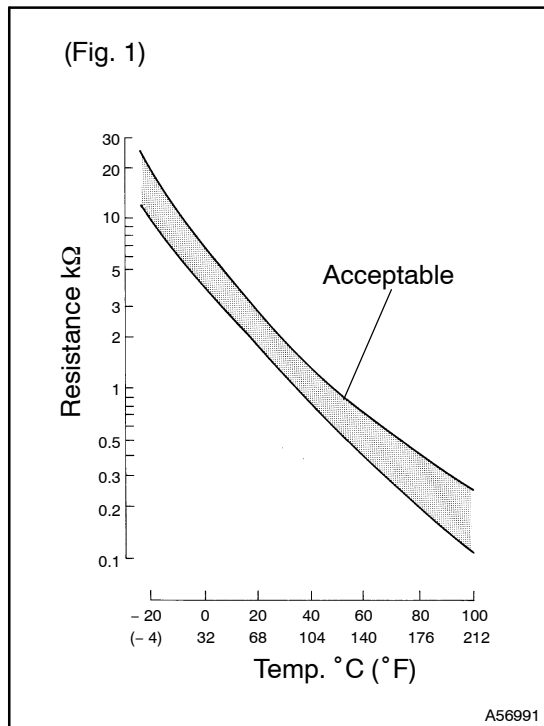


DTC	22	WATER TEMP.SENSOR CIRCUIT MALFUNCTION
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CIRCUIT DESCRIPTION



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 ECM (See below). The 5 V power source voltage in the ECM 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 ECM increases the fuel injection volume to improve drivability during cold engine operation.

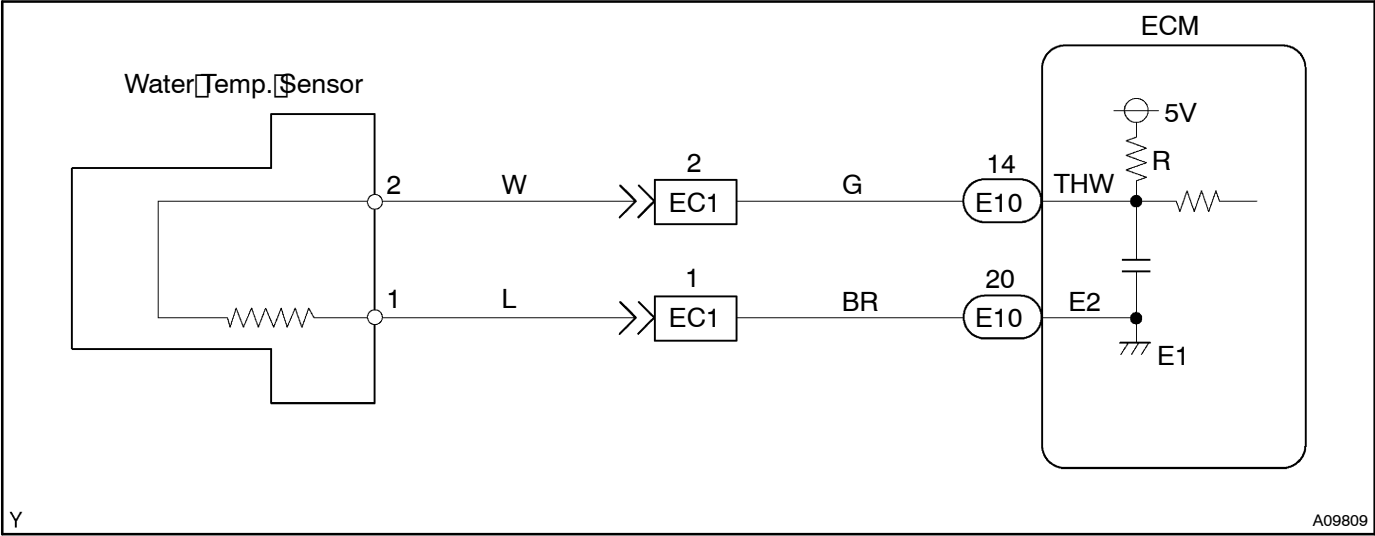
DTC No.	DTC Detection Condition	Trouble Area
22	Open or short in water temp. sensor circuit for 0.5 sec. or more	<ul style="list-style-type: none"> • Open or short in water temp. sensor circuit • Water temp. sensor • ECM

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 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, etc. at the time of the malfunction.

