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|------------|--------------|--|
| 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) |

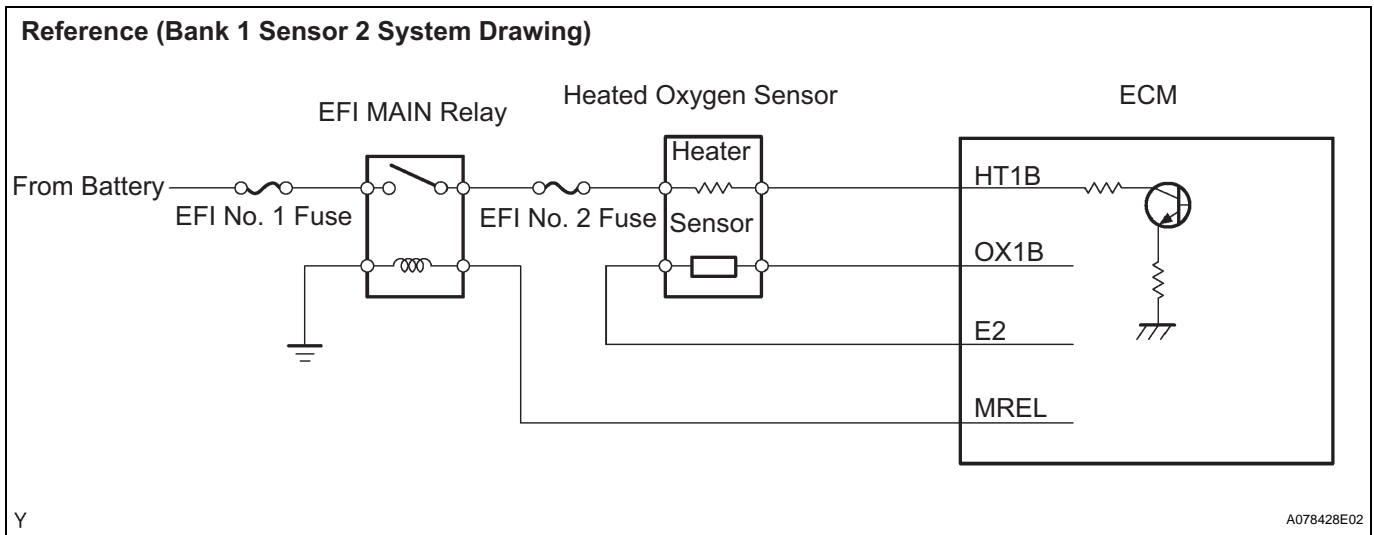
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DESCRIPTION

Refer to DTC P0136 (See page [ES-125](#)).

HINT:

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



| DTC No. | DTC Detection Condition | Trouble Area |
|----------------|---|---|
| P0037 P0057 | Heater current is 0.3 A or less 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 the heated oxygen sensor Heated oxygen sensor heater EFI MAIN relay ECM |
| P0038 P0058 | Heated current exceeds 2 A when the heater operates (1 trip detection logic) | <ul style="list-style-type: none"> Open or short in heater circuit of the heated oxygen sensor Heated oxygen sensor heater EFI MAIN relay ECM |

HINT:

- Bank 1 is the bank that includes cylinder No.1.
- Bank 2 is the bank that does not include cylinder No.1.
- Sensor 1 is the closest sensor to the engine assembly.
- Sensor 2 is the farthest sensor 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 in the oxygen concentration between the inside and outside surfaces 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 the 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 0.3 A when the heater is ON.

