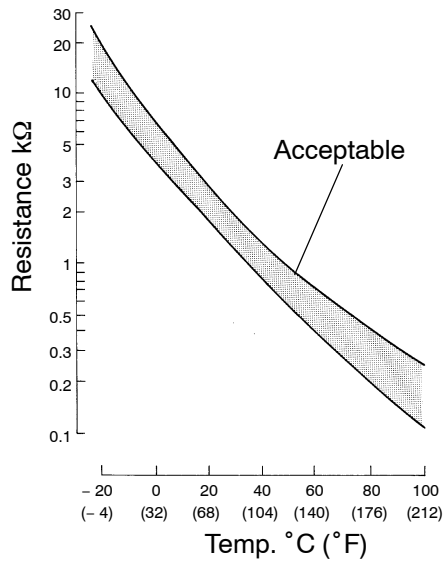
DTC	22	WATER TEMPERATURE SENSOR CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

(Fig. 1)



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

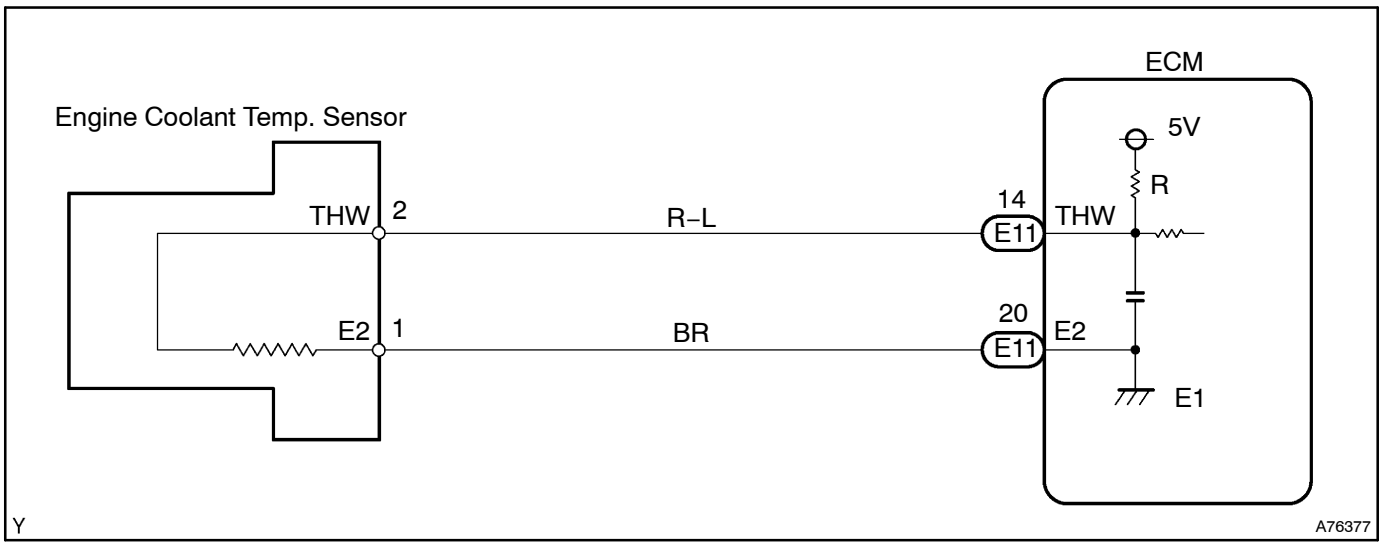
DTC No.	DTC Detection Condition	Trouble Area
22	Open or short in engine coolant temp. sensor circuit for 0.5 sec. or more	• Open or short in engine coolant temp. sensor circuit • Engine coolant temperature sensor • ECM

HINT:

After confirming DTC 22 use the hand–held tester to confirm the engine coolant 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 different DTCs that are related to different systems are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using the 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, etc. at the time of the malfunction.

When using Hand–Held tester:

1	READ VALUE OF HAND–HELD TESTER(ENGINE COOLANT TEMP.)

(a) Connect the hand–held tester to the DLC3.
(b) Read temperature value on the hand–held tester.
Temperature: The same as actual engine coolant temperature

Result:

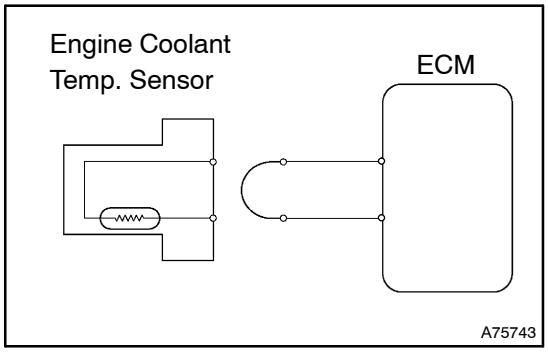
Display	Proceed
–40°C (–40°F)	A
140°C (284°F) or more	B
OK	C

