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

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

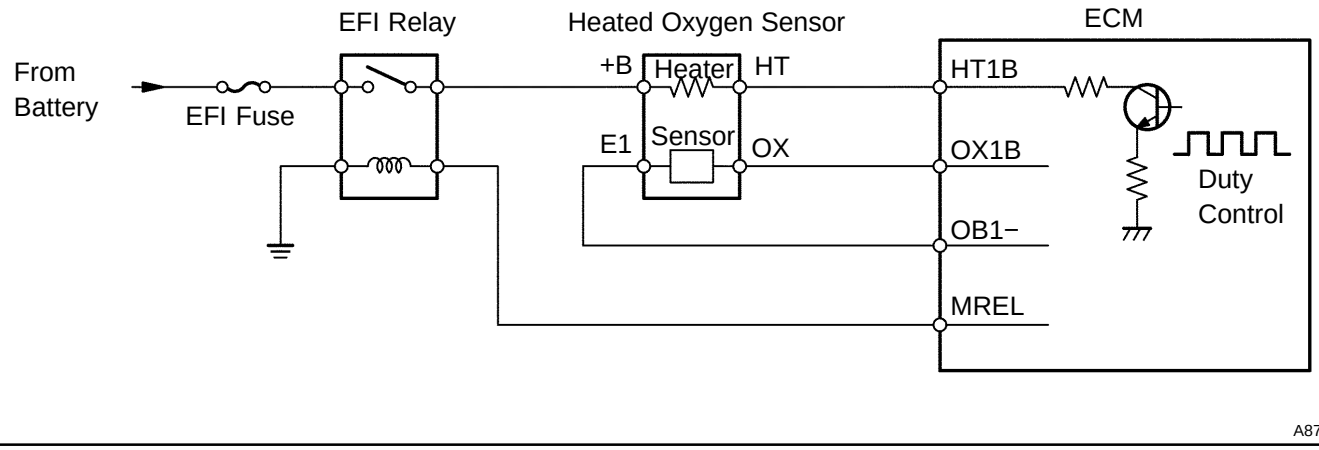
CIRCUIT DESCRIPTION

Refer to DTC P0136 on page 05−123.

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.

Reference



DTC No.	DTC Detection Condition	Trouble Area
P0037	Heater current of 0.3 A or less when the heater operates with +B greater than 10.5 V (1 trip detection logic)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM
P0038	When heater operates, heater current exceeds 2 A (1 trip detection logic)	• Same as DTC No. P0037

HINT:

Sensor 2 refers to the sensor farthest away from the engine assembly.

MONITOR DESCRIPTION

The sensing portion of the heated oxygen sensor has a zirconia element which is used to detect oxygen concentration in the exhaust. If the zirconia element is at the proper temperature and difference of the oxygen concentration between the inside and outside surface of 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)	HO2S heater
Required sensors/ components (Related)	Vehicle Seed Sensor (VSS)
Frequency of operation	Continuous
Duration	0.5 seconds
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page 05−16
Battery voltage	10.5 V or more
Engine	Running
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0037:

HO2S heater current when HO2S heater OFF	Less than 0.3 A

P0038:

HO2S heater current when HO2S heater ON	More than 2A

COMPONENT OPERATING RANGE

HO2S heater current	0.4 to 1 A (at idle, warmed−up engine and +B: 11 to 14 V)

MONITOR RESULT

Refer to page 05−25 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 05−27).

- 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

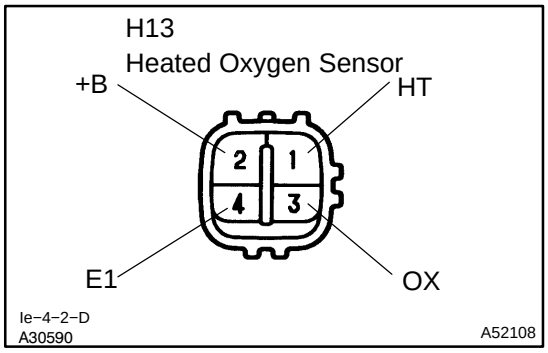
Refer to DTC P0136 on page 05−123.

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)



(a) Disconnect the H13 heated oxygen sensor connector.

(b) Measure the resistance of the heated oxygen sensor terminals.

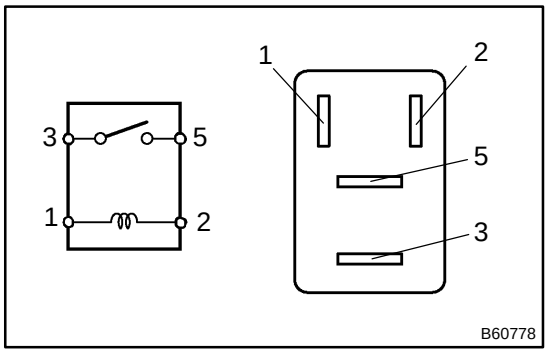
Standard:

Tester Connection	Specified Condition
H13−1 (HT) − H13−2 (+B)	11 to 16 Ω
H13−1 (HT) − H13−4 (E1)	10 kΩ or higher

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

2 INSPECT RELAY (EFI)



(a) Remove the EFI relay from the engine room J/B.

