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| DTC | P0115/22 | Water Temp. Circuit Malfunction |
|------------|-----------------|--|

CIRCUIT DESCRIPTION

A thermistor built into the water temp. sensor changes the resistance value according to the water temperature.

The structure of the sensor and connection to the engine ECU is the same as in the DTC P0110/24 (Intake Air Temp. Circuit Malfunction) shown on [page DI-36](#).

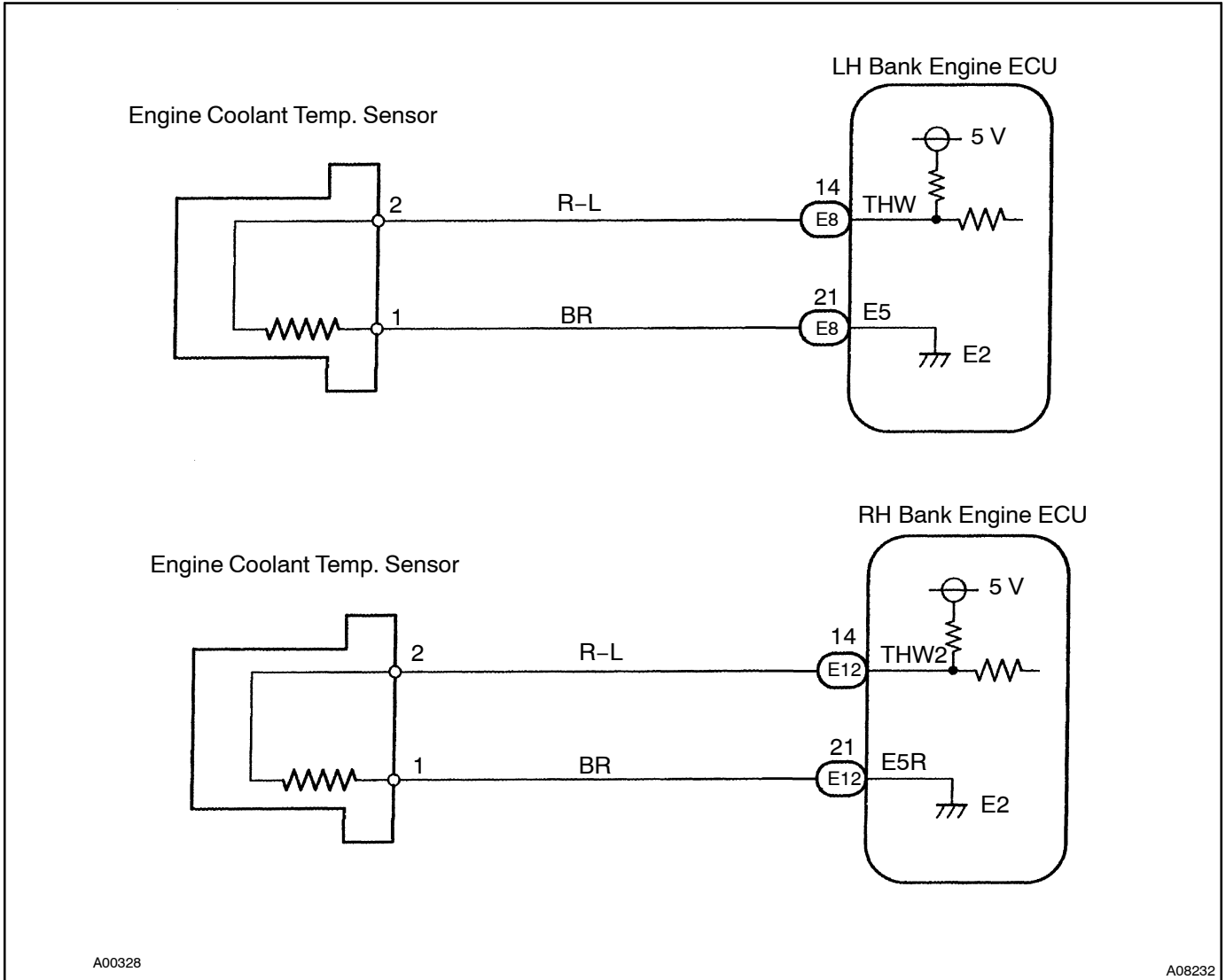
| DTC No. | DTC Detecting Condition | Trouble Area |
|----------|---|---|
| P0115/22 | Open or short in water temp. sensor circuit | <ul style="list-style-type: none"> • Open or short in water temp. sensor circuit • Water temp. sensor • Engine ECU |

HINT:

After confirming DTC P0115/22 use the hand-held tester to confirm the water temperature from CURRENT DATA.

| Temperature Displayed | Malfunction |
|-----------------------|---------------|
| -40°C (-40°F) | Open circuit |
| 140°C (284°F) or more | Short circuit |

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- LH and RH bank engine ECU detect this DTC code respectively. The inspection procedures are same for both LH and RH bank engine ECU and described in this manual. Even though terminal name and part name on the side of RH bank are described in parenthesis, perform the inspection for only ECU that has detected DTC.
- LH Bank:
If DTC P0115/22 (Water Temp. Circuit Malfunction), P0120/41 (Throttle Position Sensor Malfunction) are output simultaneously, E5 (Sensor Ground) may be open.
- Read freeze frame data using hand-held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

When using hand-held tester

1 Connect hand-held tester, and read value of water temperature.

PREPARATION:

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch to ON and switch the hand-held tester main switch to ON.