B → **Go to step 4**

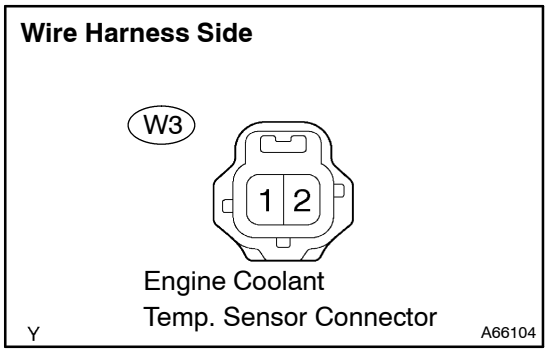
C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–303)**

A

2 CHECK HARNESS AND CONNECTOR(CHECK FOR OPEN)



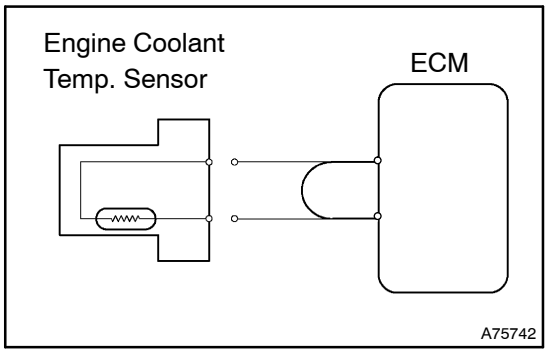
(a) Disconnect the engine coolant temperature sensor connector.
(b) Connect the terminals 1 with 2 of the engine coolant temperature sensor harness side connector.
(c) Turn the ignition switch ON.
(d) Read temperature value on the hand–held tester.
Temperature: 140°C (284°F) or more



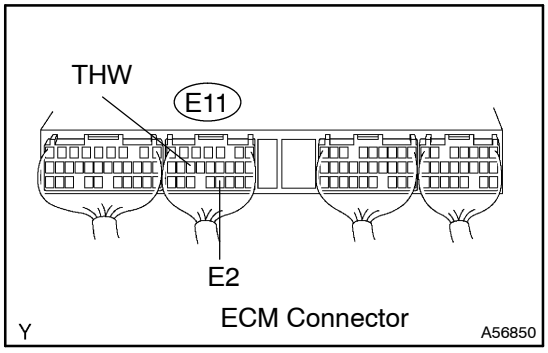
OK → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

NG

3 INSPECT ECM(CHECK FOR OPEN)



(a) Connect between terminals THW and E2 of the ECM connector.
(b) Turn the ignition switch ON.
(c) Read the temperature value on the hand–held tester.
Temperature: 140°C (284°F) or more

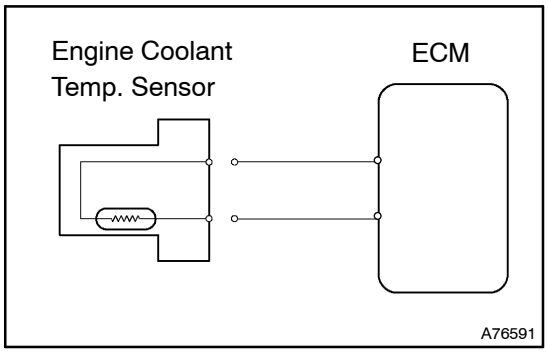


OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CHECK AND REPLACE ECM

4 CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT)

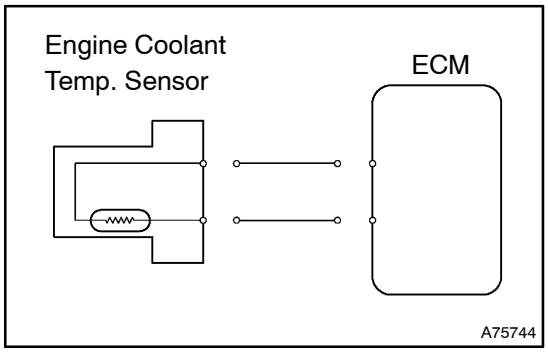


(a) Disconnect the engine coolant temperature sensor connector.
(b) Turn the ignition switch ON.
(c) Read the temperature value on the hand–held tester.
Temperature: –40°C (–40°F)

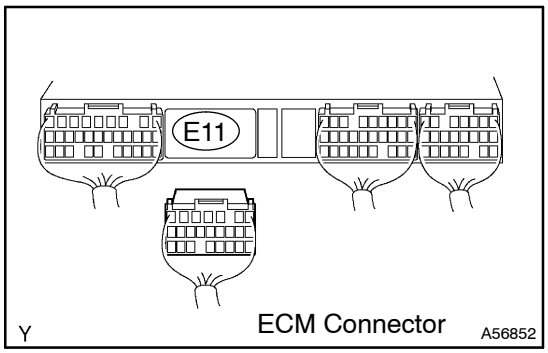
OK	**REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

