DTC	P0420	CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

DTC	P0430	CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 2)

HINT:

- If DTC P0420 is displayed, check the bank 1 catalyst.
- If DTC P0430 is displayed, check the bank 2 catalyst.
- Bank 1 includes cylinder No. 1, but bank 2 does not. Cylinder No. 1 is located in the front part of the engine, opposite the transmission.

CIRCUIT DESCRIPTION

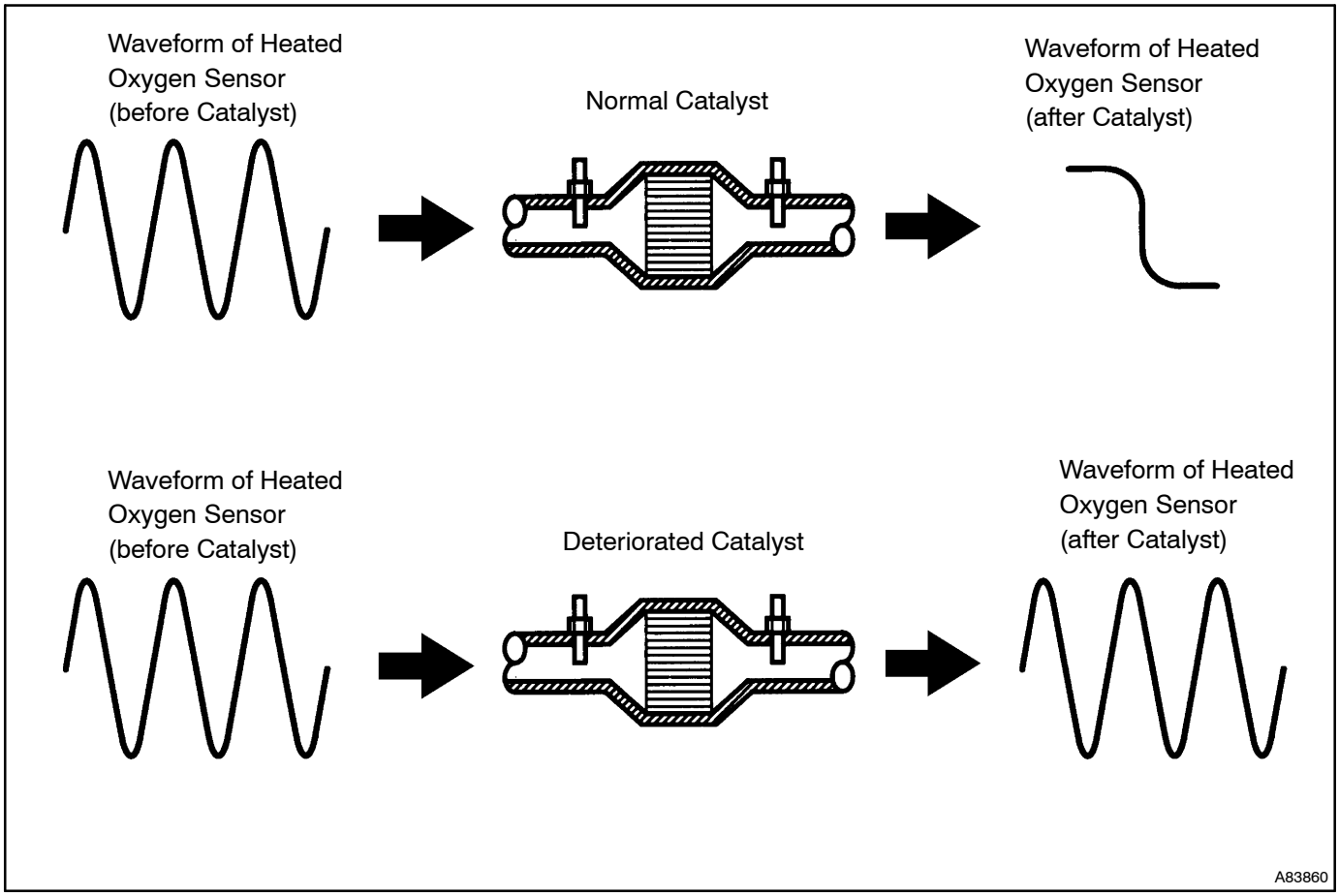
The ECM uses Heated Oxygen Sensors (HO2Ss) mounted before and after the three–way catalyst (TWC) to monitor its' efficiency. The front sensor sends pre–catalyst air–fuel information to the ECM. The rear sensor sends post–catalyst information to the ECM. The ECM compares these two signals to judge the efficiency of the catalyst and the catalyst's ability to store oxygen. During normal operation, the TWC stores and releases oxygen as needed. The capacity to store oxygen results in a low variation in the post–TWC exhaust stream as shown on the next page.