(b) Check the resistance of the EFI relay.

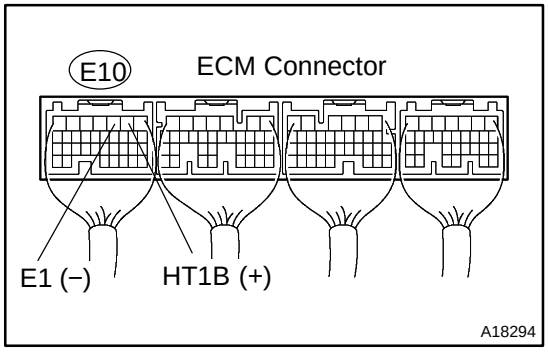
Standard:

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)

NG → **REPLACE RELAY**

OK

3 CHECK ECM (HT1B VOLTAGE)



(a) Turn the ignition switch ON.

(b) Check the voltage of the E10 ECM connector.

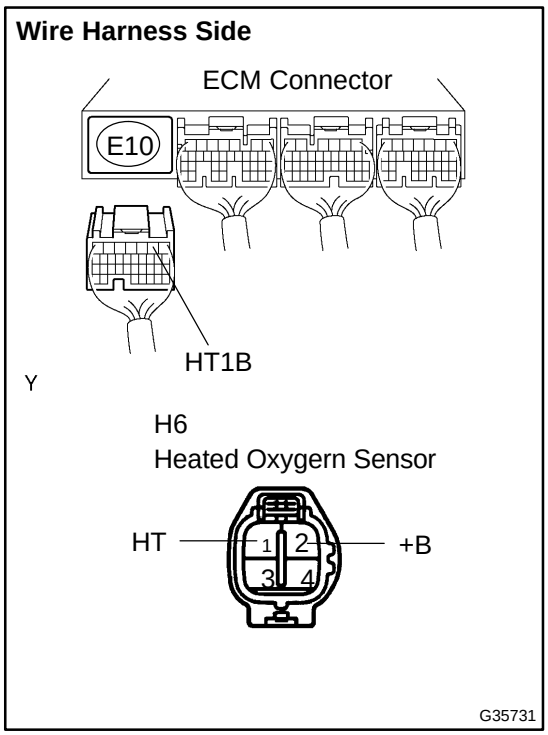
Standard:

Tester Connection	Specified Condition
E10−2 (HT1B) − E10−3 (E1)	9 to 14 V

OK → **REPLACE ECM (See page 10−9)**

NG

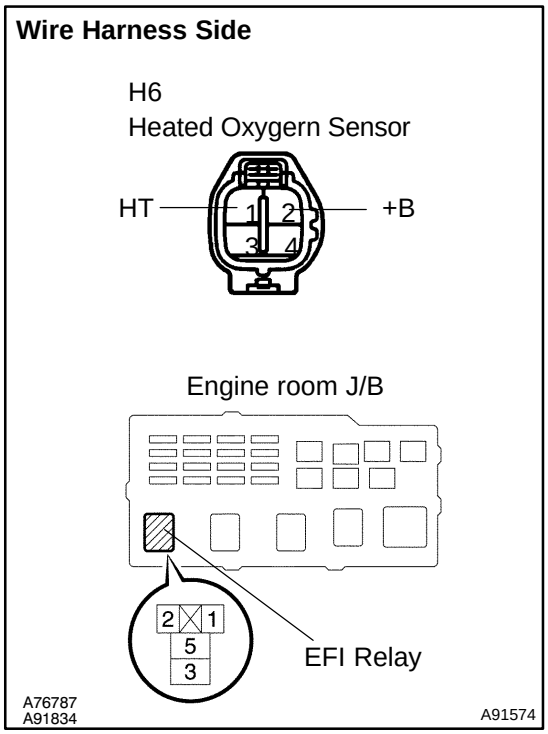
4	CHECK WIRE HARNESS (HEATED OXYGEN SENSOR − ECM, HEATED OXYGEN SENSOR − EFI RELAY)



(a) Check the wire harness between the ECM and heated oxygen sensor.
(1) Disconnect the E10 ECM connector.
(2) Disconnect the H6 heated oxygen sensor connector.
(3) Check the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
H6−1 (HT) − E10−2 (HT1B)	Below 1 Ω
H6−1 (HT) or E10−2 (HT1B) − Body ground	10 kΩ or higher



(b) Check the wire harness between the heated oxygen sensor and EFI relay.
(1) Disconnect the H6 heated oxygen sensor connector.
(2) Remove the EFI relay from the engine room J/B.
(3) Check the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
H6−2 (+B) − J/B EFI relay terminal 3	Below 1 Ω
H6−2 (+B) or J/B EFI relay terminal 3 − Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM (See page 10−9)