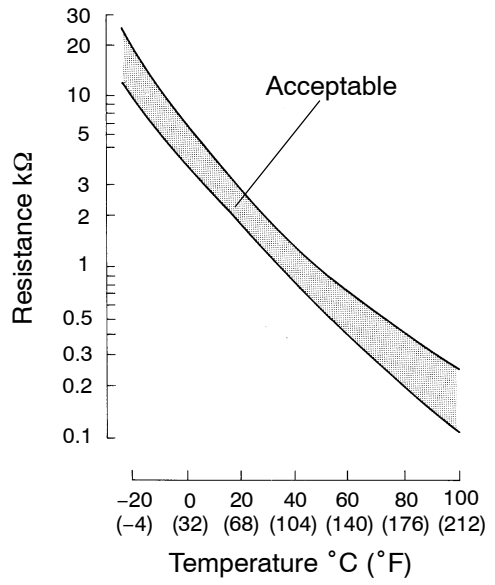
DI9G9–02

DTC	22	Water Temp. Sensor Circuit Malfunction

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 below). The 5 V power source voltage in the engine ECU is applied to the water temperature sensor from the terminal THW via a resistor R. That is, 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.

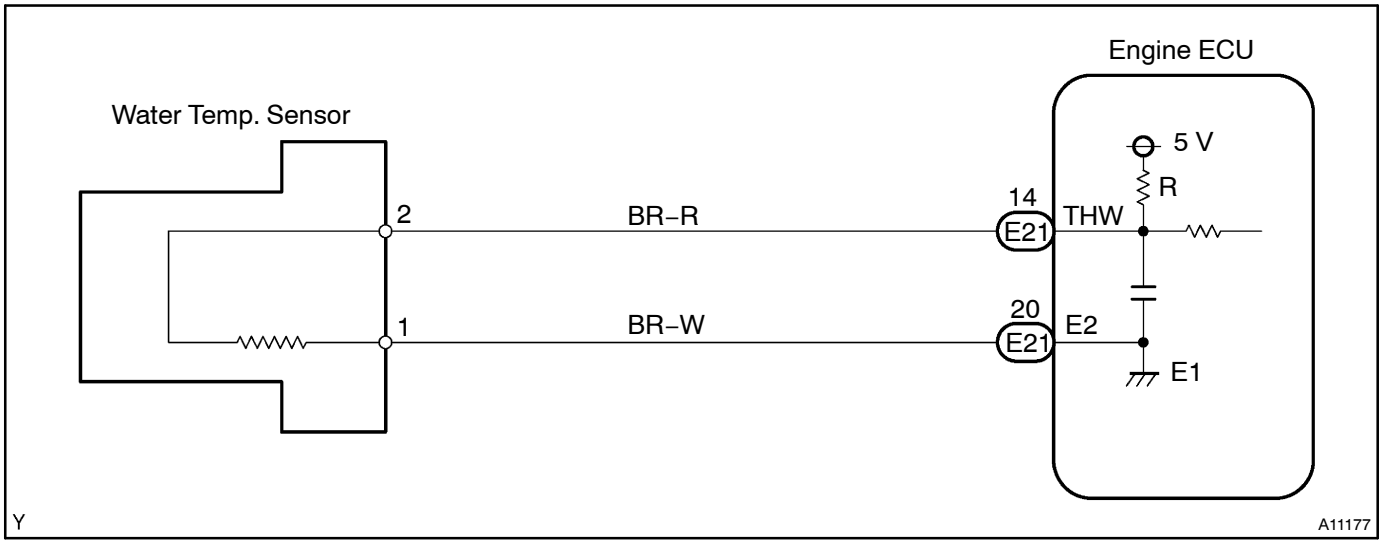
DTC No.	DTC Detecting Condition	Trouble Area
22	Open or short in water temp. sensor circuit for 0.5 sec. or more	• Open or short in water temp. sensor circuit • Water temp. sensor • Engine ECU

HINT:

After confirming DTC 22, use the hand–held tester to confirm the water temperature from the CURRENT DATA.

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs 22, 24 ,35 and 39 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using the 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 was warmed up or not, the air–fuel ratio was 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:

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

Same as actual water temperature.

HINT:

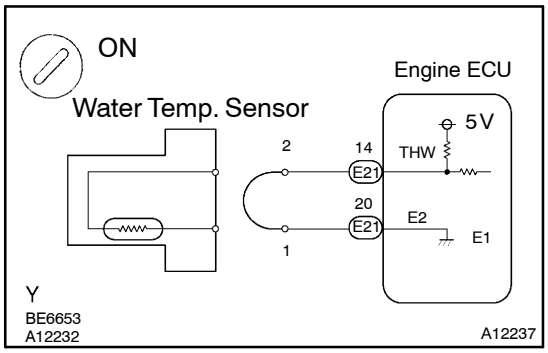
- If there is open circuit, hand–held tester indicates –40°C (–40°F).
- If there is short circuit, hand–held tester indicates 140°C (284°F) or more.