If the catalyst is functioning normally, the waveform of the HO2S (sensor 2) slowly switches between RICH and LEAN. If the catalyst is deteriorated, the waveform will alternate frequently between RICH and LEAN. As the catalyst efficiency degrades, its ability to store oxygen is reduced and the catalyst output becomes more variable.

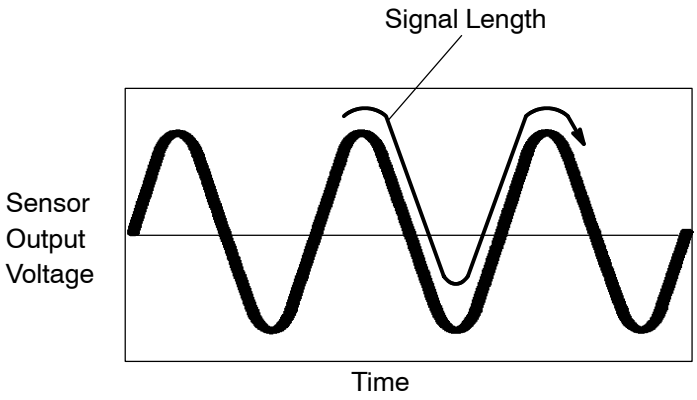
When running the catalyst monitor, the ECM begins to measure the signal length of the HO2S (sensor 1) and HO2S (sensor 2). The ECM calculates the rate of signal length of the HO2S (sensor 1) and HO2S (sensor 2) (catalyst deterioration level). If the catalyst deterioration level exceeds the threshold, the ECM interprets this as a catalyst malfunction. The ECM illuminates the MIL (2 trip detection logic) and sets a DTC.

The monitor runs after:

- The engine is warmed up (Engine Coolant Temperature (ECT) is 75°C (167°F) or more).
- The vehicle is driven at approximately 60 to 100 km/h (37 to 63 mph) for 15 minutes.

