

ES

DTC	P0037	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)
DTC	P0038	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)
DTC	P0057	Oxygen Sensor Heater Control Circuit Low (Bank 2 Sensor 2)
DTC	P0058	Oxygen Sensor Heater Control Circuit High (Bank 2 Sensor 2)
DTC	P0141	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)
DTC	P0161	Oxygen Sensor Heater Circuit Malfunction (Bank 2 Sensor 2)

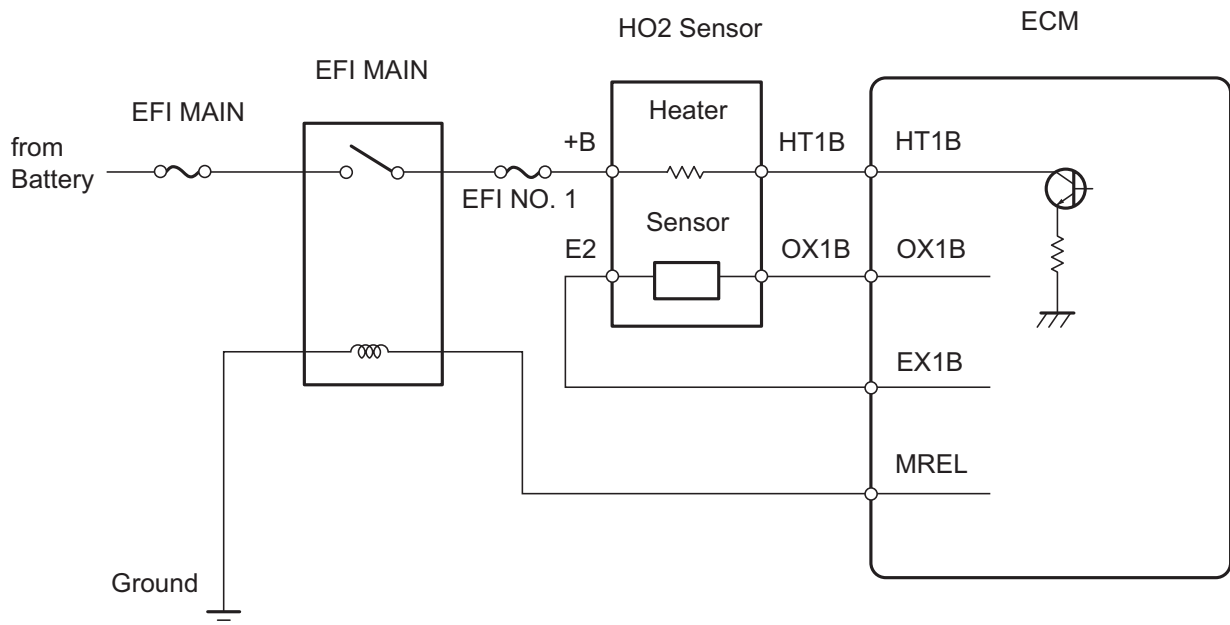
DESCRIPTION

Refer to DTC P0136 (see page [ES-158](#)).

HINT:

- When any of these DTCs are set, the ECM enters fail-safe mode. The ECM turns off the Heated Oxygen (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 HO2 sensor heater circuit uses a relay on the B+ side of the circuit.

Reference (System Diagram of Bank 1 Sensor 2):



DTC No.	DTC Detection Condition	Trouble Area
P0037 P0057	Heated Oxygen (HO2) sensor heater current less than 0.3 A (1 trip detection logic)	<ul style="list-style-type: none"> • Open in HO2 sensor heater circuit • HO2 sensor heater (sensor 2) • Integration relay (EFI MAIN relay) • ECM
P0038 P0058	Heated Oxygen (HO2) sensor heater current more than 2 A (1 trip detection logic)	<ul style="list-style-type: none"> • Short in HO2 sensor heater circuit • HO2 sensor heater (sensor 2) • Integration relay (EFI MAIN relay) • ECM
P0141 P0161	Cumulative heater resistance correction value exceeds threshold (2 trip detection logic)	<ul style="list-style-type: none"> • Open or short in HO2 sensor heater circuit • HO2 sensor heater (sensor 2) • Integration relay (EFI MAIN relay) • ECM

HINT:

- Bank 1 refers to the bank that includes cylinder No. 1.
- Bank 2 refers to the bank that does not include cylinder No. 1.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

ES**MONITOR DESCRIPTION**

The sensing position 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.

