

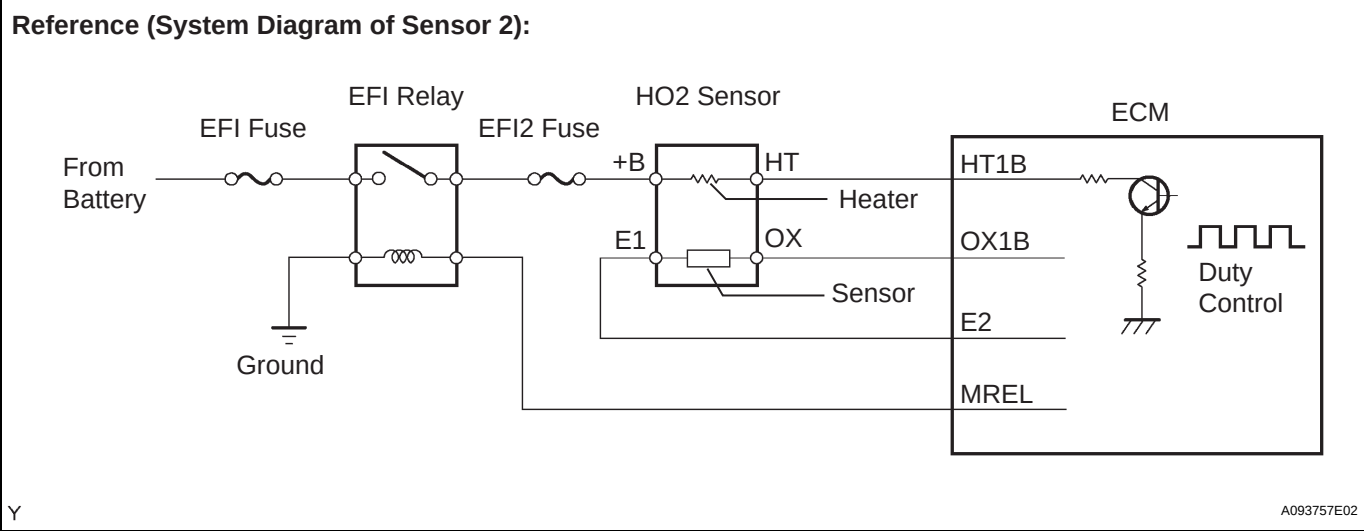
DTC	P0037	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)
DTC	P0038	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)

DESCRIPTION

Refer to DTC P0136 (See page [ES-113](#)).

HINT:

- Sensor 2 refers to the sensor mounted behind the Three-Way Catalytic Converter (TWC) and located far from the engine assembly.
- When any of these DTCs are set, the ECM enters fail-safe mode. The ECM turns off the HO2 sensor heater in fail-safe mode. Fail-safe mode continues until the ignition switch is turned OFF.
- The ECM provides a pulse width modulated control circuit to adjust the current through the heater. The Heated Oxygen (HO2) sensor heater circuit uses a relay on the B+ side of the circuit.



DTC No.	DTC Detection Conditions	Trouble Areas
P0037	HO2 sensor heater current is less than 0.25 A (1 trip detection logic)	• Open in HO2 sensor heater circuit • HO2 sensor heater • EFI relay • ECM
P0038	HO2 sensor heater current is more than 2 A (1 trip detection logic)	• Open or short in HO2 sensor heater circuit • HO2 sensor heater • EFI relay • ECM

MONITOR DESCRIPTION

The sensing portion of the Heated Oxygen (HO2) sensor has a zirconia element which is used to detect the oxygen concentration in the exhaust gas. If the zirconia element is at the appropriate temperature, and the difference between the oxygen concentrations surrounding the inside and outside surfaces of the sensor is large, the zirconia element generates voltage signals. In order to increase the oxygen concentration detecting capacity of the zirconia element, the ECM supplements the heat from the exhaust with heat from a heating element inside the sensor. When the current in the sensor heater is outside the standard operating range, the ECM interprets this as a malfunction in the sensor heater and sets a DTC. Example:

The ECM sets DTC P0038 when the current in the HO2 sensor heater is more than 2 A. Conversely, when the heater current is less than 0.25 A, DTC P0037 is set.