NG

5 INSPECT ECM(CHECK FOR SHORT)



(a) Disconnect the ECM E11 connector.
(b) Turn the ignition switch ON.
(c) Read the temperature value on the hand–held tester.
Temperature: –40°C (–40°F)



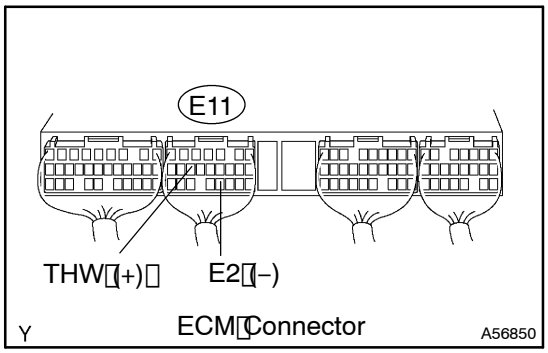
OK	**REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CHECK AND REPLACE ECM

When not using Hand–Held tester:

1	INSPECT ECM



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the ECM connector.

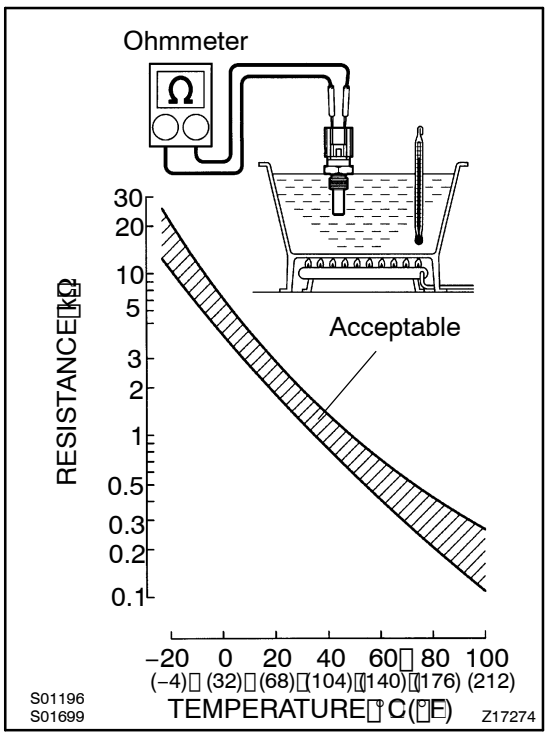
Voltage:

Symbols (Terminal No.)	Condition	Specified condition
THW (E11 – 14) ⇔ E2 (E11 – 20)	20°C (68°F)	0.2 – 3.8 V
	80°C (176°F)	0.1 – 1.5 V

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–303)**

NG

2	CHECK ENGINE COOLANT TEMPERATURE SENSOR



(a) Check the engine coolant temperature sensor for resistance.
(1) Using an ohmmeter, measure the resistance between terminals.

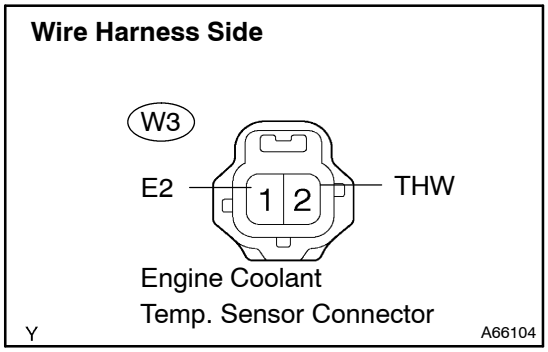
Resistance:
Approx. 20°C (68°F) 2.28 – 2.63 kΩ
Approx. 80°C (176°F) 0.305 – 0.331 kΩ

NOTICE:
In case of checking the engine coolant temperature sensor in the water, be careful not to allow water to go into the terminals, and after checking, wipe out the sensor.

NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

3 CHECK HARNESS AND CONNECTOR(ECM – ENGINE COOLANT TEMP.SENSOR)



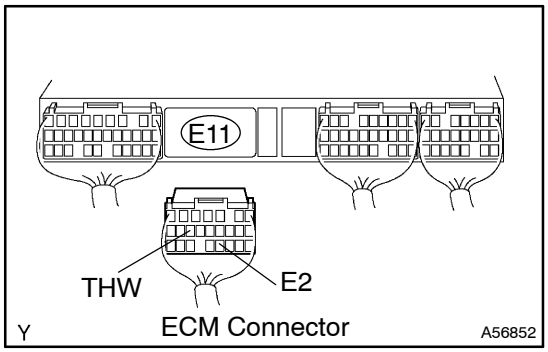
(a) Disconnect the engine coolant temperature sensor connector.
(b) Disconnect the ECM E11 connector.
(c) Check the continuity between the wire harness side connector.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
THW (W3 – 2) ⇔ THW (E11 – 14)	Continuity
E2 (W3 – 1) ⇔ E2 (E11 – 20)	

Standard (Check for short):

Symbols (Terminal No.)	Specified condition
THW (E11 – 14) ⇔ E2 (E11 – 20)	No continuity



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ECM