

DTC	P0037	OXYGEN SENSOR HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)
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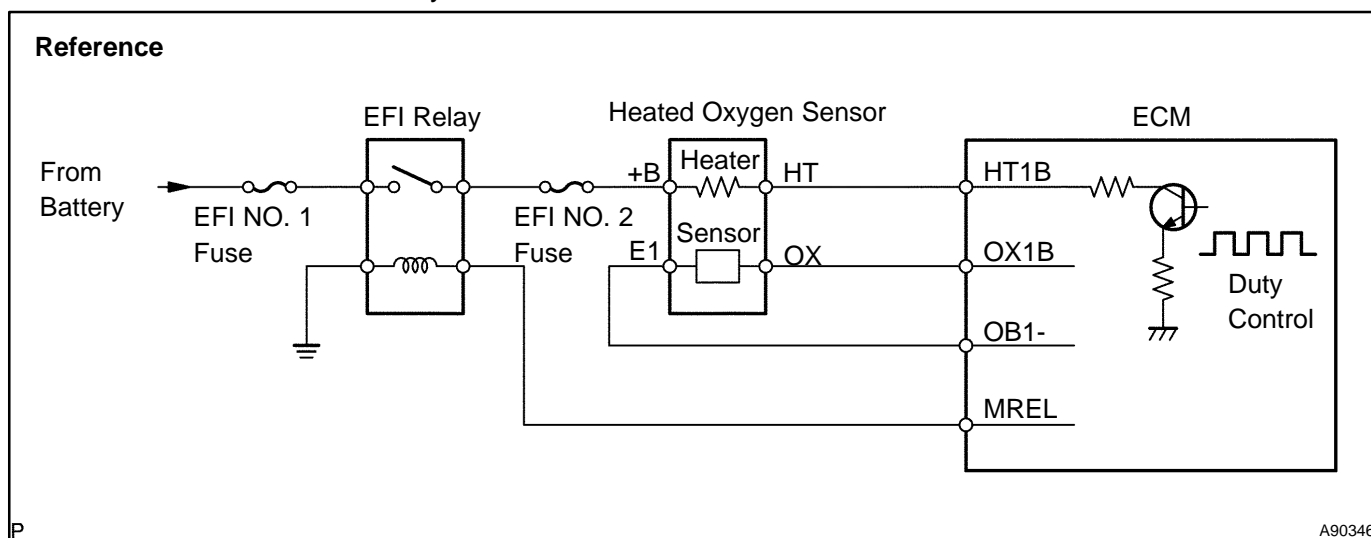
DTC	P0038	OXYGEN SENSOR HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)
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CIRCUIT DESCRIPTION

Refer to DTC P0136 on page 05-1 18.

HINT:

The ECM provides a pulse width a modulated control circuit to adjust current through the heater. The oxygen sensor heater circuit uses a relay on the +B side of the circuit.



DTC No.	DTC Detection Condition	Trouble Area
P0037	Heater current of less than 0.3 A when the heater operates with +B greater than 10.5 V (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM
P0038	Heater current exceeds 2 A when heater operates (1 trip detection logic)	<ul style="list-style-type: none"> • Same as DTC No. P0037

HINT:

Sensor 2 is the sensor farthest away from the engine assembly.

MONITOR DESCRIPTION

The sensing portion of the heated oxygen sensor has a zirconia element that is used to detect oxygen concentration in the exhaust. If the zirconia element is at the proper temperature and the difference of the oxygen concentration between the inside and outside surface of the sensor is large, the zirconia element will generate voltage signals. In order to increase the oxygen concentration detecting capacity in the zirconia element, the ECM supplements the heat from the exhaust with heat from a heating element inside the sensor. When current in the sensor is out of the standard operating range, the ECM interprets this as a fault in the heated oxygen sensor and sets a DTC.

Example:

The ECM will set a high current DTC if the current in the sensor is more than 2 A when the heater is OFF. Similarly, the ECM will set a low current DTC if the current is less than 0.25 A when the heater is ON.