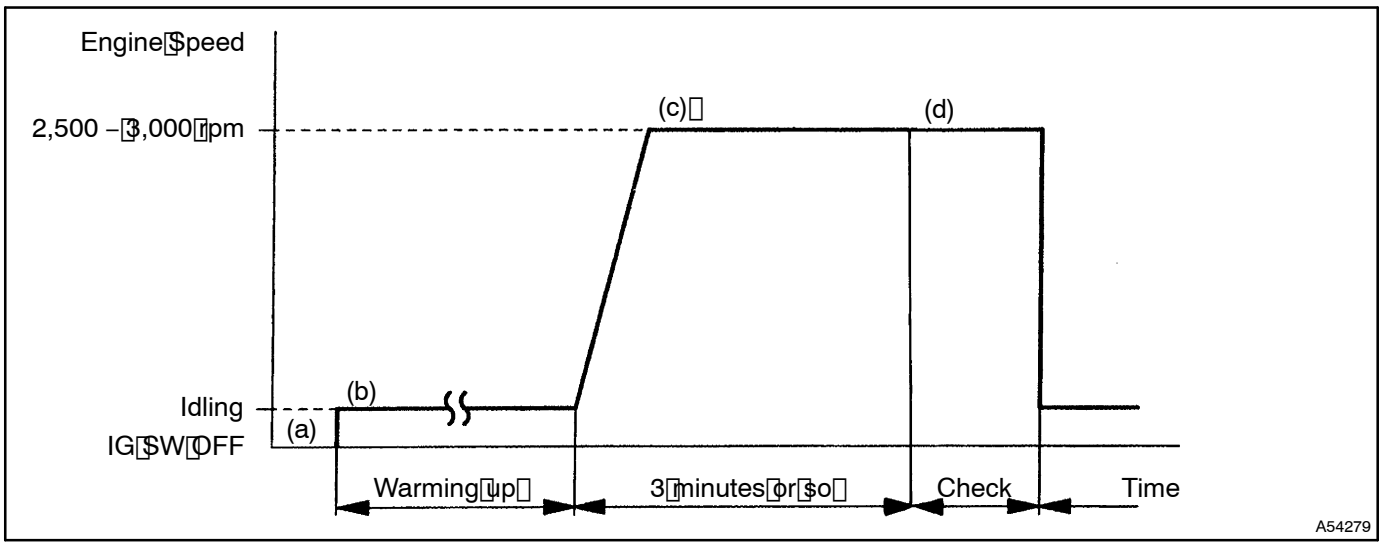


HO2S Signal Length



DTC No.	DTC Detection Condition	Trouble Area
P0420 P0430	After engine and TWC are warmed up, and while vehicle is driven within set value and engine RPM ranges Waveforms of HO2S (sensor 2) alternates frequency between Rich and Lean (2 trip detection logic)	• HO2S (sensor 1) • HO2S (sensor 2) • Gas leakage in exhaust system • TWC

CONFIRMATION DRIVING PATTERN

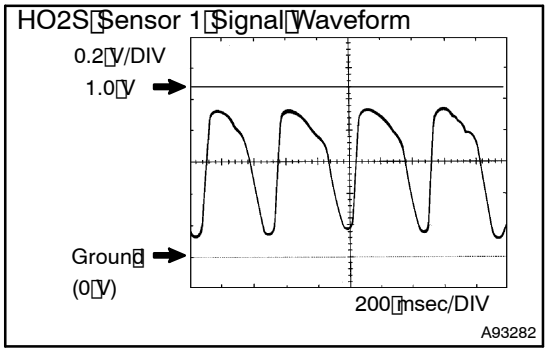


(a) Connect the Intelligent Tester II to the DLC3.
(b) Enter the following menus: Enter/Diagnosis/OBD·MOBD/Power train/Engine and ECT/Data List/All Data/O2S B1 S1 and O2S B1 S2 (O2S B2 S1 and O2S B2 S2).
(c) Start the engine and warm it up with all the accessories switched OFF until the Engine Coolant Temperature (ECT) becomes stable.
(d) Run the engine at 2,500 to 3,000 rpm for about 3 minutes.

HINT:

Control the engine RPM so that the calculated catalyst temperature can be between 550 and 800°C (1,022 and 1,472°F). The calculated catalyst temperatures of the bank 1 and bank 2 can be read by viewing Catalyst Temperature.

(e) Confirm that HO2S bank 1 sensor 1 (OX1A) and bank 2 sensor 1 (OX2A) have waveforms that are around 0.5 V during feedback to the ECM. Then check the waveform of HO2S bank 1 sensor 2 (OX1B) and bank 2 sensor 2 (OX2B) for the same waveforms (0.5 V during feedback).



HINT:

If there is a malfunction in the catalyst, the waveform of the HO2S sensor 2 (OX1B, OX2B) is almost the same as that of the HO2S sensor 1 (OX1A, OX2A), which is shown on the left.

WIRING DIAGRAM

Refer to DTC P0031 on page 05–54.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Intelligent Tester II. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, 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, P0430)

Display (DTC output)	Proceed to
P0420 or P0430	A
P0420 or P0430 and other DTCs	B

B → GO TO RELEVANT DTC CHART (See page 05–36)

