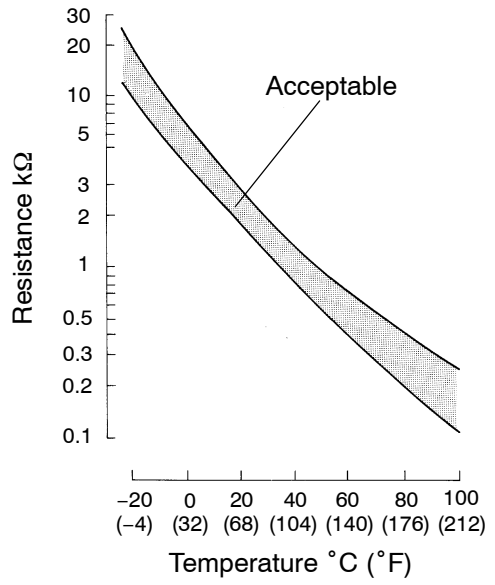
DI8FK–01

DTC	22	Water Temp. Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Fig. 1



The water temperature sensor senses the coolant temperature. A thermistor built in 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 terminal THW via a 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 terminal THW also changes. Based on this signal, the engine ECU increases the fuel injection volume to improve driveability during the cold engine operation.

DTC No.	DTC Detection 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

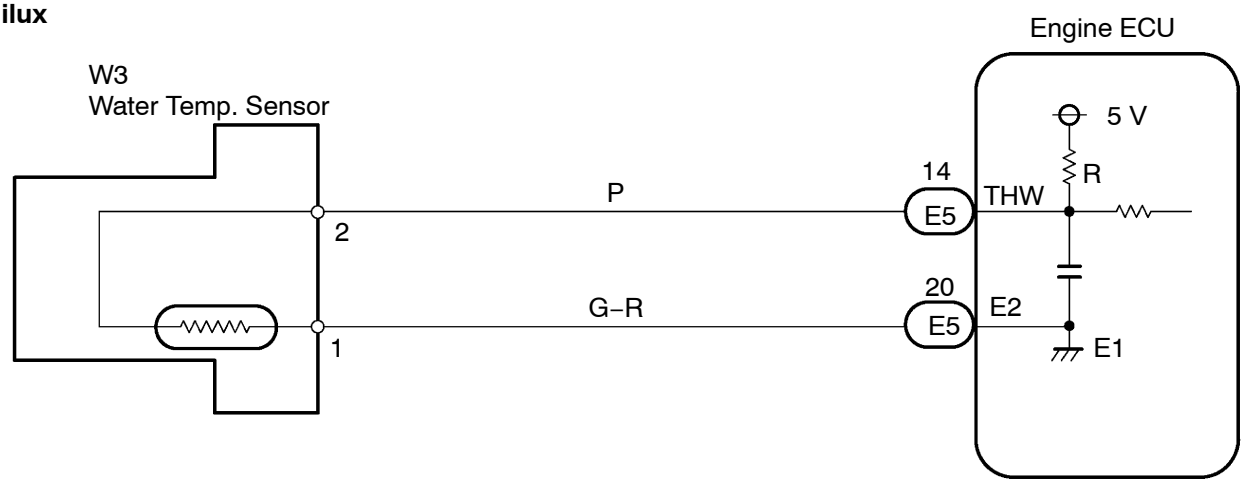
HINT:

After confirming DTC22, use the hand–held tester to confirm the water temperature from the CURRENT DATA.