MONITOR STRATEGY

Related DTCs	P0037: Heated Oxygen sensor heater range check (low current) P0038: Heated Oxygen sensor heater range check (high current)
Required Sensors/Components (Main)	Heated Oxygen sensor heater
Required Sensors/Components (Related)	Vehicle Speed Sensor
Frequency of Operation	Continuous
Duration	10 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever the following DTCs are not present	None
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P0037:

Battery voltage	10.5 V or more
Engine	Running
Starter	OFF
All heater is turned OFF and intrusive heating is operated when the following conditions are met	(a) and (b)
(a) Heater	OFF
(b) Heater current	Less than 0.5 A

P0038 Case 1:

Battery voltage	10.5 V or more
Engine	Running
Starter	OFF
Intrusive heating	Not operating

P0038 Case 2:

Battery voltage	10.5 V or more
All heater is turned OFF and intrusive heating is operated when the following conditions are met	(a) and (b)
(a) Heater	OFF
(b) Heater current	2 A or more

TYPICAL MALFUNCTION THRESHOLDS

P0037:

Heated Oxygen sensor heater current during intrusive heating	Less than 0.3 A
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P0038 Case 1:

Heated Oxygen sensor heater current	2 A or more
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P0038 Case 2:

Heated Oxygen sensor heater current	More than 2 A
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COMPONENT OPERATING RANGE

Heated Oxygen sensor heater current	0.4 to 1 A (when engine idles, HO2 sensor warmed up and battery voltage 11 to 14 V)
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MONITOR RESULT

The monitor result (mode 6) allows the OBD scan tool to display the monitor status, test value and test limit.

A problem in this component can be found by comparing the test value and test limit. This procedure is described in "CHECKING MONITOR STATUS" (See page ES-15).

- TID (Test Identification) is assigned to each emission-related component.
- TLT (Test Limit Type):
If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD scan tools.

TID \$04: HO2S Heater

TLT	CID	Unit Conversion	Description of Test Value	Description of Test Limit
1	\$02	Multiply by 0.000076 (A)	Maximum HO2S heater current (bank 1 sensor 2)	Malfunction criterion

WIRING DIAGRAM

Refer to DTC P0136 (See page ES-120).

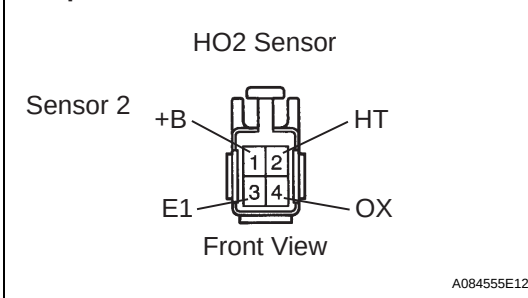
INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester or OBD II scan tool. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can be helpful in determining whether the vehicle was running or stopped, whether the engine was warmed up or not, whether the air/fuel ratio was lean or rich, as well as other data recorded at the time of a malfunction.

1 INSPECT HEATED OXYGEN SENSOR (HEATER RESISTANCE)

Component Side:



- Disconnect the H8 Heated Oxygen (HO2) sensor connector.
- Measure the resistance between the terminals of the HO2 sensor connector.

Standard resistance

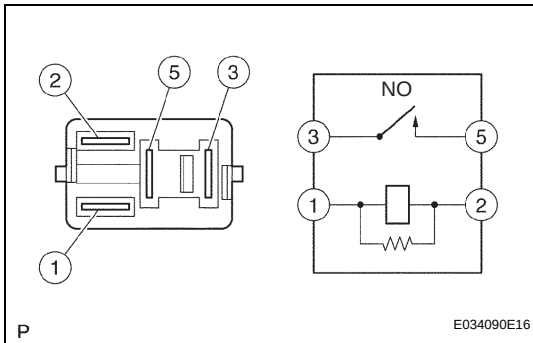
Tester Connections	Specified Conditions
HT (2) - +B (1)	Between 11 Ω and 16 Ω at 20°C (68°F)
HT (2) - E1 (3)	10 k Ω or higher

- Reconnect the HO2 sensor connector.