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MONITOR STRATEGY

| | |
|-------------------------------|--|
| Related DTCs | P0037: Heated oxygen sensor heater (Bank 1) open/short (Low electrical current) P0038: Heated oxygen sensor heater (Bank 1) open/short (High electrical current) P0057: Heated oxygen sensor heater (Bank 2) open/short (Low electrical current) P0058: Heated oxygen sensor heater (Bank 2) open/short (High electrical current) |
| Required sensors / components | Heated oxygen sensor heater (Bank 1 and 2) |
| Required sensors / components | Vehicle Speed Sensor |
| Frequency of operation | Continuous |
| Duration | Heated oxygen sensor heater (Bank 1) open/short (Low electrical current) : 0.5 seconds Heated oxygen sensor heater (Bank 2) open/short (Low electrical current) : 0.5 seconds Heated oxygen sensor heater (Bank 1) open/short (High electrical current) : 0.2 seconds Heated oxygen sensor heater (Bank 2) open/short (High electrical current) : 0.2 seconds |
| MIL operation | Immediate |
| Sequence operation | None |

TYPICAL ENABLING CONDITIONS

All:

| | |
|---|------|
| Monitor run whenever following DTCs are not present | None |
|---|------|

P0037, P0057:

| | |
|--|-----------------|
| 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 | ON |
| (b) Heater current | Less than 0.3 A |

P0038, P0058 Case 1:

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

P0038 and P0058 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 | ON |

| | |
|---|------|
| (b) Hybrid IC high current limiter port | Fail |
|---|------|

TYPICAL MALFUNCTION THRESHOLDS

P0037 and P0057:

| | |
|--|-----------------|
| Heated oxygen sensor heater current during intrusive heating | Less than 0.3 A |
|--|-----------------|

P0038 and P0058 Case 1:

| | |
|-------------------------------------|------|
| Hybrid IC high current limiter port | Fail |
|-------------------------------------|------|

P0038 and P0058 Case 2:

| | |
|--|---------------|
| Heated oxygen sensor heater current during intrusive heating | More than 2 A |
|--|---------------|

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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 "Checking Monitor Status" for detailed information (See page [ES-14](#)).

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 [ES-16](#)).

- 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 |
| 1 | \$20 | Multiply by 0.000076 (A) | Maximum HO2S heater current (Bank 2 Sensor 2) | Malfunction threshold for HO2S heater |

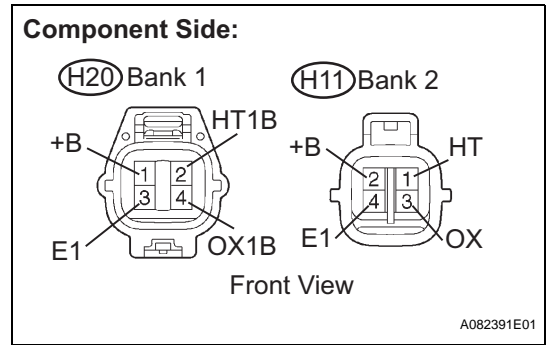
WIRING DIAGRAM

Refer to DTC P0136 (See page [ES-130](#)).

HINT:

- If DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the intelligent tester or the 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 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 H11 or H20 heated oxygen sensor connector.
- (b) Measure the resistance of the heated oxygen sensor terminals.

Standard resistance (bank 1, 2 sensor 2)

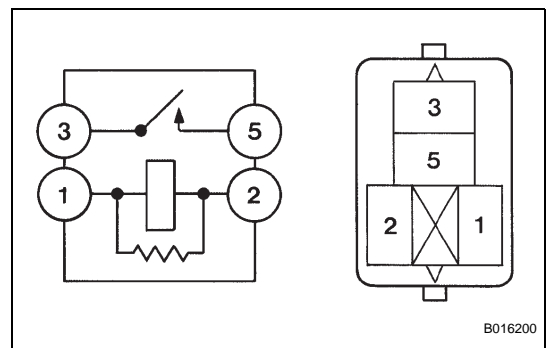
| Tester Connection | Condition | Specified Condition |
|--|-------------|---------------------|
| H11-1 (HT) - H11-2 (+B) H20-1 (+B) - H20-2 (HT1B) | 20°C (68°F) | 11 to 16 Ω |

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NG → **REPLACE HEATED OXYGEN SENSOR**