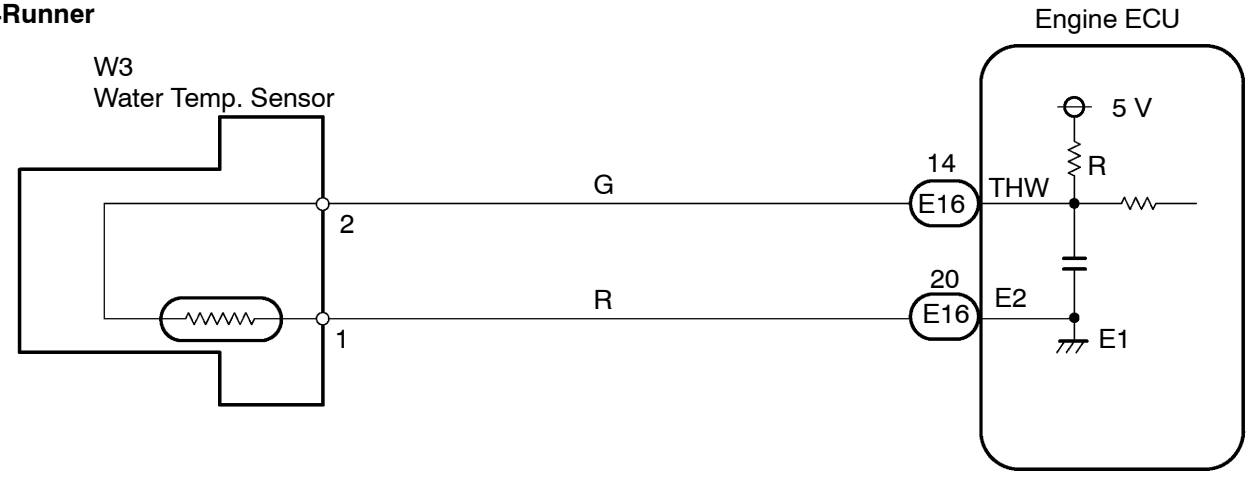
Displayed Temperature	Malfunction
–40°C (–40°F)	Open circuit
140°C (284°F) or more	Short circuit

WIRING DIAGRAM

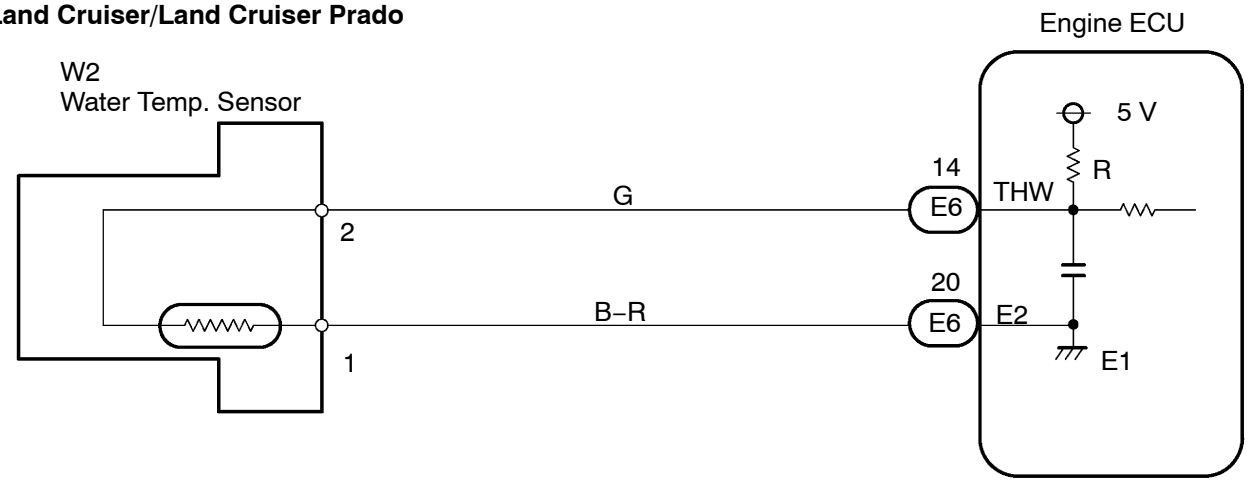
Hilux



4Runner



Land Cruiser/Land Cruiser Prado



INSPECTION PROCEDURE

HINT:

- If DTC22, 24 and 39 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester, as freeze frame data records the engine conditions when a 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 value as the actual water temperature.

HINT:

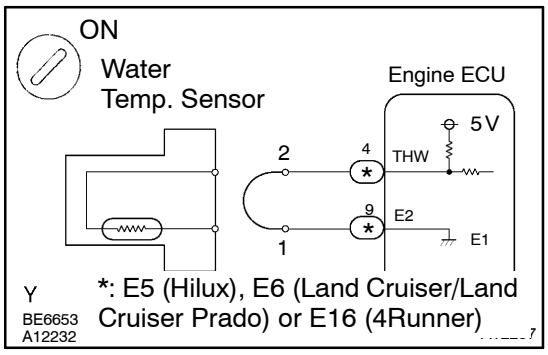
- If there is open circuit, hand–held tester indicates –40°C (–40°F).
- If there is short circuit, hand–held tester indicates 140°C (284°F) or more.

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.