Heated oxygen sensor heater range check (P0037, P0038, P0057 and P0058):

The ECM monitors the current applied to the O2 sensor heater to check the heater for malfunctions. If the current is below the threshold value, the ECM determines that there is an open circuit in the heater. If the current is above the threshold value, the ECM determines that there is a short circuit in the heater. The ECM constantly monitors the current applied to the heater. If the ECM detects an open or short circuit, the ECM turns the MIL on and sets a DTC.

If a malfunction is detected, the ECM cuts off the current applied to the heater.

Example:

The ECM sets DTC P0038 or P0058 when the current in the HO2 sensor heater is more than 2 A. Conversely, when the heater current is less than 0.3 A, DTC P0037 or P0057 is set.

Heated oxygen sensor heater performance (P0141 and P0161):

After the accumulated heater ON time exceeds 100 seconds, the ECM calculates the heater resistance using the battery voltage and the current applied to the heater.

If the resistance is above the threshold value, the ECM determines that there is a malfunction in the HO2 sensor heater and set DTC P0141 or P0161.

MONITOR STRATEGY

Related DTCs	P0037: Heated oxygen sensor heater (bank 1) range check (Low electrical current) P0038: Heated oxygen sensor heater (bank 1) range check (High electrical current) P0057: Heated oxygen sensor heater (bank 2) range check (Low electrical current) P0058: Heated oxygen sensor heater (bank 2) range check (High electrical current) P0141: Heated oxygen sensor heater performance (bank 1) P0161: Heated oxygen sensor heater performance (bank 2)
Required Sensors/Components (Main)	Heated oxygen sensor heater
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous: P0037, P0038, P0057 and P0058 Once per driving cycle: P0141 and P0161

Duration	2 second: P0037, P0038, P0057 and P0058 10 seconds: P0141 and P0161
MIL Operation	Immediate: P0037, P0038, P0057 and P0058 2 driving cycles: P0141 and P0161
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All:

Monitor runs whenever following DTCs not present	None
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P0037 and P0057:

Battery voltage	10.5 to 20 V
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P0038 and P0058:

Battery voltage	10.5 to 20 V
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P0141 or P0161 (Heater performance monitor check):

All of following conditions met:	-
Battery voltage	10.5 V or more
Fuel cut	OFF
Time after fuel cut ON to OFF	30 seconds or more
Accumulated heater ON time	100 seconds or more

TYPICAL MALFUNCTION THRESHOLDS

P0037 and P0057:

Heater current	Less than 0.3 A
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P0038 and P0058:

Heater current	More than 2 A
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P0141 or P0161 (Heater performance monitor check):

Accumulated heater resistance	Varies with sensor element temperature (Example: More than 23 Ω)
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COMPONENT OPERATING RANGE

Heated Oxygen (HO ₂) sensor heater current	0.4 to 1 A (when engine idles, HO ₂ sensor warmed up and battery voltage 11 to 14 V)
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WIRING DIAGRAM

Refer to DTC P0136 (see page [ES-165](#)).

CONFIRMATION DRIVING PATTERN

These DTCs are detected when the engine idles for 110 seconds or more.

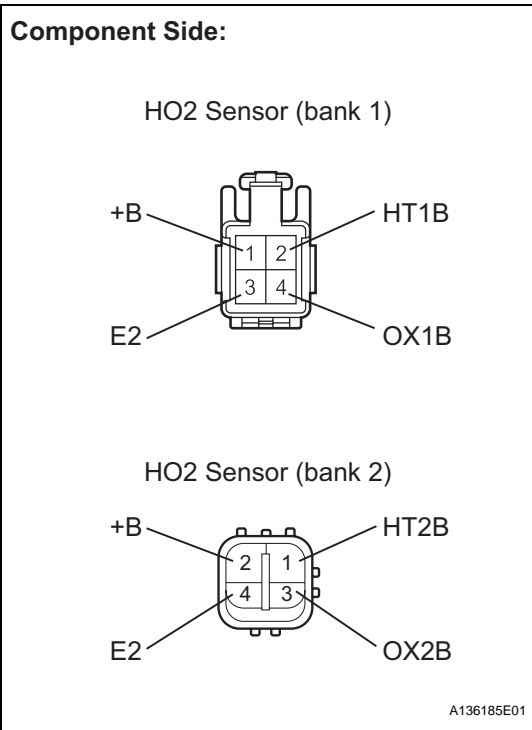
INSPECTION PROCEDURE

HINT:

Sensor 2 refers to the sensor mounted behind the Three-Way Catalytic Converter (TWC) and located far from the engine assembly.

Read freeze frame data using the intelligent tester. Freeze frame data records 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 INSPECT HEATED OXYGEN SENSOR (HEATER RESISTANCE)



- (a) Disconnect the B19 or E35 Heated Oxygen (HO2) sensor connector.
- (b) Measure the resistance of the HO2 sensor connector.