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REPLACE HEATED OXYGEN SENSOR

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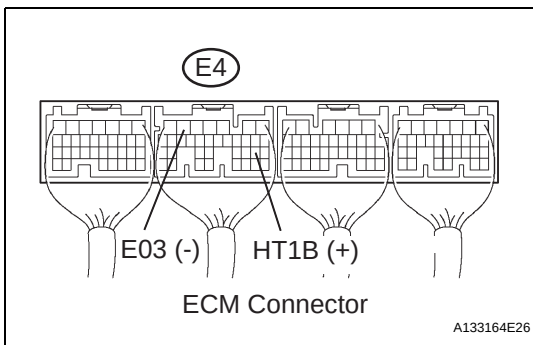
2 INSPECT EFI RELAY

- (a) Remove the EFI relay from the engine room R/B.
 (b) Check the EFI relay resistance.

Standard resistance

Tester Connections	Specified Conditions
3 - 5	10 k Ω or higher
3 - 5	Below 1 Ω (when battery voltage applied to terminals 1 and 2)

- (c) Reinstall the EFI relay.

NG**REPLACE EFI RELAY****ES****OK****3 INSPECT ECM (HT1B VOLTAGE)**

- (a) Turn the ignition switch to ON.
 (b) Measure the voltage between the terminals of the E4 ECM connector.

Standard voltage

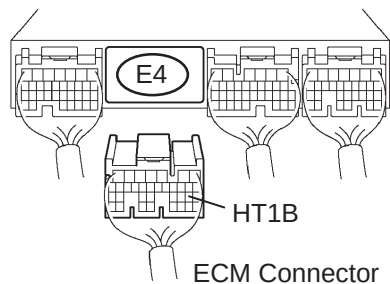
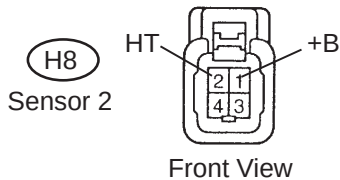
Tester Connections	Specified Conditions
HT1B (E4-21) - E03 (E4-6)	Between 9 V and 14 V

OK**REPLACE ECM****NG**

4 CHECK HARNESS AND CONNECTOR

Wire Harness Side:

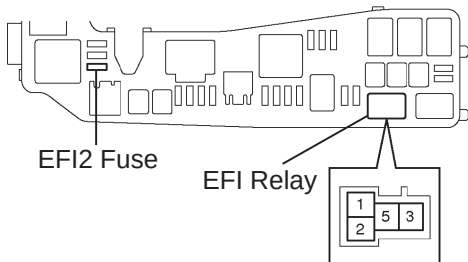
HO2 Sensor Connector



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A136258E01

Engine Room R/B:



Y

A093235E01

- (a) Check the harness and connector between the ECM and HO2 sensor.

- (1) Disconnect the H8 HO2 sensor connector.
- (2) Disconnect the E4 ECM connector.
- (3) Check the resistance.

Standard resistance (Check for open)

Tester Connections	Specified Conditions
HT (H8-2) - HT1B (E4-21)	Below 1 Ω

Standard resistance (Check for short)

Tester Connections	Specified Conditions
HT (H8-2) or HT1B (E4-21) - Body ground	10 k Ω or higher

- (4) Reconnect the HO2 sensor connector.
- (5) Reconnect the ECM connector.

- (b) Check the harness and connector between the HO2 sensor and EFI relay.

- (1) Inspect the EFI2 fuse.
 - Remove the EFI2 fuse from the engine room R/B.
 - Check the EFI2 fuse resistance.

Standard resistance:

Below 1 Ω

- Reinstall the EFI2 fuse.
- (2) Disconnect the H8 HO2 sensor connector.
- (3) Remove the EFI relay from the engine room R/B.
- (4) Check the resistance.

Standard resistance (Check for open)

Tester Connections	Specified Conditions
+B (H8-1) - EFI relay (3)	Below 1 Ω

Standard resistance (Check for short)

Tester Connections	Specified Conditions
+B (H8-1) or EFI relay (3) - Body ground	10 k Ω or higher

- (5) Reconnect the HO2 sensor connector.
- (6) Reinstall the EFI relay.

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REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM