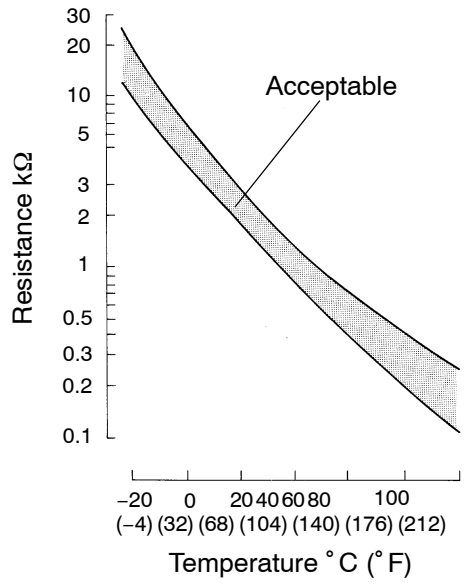
DI3S7–08

DTC	P0 115/22	Water Temperature Sensor Circuit

CIRCUIT DESCRIPTION

(Fig.1)



The water temperature sensor senses the coolant temperature. A thermistor built into the sensor changes the resistance value according to the coolant temperature. The lower the coolant temperature, the greater the thermistor resistance value, and the higher the coolant temperature, the lower the thermistor resistance value (See Fig.1).

The water temperature sensor is connected to the engine ECU (see next page). The 5 V power source voltage in the engine ECU is applied to the water temperature sensor from the terminal THW via resistor R. That is, the resistor R and the water temperature sensor are connected in series. When the resistance value of the water temperature sensor changes, in accordance with changes in the coolant temperature, the potential at the terminal THW also changes. Based on this signal, the engine ECU increases the fuel injection volume to improve driveability during cold engine operation.

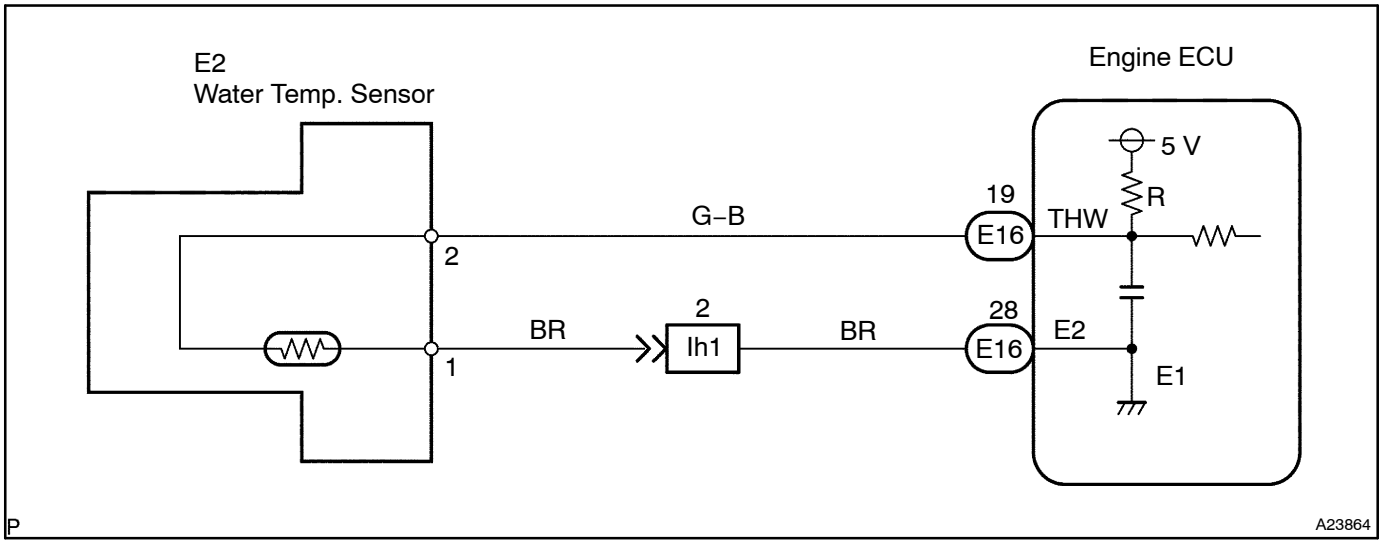
DTC No.	DTC Detection Condition	Trouble Area
P0115/22	Open or short in water temp. sensor circuit for 0.5 sec. or more	• Open or short in water temp. sensor circuit • Water temp. sensor • Engine ECU

HINT:

When DTC P0115/22 is detected, check the engine coolant temperature by entering the following menus on the intelligent tester II: Powertrain / Engine and ECT / Data List / Coolant Temp.

Temperature displayed	Malfunction
–40°C (–40°F)	Open circuit
140°C (284°F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

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 II. 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, and other data from the time the malfunction occurred.

When using intelligent tester II:

1	**Connect intelligent tester II, and read value of water temperature.**

PREPARATION:

(a) Connect the intelligent tester II to the DLC 3.

(b) Turn the ignition switch ON and push the intelligent tester II main switch ON.

CHECK:

Read the temperature value on the intelligent tester II.

OK:

Same as actual water temperature.

HINT:

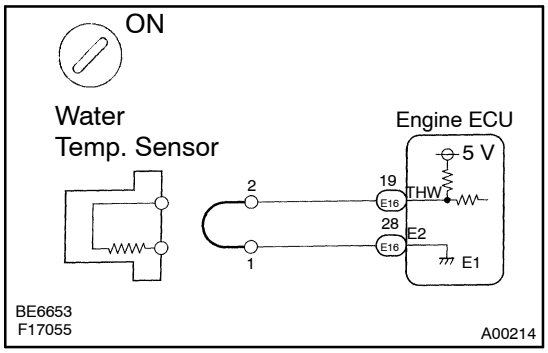
- If there is an open circuit, the intelligent tester II indicates –40°C (–40°F).
- If there is a short circuit, the intelligent tester II indicates 140°C (284°F) or more.

NG → **–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:

(a) Disconnect the water temp. sensor connector.

(b) Connect sensor wire harness terminals together.

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the intelligent tester II.

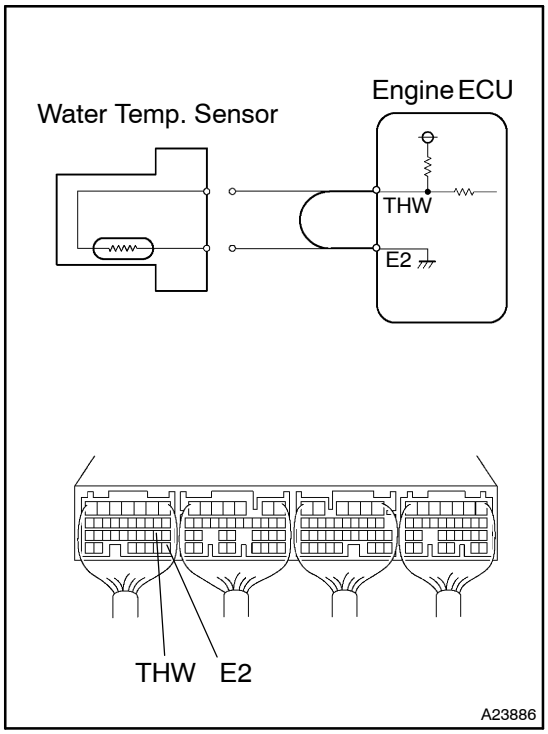
OK:

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

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

NG

3	Check for open in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment door.

(b) Connect between terminals THW and E2 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 IN–19).

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the intelligent tester II.

OK:

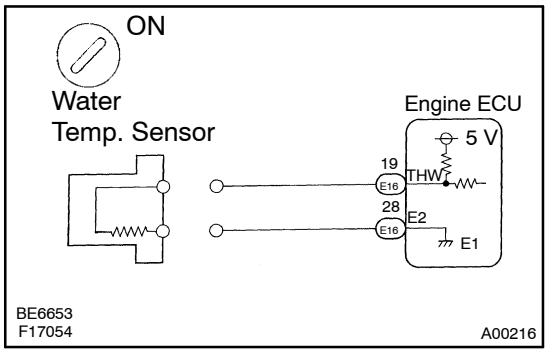
Temperature value: 140°C (284°F) or more

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

NG

Confirm good connection at engine ECU. If OK, replace engine ECU.

4	Check for short in harness and engine ECU.



PREPARATION:

(a) Disconnect the water temp. sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Read the temperature value on the intelligent tester II.

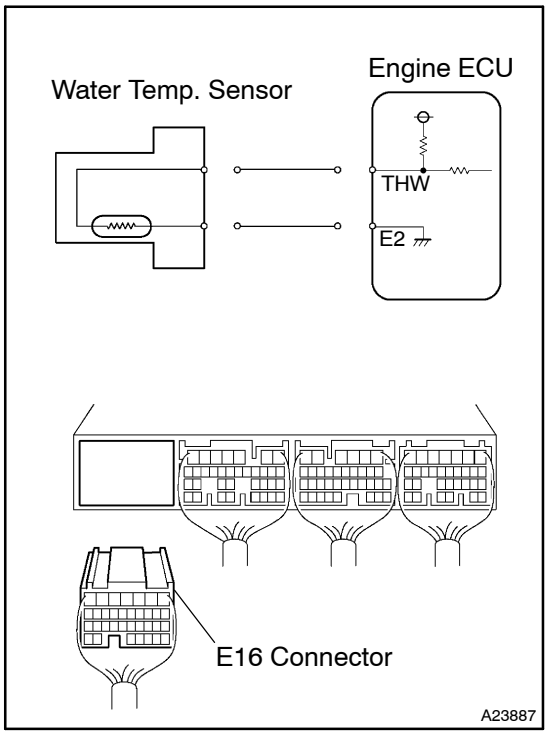
OK:

Temperature value: –40° C (–40° F)

OK	Replace water temp. sensor.

NG

5	Check for short in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment door.

(b) Disconnect the E16 connector of the engine ECU.

HINT:

Water temp. sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the intelligent tester II.

OK:

Temperature value: –40° C (–40° F)

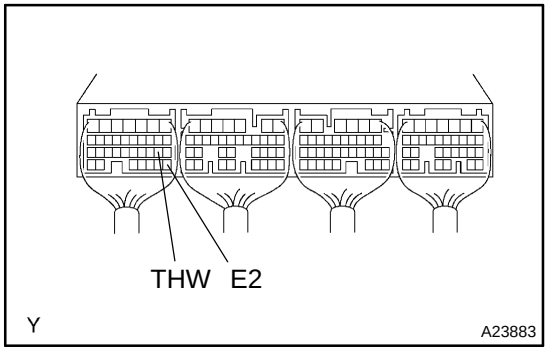
OK	Repair or replace harness or connector.

NG

Check and replace engine ECU (See page IN–19).

When not using intelligent tester II:

1	**Check voltage between terminals THW and E2 of engine ECU connector.**



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals THW and E2 of the engine ECU connector.

OK:

Water temp.	Voltage
20˚C (68˚F) (Engine is cool)	0.2 to 3.8 V
80˚C (176˚F) (Engine is hot)	0.1 to 1.5 V

OK → **Check for intermittent problems (See page DI−4).**

NG

2	**Check water temp. sensor (See Pub. No. RM617E on page ED−5).**

NG → **Replace water temp. sensor.**

OK

3	**Check for open and short in harness and connector between engine ECU and water temp. sensor (See page IN−19).**

NG → **Repair or replace harness or connector.**

OK

Check and replace engine ECU (See page IN−19).