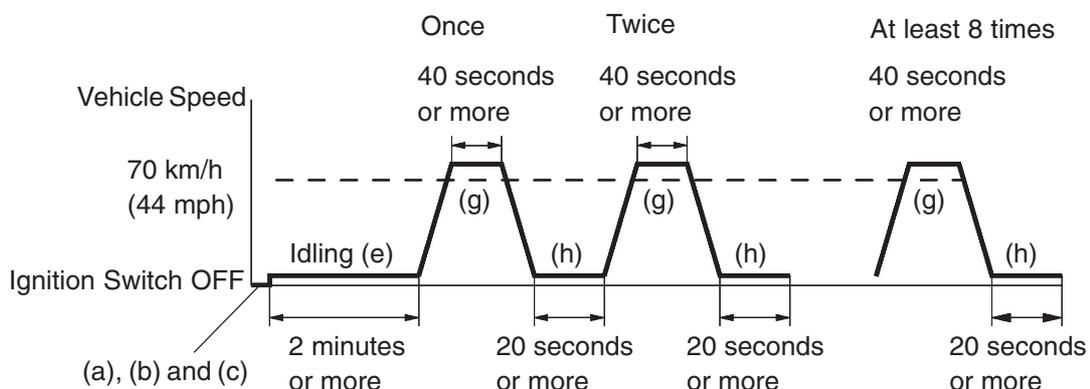
Heated Oxygen Sensor Signal Length:

A82718

DTC No.	DTC Detecting Condition	Trouble Area
P0420	After engine and TWC are warmed up, and while vehicle is driven within predetermined vehicle speed and engine speed range: Waveforms of heated oxygen sensor (sensor 2) frequently fluctuates between rich and lean (2 trip detection logic)	<ul style="list-style-type: none"> • Gas leakage in exhaust system • Heated oxygen sensor (sensor 1) • Heated oxygen sensor (sensor 2) • Three-way catalytic converter (TWC)

CONFIRMATION DRIVING PATTERN

Engine coolant temperature is more than 75°C (167°F)



Y

A58686

- Connect the intelligent tester II to the DLC3.
- Turn the ignition switch to ON and turn the intelligent tester II ON.
- Switch the ECM from normal mode to check mode using the intelligent tester II ([see page 05-20](#)).
- Start the engine.
- Allow the engine to idle for 2 minutes.
- Warm up the engine until the engine coolant temperature reaches more than 75°C (167°F).
- Drive the vehicle at 70 km/h (44 mph) or more for 40 seconds or more.
- Stop the vehicle and allow the engine to idle for 20 seconds or more.
- Repeat the steps (g) and (h) at least 8 times in one driving cycle.

HINT:

If a malfunction exists, the MIL will be illuminated during step (i).

NOTICE:

If the conditions in this test are not strictly followed, no malfunction will be detected. If you do not have the intelligent tester II, turn the ignition switch to OFF after performing steps from (d) to (i), then perform steps (d) to (i) again.

WIRING DIAGRAM

Refer to DTC P0130 on [page 05-74](#).

INSPECTION PROCEDURE**HINT:**

Read freeze frame data using the intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0420)

- (a) Connect the intelligent tester II to the DLC3.
- (b) Turn the ignition switch to ON and turn the intelligent tester II ON.
- (c) Select the following menu items: Powertrain / Engine and ECT / DTC.
- (d) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P0420	A
P0420 and other DTCs	B

HINT:

If any DTCs other than P0420 are output, troubleshoot those DTCs first.

B

GO TO RELEVANT DTC CHART
(See [page 05-27](#))

A**2 CHECK FOR EXHAUST GAS LEAKAGE**

OK: No gas leakage.

NG

REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT

OK**3 INSPECT HEATED OXYGEN SENSOR(SENSOR 1) (See [page 05-74](#))****NG**

REPLACE HEATED OXYGEN SENSOR

OK

4	INSPECT HEATED OXYGEN SENSOR(SENSOR 2) (See page 05-100)
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OK: During air-fuel ratio feedback, the oxygen sensor output fluctuates between rich and lean.

NG 

REPLACE HEATED OXYGEN SENSOR

OK 

REPLACE THREE-WAY CATALYTIC CONVERTER (BOTH FRONT AND REAR TWC)
--

NOTICE:

On the damaged bank, replace both the front and rear catalyts.

HINT:

Intelligent tester II only:

Malfunctioning areas can be found by performing the Active Test / A/F Control operation. The A/F Control operation can determine if the heated oxygen sensor or other potential trouble areas are malfunctioning or not.

(a) Perform the Active Test using the intelligent tester II.

HINT:

The A/F Control operation lowers the injection volume by 12.5 % or increases the injection volume by 25 %.

- (1) Connect the intelligent tester II to the DLC3.
- (2) Start the engine and turn the intelligent tester II ON.
- (3) Warm up the engine by running the engine at 2,500 rpm for approximately 3 minutes.
- (4) On the intelligent tester II, select the following menu items: Powertrain / Engine and ECT / Active Test / A/F Control.
- (5) Select the following monitor items: O2S B1 S1 and O2S B1 S2.
- (6) Perform the A/F Control operation with the engine in an idling condition (press the right or left button).

Result:

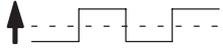
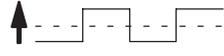
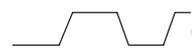
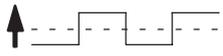
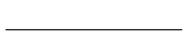
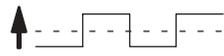
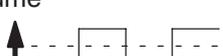
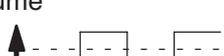
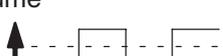
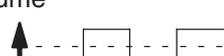
The heated oxygen sensor reacts in accordance with increases and decreases of the injection volume:

+25 % → Rich output: More than 0.5 V

-12.5 % → Lean output: Less than 0.4 V

NOTICE:

Sensor 1 (front sensor) has an output delay of a few seconds. Sensor 2 (rear sensor) has a maximum output delay of approximately 20 seconds.

	Output Voltage of Heated Oxygen Sensor (sensor 1: front sensor)	Output Voltage of Heated Oxygen Sensor (sensor 2: rear sensor)	Main Suspect Trouble Area
Case 1	Injection volume +25 %  -12.5 % Output voltage More than 0.5 V  OK Less than 0.4V	Injection volume +25 %  -12.5 % Output voltage More than 0.5 V  OK Less than 0.4V	—
Case 2	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 %  -12.5 % Output voltage More than 0.5 V  OK Less than 0.4V	Sensor 1: front sensor (Sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 %  -12.5 % Output voltage More than 0.5 V  OK Less than 0.4V	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Sensor 2: rear sensor (Sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Injection volume +25 %  -12.5 % Output voltage Almost no reaction  NG	Extremely rich or lean actual air-fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F Control procedure enables the technician to check and graph the voltage output of both the heated oxygen sensors.

To display the graph, select the following menu items on the tester: View / Line Graph.