MONITOR STRATEGY

Related DTCs	P0037: HO2S heater range check (Low current) P0038: HO2S heater range check (High current)
Required sensors / components (Main)	Heated oxygen sensor (HO2S) heater
Required sensors / components (Related)	Vehicle speed sensor (VSS)
Frequency of operation	Continuous
Duration	0.3 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever these DTCs are not present	See page 05-16
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P0037:

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

P0038 (Case 1):

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

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	Condition 1 and 2
1. Heater	ON
2. Heater current	2 A or more

TYPICAL MALFUNCTION THRESHOLDS

P0037:

HO2S heater current intrusive heating	Less than 0.3 A
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P0038 (Case 1):

HO2S heater current	2 A or more
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P0038 (Case 2):

HO2S heater current intrusive heating	More than 2 A
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COMPONENT OPERATING RANGE

HO2S heater current	0.4 to 1 A (when engine is idle, warmed-up and battery voltage is 11 to 14 V)
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MONITOR RESULT

Refer to page 05-24 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page 05-26).

- TID (Test Identification Data) is assigned to each emissions-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 Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID \$04: HO2S heater

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	\$02	Multiply by 0.000076 (A)	Maximum HO2S heater current (Bank 1 Sensor 2)	Malfunction threshold for HO2S heater

WIRING DIAGRAM

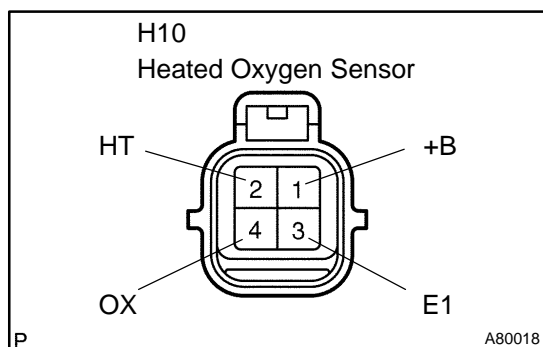
Refer to DTC P0136 on page 05-1 18.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester or the OBD II scan tool. 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 INSPECT HEATED OXYGEN SENSOR (HEATER RESISTANCE)



- Disconnect the H10 heated oxygen sensor connector.
- Measure the resistance of the heated oxygen sensor terminals.

Standard:

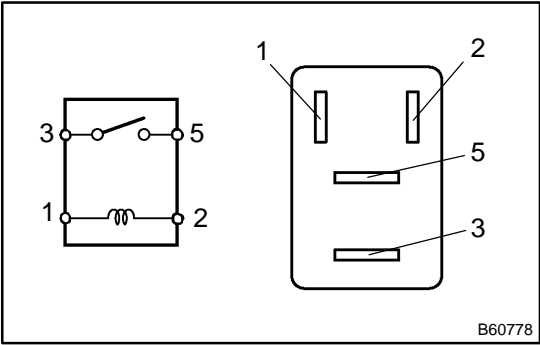
Tester Connection	Condition	Specified Condition
H10-2 (HT) - H10-1 (+B)	20°C (68°F)	11 to 16 Ω
H10-2 (HT) - H10-1 (+B)	800°C (1,472°F)	23 to 32 Ω

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REPLACE HEATED OXYGEN SENSOR

OK

2 INSPECT RELAY (EFI)



- (a) Remove the EFI relay from the engine room J/B.
- (b) Measure the resistance of the EFI relay.

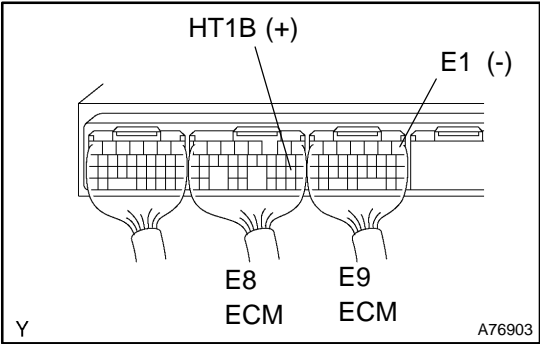
Standard:

Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (when battery voltage is applied to terminals 1 and 2)

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OK

3 INSPECT ECM (HT1B VOLTAGE)



- (a) Turn the ignition switch ON.
- (b) Measure the voltage of the ECM connectors.