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 temperature sensor connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

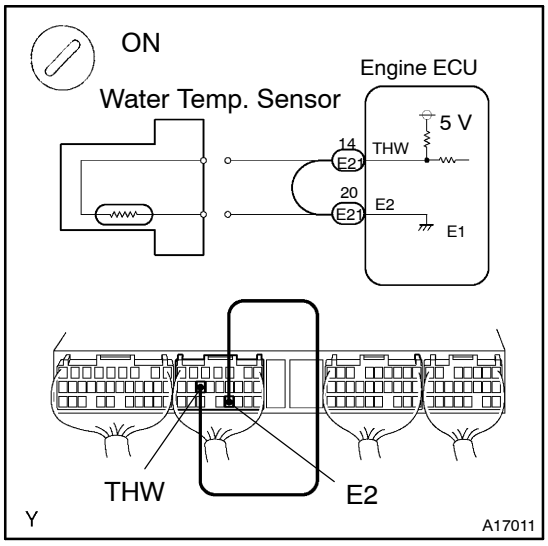
OK:

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

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

NG

3	Check for open in harness or engine ECU.



PREPARATION:

(a) Disconnect the engine ECU from the body bracket (See page ED–30).
(b) Connect between terminals THW and E2 of the engine ECU connector.

HINT:

The water temperature sensor connector is disconnected. Before checking, do a visual and contact pressure check for the engine ECU connector (See page IN–20).

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

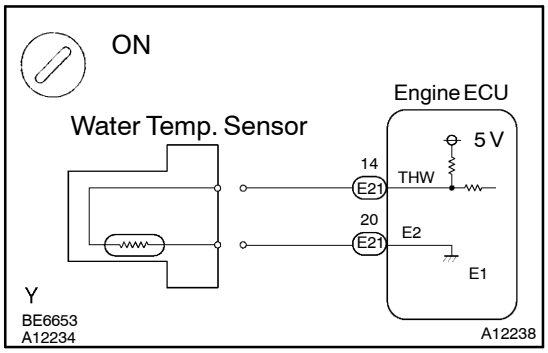
Temperature value: 140°C (284°F) or more

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 temperature sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

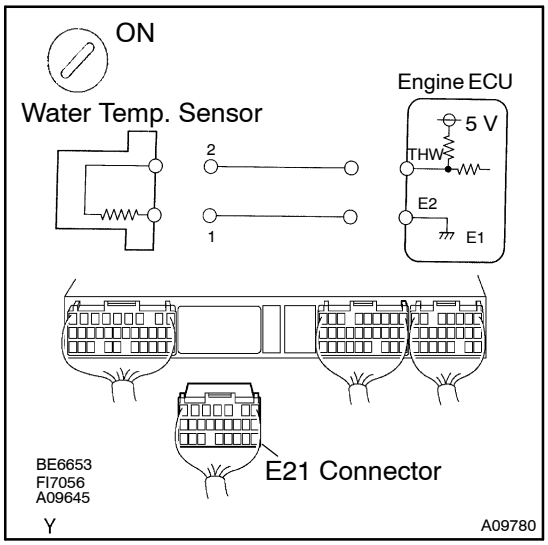
OK:

Temperature value: –40°C (–40°F)

OK	Replace water temperature sensor.

NG

5	Check for short in harness or engine ECU.



PREPARATION:

(a) Disconnect the engine ECU from the body bracket (See page ED–30).

(b) Disconnect the E21 connector from the engine ECU.

HINT:

The water temperature sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the hand–held tester.

OK:

Temperature value: –40°C (–40°F)

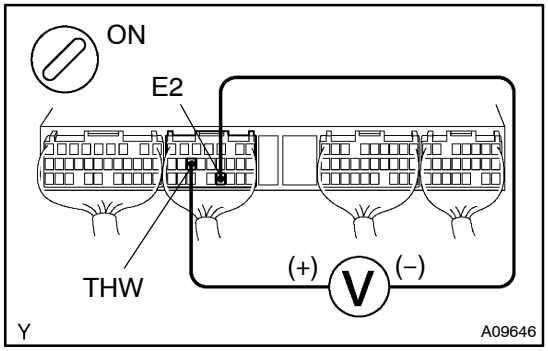
OK	Repair or replace harness or connector.

NG

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

When not using hand–held tester:

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



PREPARATION:

(a) Disconnect the engine ECU from the body bracket (See page ED–30).

(b) Turn the ignition switch ON.

CHECK:

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

OK:

Water Temp. °C (°F)	Voltage
20 (68) (Engine is cool)	0.2 – 3.8 V
80 (176) (Engine is hot)	0.1 – 1.5 V

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

NG

2	**Check water temperature sensor (See page ED–15).**

NG	**Replace water temperature sensor.**

OK

3	**Check for open and short in harness and connector between engine ECU and water temperature sensor (See page IN–20).**

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

OK

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