CHECK:

Read temperature value on the hand-held tester.

OK:

Same as actual water temperature

HINT:

- If there is open circuit, hand-held tester indicates -40°C (-40°F).
- If there is short circuit, hand-held tester indicates 140°C (284°F) or more.

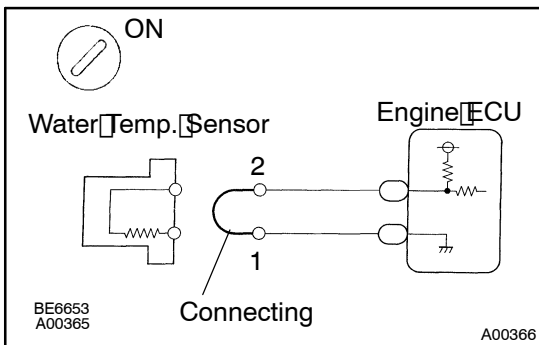
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-40°C (-40°F)...Go to step 2.
 140°C (284°F) or more...Go to step 4.

OK

Check for intermittent problems (See page DI-4)

2 Check for open in harness or engine ECU.



PREPARATION:

- Disconnect the water temp. sensor connector.
- Connect sensor wire harness terminals together.
- Turn the ignition switch to ON.

CHECK:

Read temperature value on the hand-held tester.

OK:

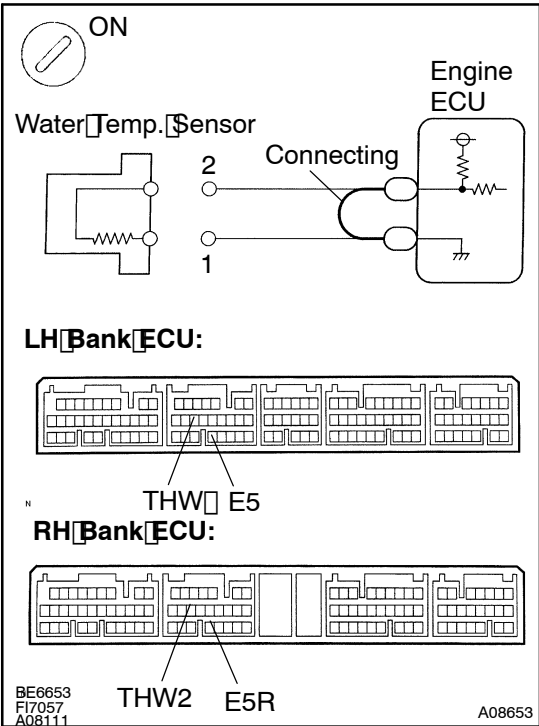
Temperature value: 140°C (284°F) or more

OK

Confirm good connection at sensor. If OK, replace water temp. sensor.

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3 Check for open in harness or engine ECU.



PREPARATION:

- (a) Remove the engine ECU with connectors still connected.
- (b) Connect between terminals THW, THW2 and E5 (E5R) of the engine ECU connector.

HINT:

Water Temp. sensor connector is disconnected. Before checking, do a visual and contact pressure check for the engine ECU connector (See page N-20).

- (c) Turn the ignition switch ON.

CHECK:

Read temperature value on the hand-held tester.

OK:

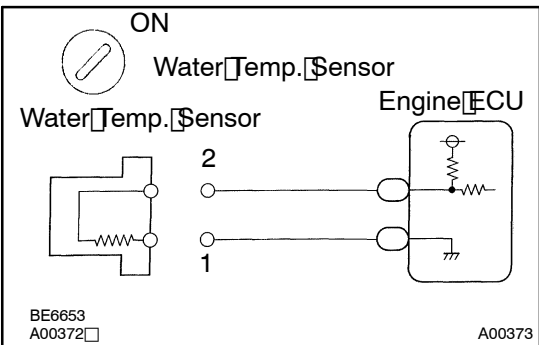
Temperature value: 140°C (284°F) or more

OK Open in harness between terminals E2 or THW, repair or replace harness.

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Confirm good connection at engine ECU. If OK, check and replace engine ECU (See page N-20).

4 Check for short in harness and engine ECU.



PREPARATION:

- (a) Disconnect the water temp. sensor connector.
- (b) Turn the ignition switch to ON.