A

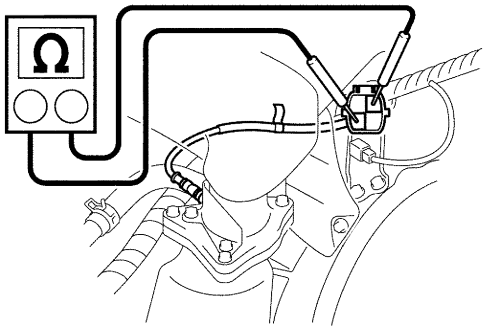
2	CHECK FOR EXHAUST GAS LEAKAGE

NG → REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT

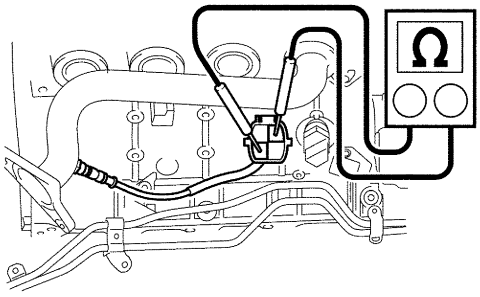
OK

3 INSPECT HEATED OXYGEN SENSOR (RESISTANCE)

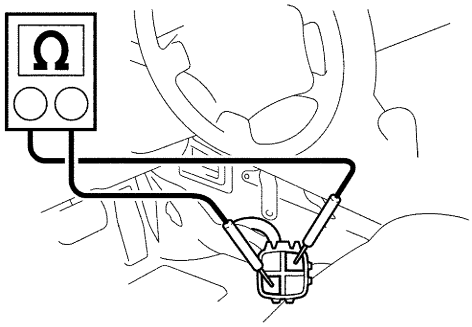
Bank 1 sensor 1



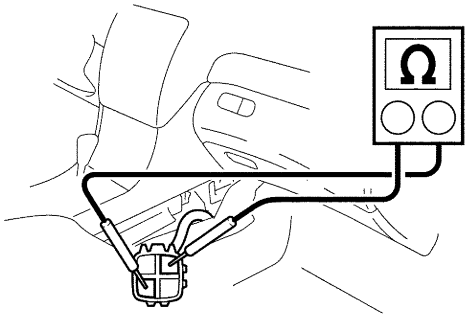
Bank 2 sensor 1



Bank 1 sensor 2



Bank 2 sensor 2



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(a) Disconnect the H9, H10, H19 and H20 HO2S connectors.
(b) Measure the resistance the sensor.

Standard:

Terminal No.	Condition	Specified Condition
1 – 4	20°C (68°F)	11 to 16 Ω
1 – 4	800°C (1,472°F)	23 to 32 Ω

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

4	PERFORM ACTIVE TEST

HINT:
It is possible the malfunctioning area can be found using the active test "Control the injection volume A/F sensor" operation. The active test can determine if the HO2S or othe potential trouble areas are malfunctioning or not.
The injection volume can be switched to –12.5 % (decrease) or +25 % (increase) by the active test.
The active test procedure enables a technician to check and graph the voltage outputs of the HO2Ss.

Procedure:

(a) Connect the Intelligent Tester II to the DLC3 on the vehicle.
(b) Turn the ignition switch ON.
(c) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(d) Enter the following menus: Active Test/ Control the injection volume A/F sensor.
(e) Perform the active test at the engine idling.

Standard:

The HO2S reacts in accordance with increase and decrease of injection volume +25 % → Rich output: more than 0.55 V
–12.5 % → Lean output: Less than 0.4 V

NOTICE:

The HO2S (sensor 1) output has a few seconds of delay and the HO2S (sensor 2) output has a maximum of 20 seconds of delay.
If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and the DTCs will be recorded.

Case	HO2S Voltage (Sensor 1)	HO2S Voltage (Sensor 2)	Main Suspected Trouble Area
1	Injection Volume +25 % / –12.5 % HO2S Voltage 0.55 V or more / Below 0.4 V → **OK**	Injection Volume +25 % / –12.5 % HO2S Voltage 0.5 V or more / Below 0.4 V → **OK**	–
2	Injection Volume +25 % / –12.5 % HO2S Voltage Almost no reaction → **NG**	Injection Volume +25 % / –12.5 % HO2S Voltage 0.5 V or more / Below 0.4 V → **OK**	HO2S (sensor 1) HO2S heater (sensor 1)
3	Injection Volume +25 % / –12.5 % HO2S Voltage 0.55 V or more / Below 0.4 V → **OK**	Injection Volume +25 % / –12.5 % HO2S Voltage Almost no reaction → **NG**	HO2S (sensor 2) HO2S heater (sensor 2)
4	Injection Volume +25 % / –12.5 % HO2S Voltage Almost no reaction → **NG**	Injection Volume +25 % / –12.5 % HO2S Voltage Almost no reaction → **NG**	Injector Fuel Pressure Exhaust Gas Leak etc. (Air–Fuel ratio is extremely Lean or Rich)

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

REPLACE CATALYTIC CONVERTER (BANK 1 OR BANK 2) AND FRONT EXHAUST PIPE

NOTICE:
Replace both the front catalyst and rear catalyst (front exhaust pipe) of the damaged bank.