Standard:

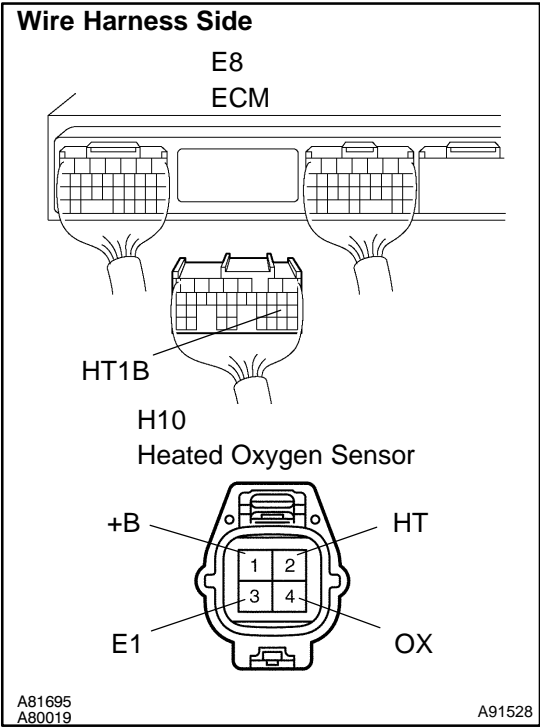
Tester Connection	Specified Condition
E8-21 (HT1B) - E9-1 (E1)	9 to 14 V

OK **REPLACE ECM (See page 10-9)**

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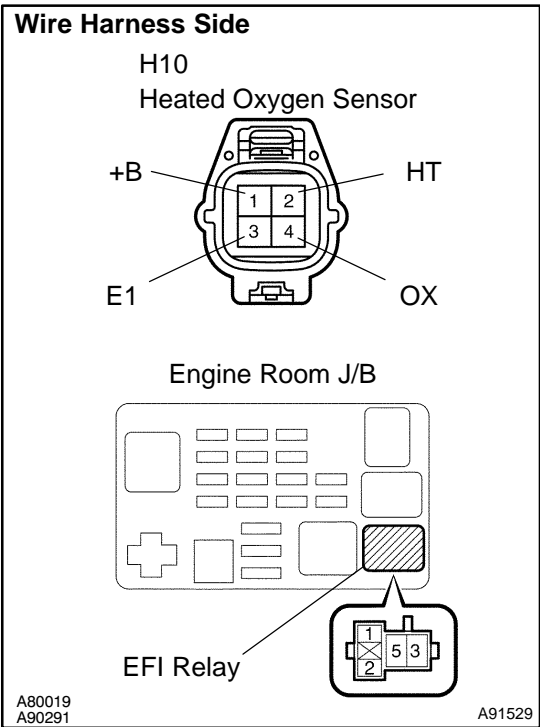
CHECK WIRE HARNESS (ECM - HEATED OXYGEN SENSOR, HEATED OXYGEN SENSOR - EFI RELAY)



- (a) Check the wire harness between the ECM and heated oxygen sensor.
- (1) Disconnect the E8 ECM connector.
 - (2) Disconnect the H10 heated oxygen sensor connector.
 - (3) Measure the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
H10-2 (HT) - E8-21 (HT1B)	Below 1 Ω
H10-2 (HT) or E8-21 (HT1B) - Body ground	10 kΩ or higher



- (b) Check the wire harness between the heated oxygen sensor and EFI relay.
- (1) Disconnect the H10 heated oxygen sensor connector.
 - (2) Remove the EFI relay from the engine room J/B.
 - (3) Measure the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
H10-1 (+B) - J/B EFI relay terminal 3	Below 1 Ω
H10-1 (+B) or J/B EFI relay terminal 3 - Body ground	10 kΩ or higher

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REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE ECM (See page 10-9)