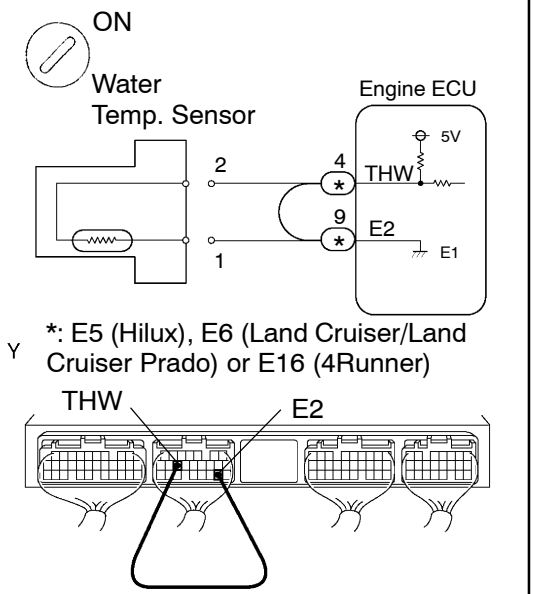
OK:

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) Remove the glove compartment door.

(b) Connect terminals THW and E2 of the engine ECU connector.

HINT:

Water temperature sensor connector is disconnected.

Before checking, do a visual and contact check of the pressure of 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:

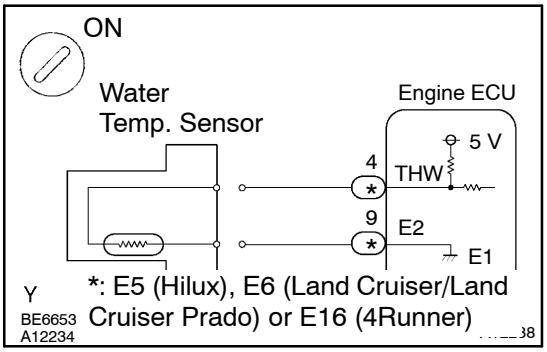
Temperature value: 140°C (284°F) or more

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.

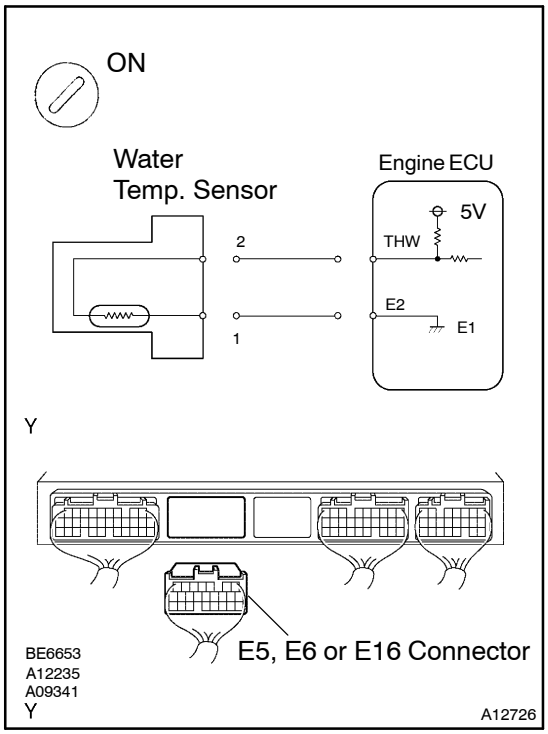
OK:

Temperature value: –40°C (–40°F)

OK	Replace water temperature sensor.

NG

5	Check for short in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment door.

(b) Disconnect the E5 (Hilux), E6 (Land Cruiser/Land Cruiser Prado) or E16 (4Runner) connector of the engine ECU.

HINT:

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)

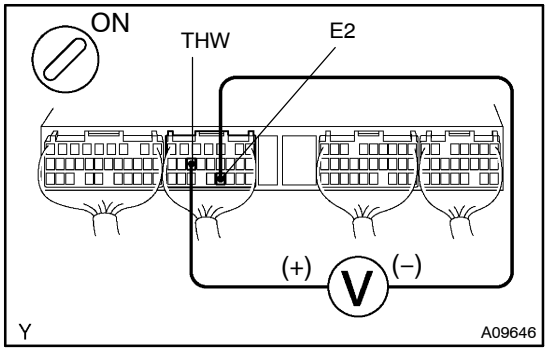
OK → **Repair or replace harness or connector.**

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) 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 – 3.8 V
80°C (176°F) (Engine is hot)	0.1 – 1.5 V

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

NG

2	Check water temperature sensor (See Pub. No. RM710E, ED section).

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.