Standard resistance
Bank 1

Tester Connection	Specified Condition
2 (HT1B) - 1 (+B)	11 to 16 Ω at 20°C (68°F)
2 (HT1B) - 3 (E2)	10 kΩ or higher

Standard resistance
Bank 2

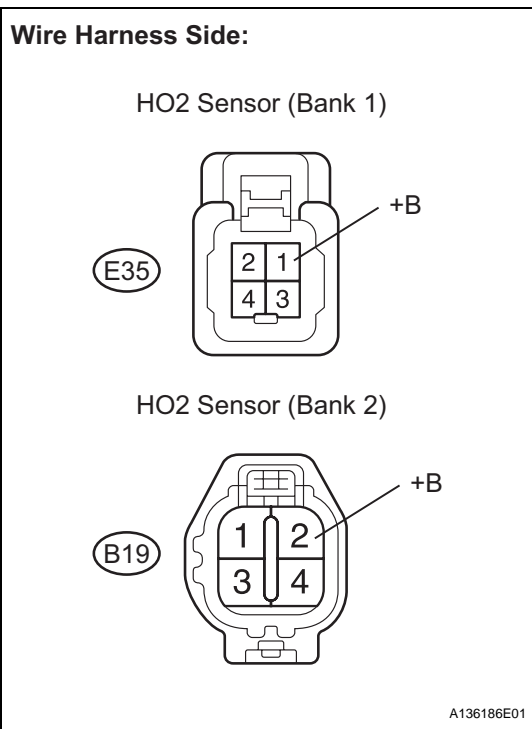
Tester Connection	Specified Condition
1 (HT2B) - 2 (+B)	11 to 16 Ω at 20°C (68°F)
1 (HT2B) - 4 (E2)	10 kΩ or higher

- (c) Reconnect the HO2 sensor connector.

NG → **REPLACE HEATED OXYGEN SENSOR**

OK

2 CHECK TERMINAL VOLTAGE (+B OF HO2 SENSOR)



- (a) Disconnect the B19 or E35 HO2 sensor connector.
- (b) Turn the ignition switch ON.
- (c) Measure the voltage between the terminals of the B19 or E35 HO2 sensor connector and body ground.

Standard voltage

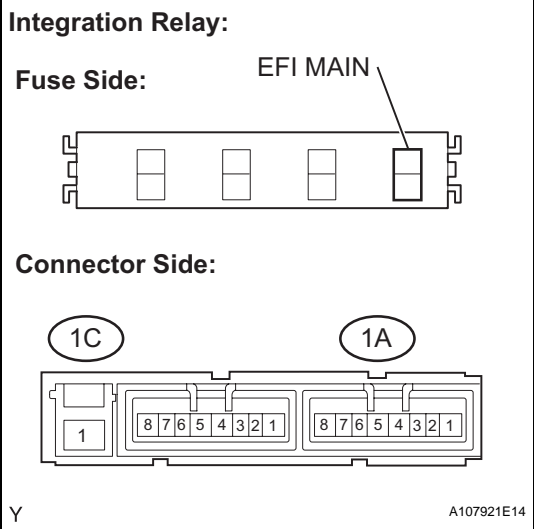
Tester Connection	Specified Condition
E35-1 (+B) - Body ground	9 to 14 V
B19-2 (+B) - Body ground	9 to 14 V

- (d) Reconnect the HO2 sensor connector.

OK → **Go to step 5**

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3 INSPECT INTEGRATION RELAY (EFI MAIN RELAY)



- (a) Remove the integration relay from the engine room No. 1 relay block.
- (b) Inspect the EFI MAIN fuse.
 - (1) Remove the EFI MAIN fuse from the integration relay.
 - (2) Measure the EFI MAIN fuse resistance.

Standard resistance:
Below 1 Ω
- (c) Inspect the EFI MAIN relay.
 - (1) Measure the EFI MAIN relay resistance.

Standard resistance

Tester Connection	Specified Condition
1C-1 - 1A-4	10 kΩ or higher
	Below 1 Ω (Apply battery voltage between terminals 1A-2 and 1A-3)

- (d) Reinstall the integration relay.

NG → **REPLACE INTEGRATION RELAY**

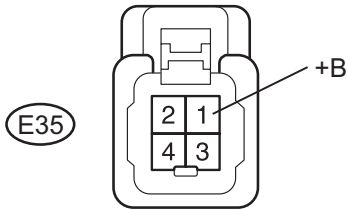
OK

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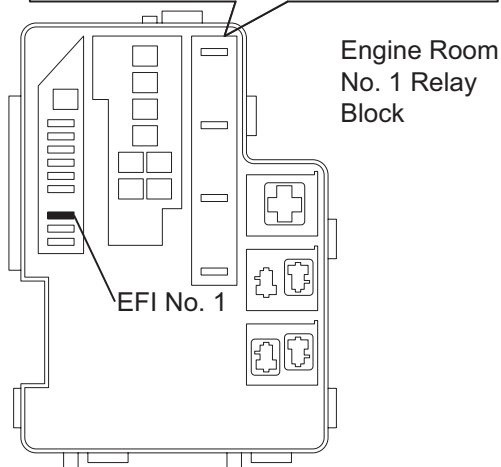
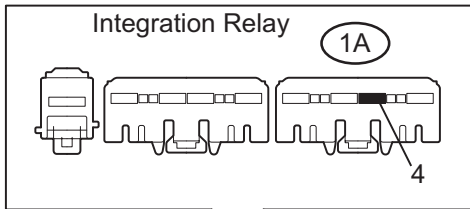
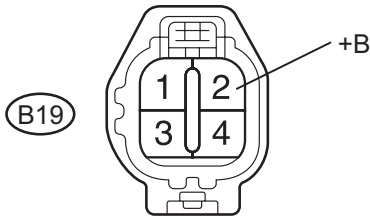
4 CHECK WIRE HARNESS (HO2 SENSOR - EFI RELAY)

Wire Harness Side:

HO2 Sensor (Bank 1)



HO2 Sensor (Bank 2)



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- (a) Check the EFI No. 1 fuse.
- (b) Disconnect the B19 or E35 HO2 sensor connector.
- (c) Remove the integration relay from the engine room No. 1 relay block.
- (d) Check the resistance.

Standard resistance

Tester Connection	Specified Condition
E35-1 (+B) - 1A-4	Below 1 Ω
B19-2 (+B) - 1A-4	Below 1 Ω
E35-1 (+B) or 1A-4 - Body ground	10 kΩ or higher
B19-2 (+B) or 1A-4 - Body ground	10 kΩ or higher

- (e) Reconnect the HO2 sensor connector.
- (f) Reinstall the integration relay.

NG **REPAIR OR REPLACE HARNESS AND CONNECTOR**

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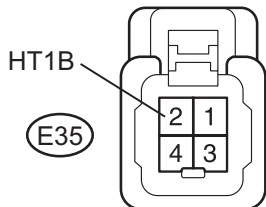
OK

CHECK ECM POWER SOURCE CIRCUIT

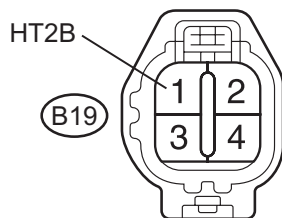
5 CHECK WIRE HARNESS (HO2 SENSOR - ECM)

Wire Harness Side:

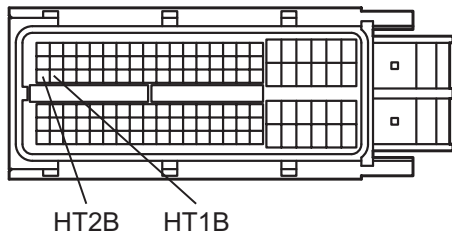
HO2 Sensor (Bank 1)



HO2 Sensor (Bank 2)



B30 ECM



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- (a) Disconnect the B19 or E35 HO2 sensor connector.
- (b) Disconnect the B30 ECM connector.
- (c) Measure the resistance.

Standard resistance

Tester Connection	Specified Condition
E35-2 (HT1B) - B30-48 (HT1B)	Below 1 Ω
B19-1 (HT2B) - B30-47 (HT2B)	Below 1 Ω
E35-2 (HT1B) or B30-48 (HT1B) - Body ground	10 kΩ or higher
B19-1 (HT2B) or B30-47 (HT1B) - Body ground	10 kΩ or higher

- (d) Reconnect the HO2 sensor connector.
- (e) Reconnect the ECM connector.

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REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

6 CHECK WHETHER DTC OUTPUT RECURS

- (a) Connect the intelligent tester to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Turn the tester ON.
- (d) Clear DTCs (see page ES-39).
- (e) Start the engine.
- (f) Allow the engine to idle for 2 minutes or more.
- (g) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (h) Read DTCs.

Result

Display (DTC Output)	Proceed to
No output	A

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Display (DTC Output)	Proceed to
P0037, P0038, P0057, P0058, P0141 and/or P0161	B



REPLACE ECM



CHECK FOR INTERMITTENT PROBLEMS