OK

2 INSPECT EFI MAIN RELAY



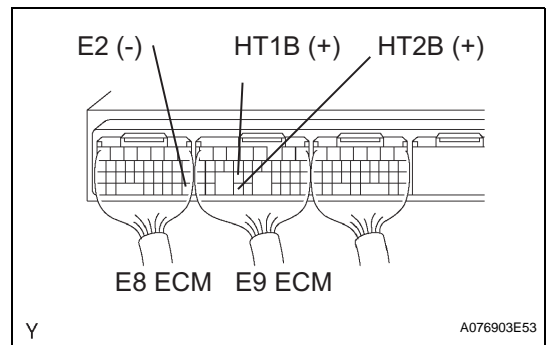
- (a) Remove the EFI MAIN relay from the engine room J/B.
 - (b) Measure the resistance of the EFI MAIN relay.
- Standard resistance**

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

NG → **REPLACE EFI MAIN RELAY**

OK

3 INSPECT ECM (HT1B OR HT2B VOLTAGE)



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

| Tester Connection | Specified Condition |
|--|---------------------|
| E9-25 (HT1B) - E8-28 (E2) E9-33 (HT2B) - E8-28 (E2) | 9 to 14 V |

HINT:

- The HT1B stands for the heated oxygen sensor bank 1 sensor 2.
- The HT2B stands for the heated oxygen sensor bank 2 sensor 2.

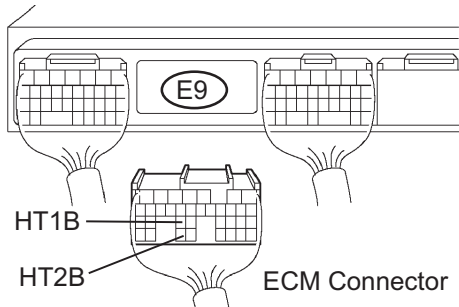
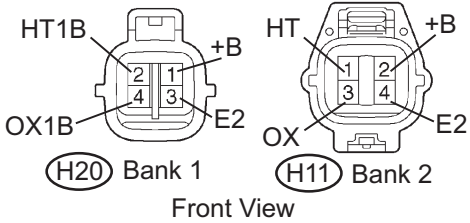
OK → **REPLACE ECM**

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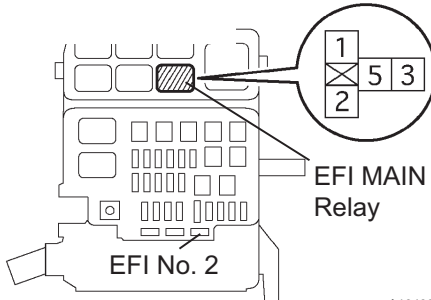
4 CHECK HARNESS AND CONNECTOR (HEATED OXYGEN SENSOR - ECM, HEATED OXYGEN SENSOR - EFI RELAY)

Wire Harness Side:

Heated Oxygen Sensor Connector



Engine Room R/B and Fusible Link Block:



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- (a) Check the wire harness between the ECM and heated oxygen sensor.
- (1) Disconnect the E9 ECM connector.
 - (2) Disconnect the H11 or H20 heated oxygen sensor connector.
 - (3) Measure the resistance of the wire harness side connectors.

Standard resistance

| Tester Connection | Specified Condition |
|--|---------------------|
| H20-2 (HT1B) - E9-25 (HT1B) H11-1 (HT) - E9-33 (HT2B) | Below 1 Ω |
| H20-2 (HT1B) or E9-25 (HT1B) - Body ground H11-1 (HT) or E9-33 (HT2B) - Body ground | 10 kΩ or higher |

- (b) Check the wire harness between the heated oxygen sensor and EFI MAIN relay.
- (1) Disconnect the H11 or H20 heated oxygen sensor connector.
 - (2) Remove the EFI MAIN relay from the engine room J/B.
 - (3) Measure the resistance of the wire harness side connectors.

Standard resistance

| Tester Connection | Specified Condition |
|--|---------------------|
| H11-2 (+B) - EFI relay terminal 3 H20-1 (+B) - EFI relay terminal 3 | Below 1 Ω |
| H11-2 (+B) or EFI relay terminal 3 - Body ground H20-1 (+B) or EFI relay terminal 3 - Body ground | 10 kΩ or higher |

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

ES