CHECK:

Read temperature value on the hand-held tester.

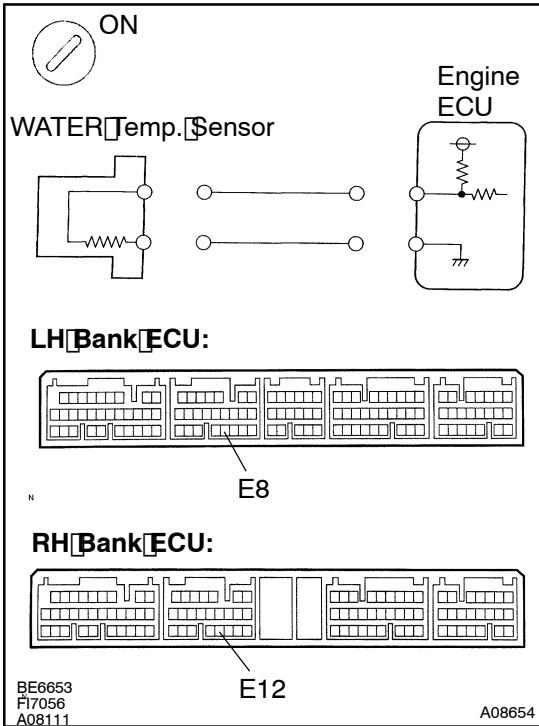
OK:

Temperature value: -40°C (-40°F)

OK Replace water temp. sensor.

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5 Check for short in harness or engine ECU.



PREPARATION:

- (a) Remove the engine ECU with connectors still connected.
- (b) Disconnect the E8 (E12) connector of the engine ECU.

HINT:

Water Temp. Sensor connector is disconnected.

- (c) Turn the ignition switch to ON.

CHECK:

Read temperature value on the hand-held tester.

OK:

Temperature value: -40°C (-40°F)

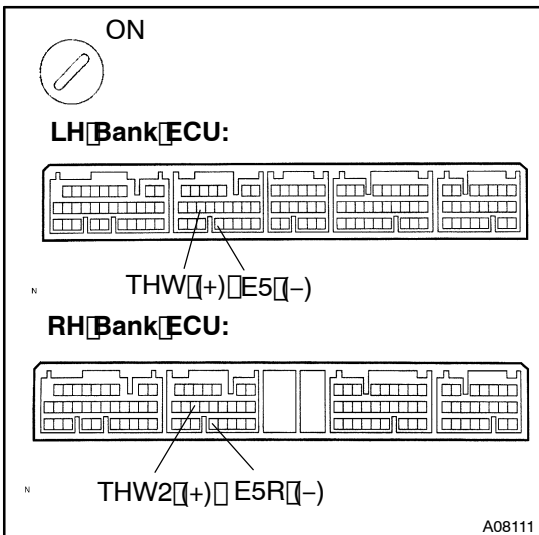
OK Repair or replace harness or connector.

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Check and replace engine ECU (See page IN-20).

When not using hand-held tester

1 Check voltage between terminals THW (THW2) and E5 (E5R) of engine ECU connector.



PREPARATION:

- (a) Remove the engine ECU with connectors still connected.
- (b) Turn ignition switch to ON.

CHECK:

Measure voltage between terminals THW (THW2) and E5 (E5R) of engine ECU connector.

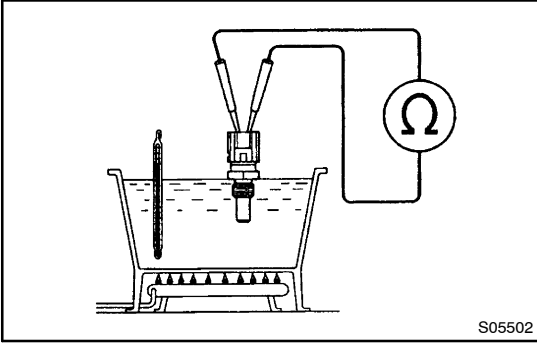
OK:

| Water temp. °C (°F) | Voltage |
|------------------------|-------------|
| 20 (68) | 0.5 - 3.4 V |
| 60 (140) | 0.2 - 1.0 V |

OK Check for intermittent problems (See page DI-4)

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2 Check water temp. sensor.

**PREPARATION:**

Disconnect the water temp. sensor connector.

CHECK:

Measure resistance between terminals.

OK:

Resistance is within acceptable zone on chart.

| Water Temp. | Resistance |
|--------------|--------------|
| 20°C (68°F) | 2 - 3 kΩ |
| 80°C (176°F) | 0.2 - 0.4 kΩ |

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Replace water temp. sensor.

OK

3 Check for open and short in harness and connector between engine ECU and water temp. sensor (See Pub. No. RM677E, page CO-41).

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Repair or replace harness or connector.

OK

Check and replace engine ECU (See page IN-20).