When using hand-held tester:

1 READ VALUE OF HAND-HELD TESTER (WATER TEMP.)

- (a) Connect the hand-held tester to the DLC3.
- (b) Read temperature value on the hand-held tester.
- Temperature:** The same as actual water temperature

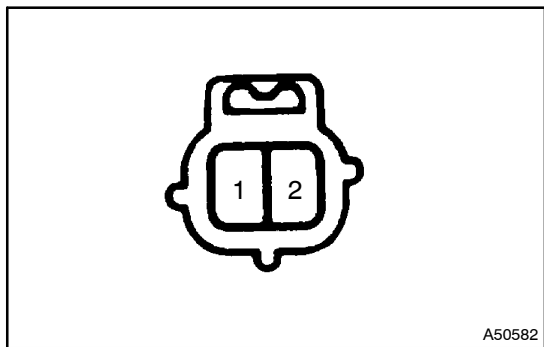
Result:

A	B	C
-40°C (-40°F)	140°C (284°F)	OK

B Go to step 4

C CHECK FOR INTERMITTENT PROBLEMS
(See page 05-156)

A

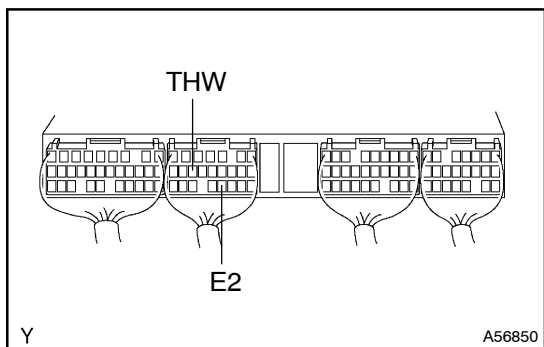
2 CHECK HARNESS AND CONNECTOR(CHECK FOR OPEN)

- (a) Disconnect the water temperature sensor connector.
- (b) Connect the terminals 1 with 2 of the water 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 DIESEL ENGINE
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 AND CONNECTOR**

NG

CHECK AND REPLACE ECM

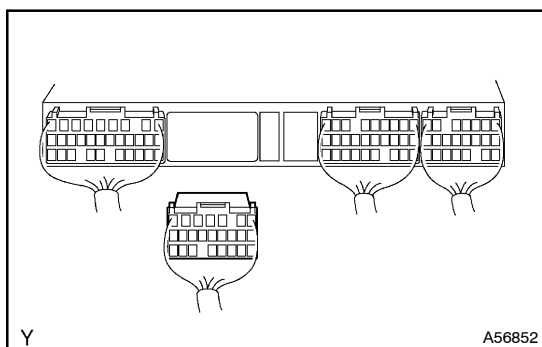
4 CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT)

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

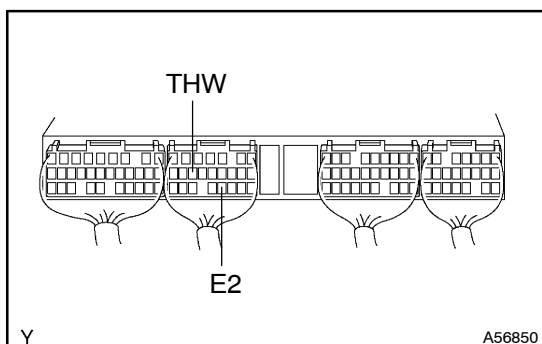
OK

**REPLACE DIESEL ENGINE
ENGINE COOLANT TEMPERATURE SENSOR**

NG

5 INSPECT ECM (CHECK FOR SHORT)

- (a) Disconnect the ECM E10 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 AND 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 terminals THW and E2 of the ECM connector.

Voltage:

Water Temperature	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 05-156)****NG****2 CHECK DIESEL ENGINE ENGINE COOLANT TEMPERATURE SENSOR**

- (a) Disconnect the water temp. sensor connector.
 (b) Measure resistance between the water temp. sensor terminals.

Resistance:**Within acceptable zone on the chart below**

Water temp. $^{\circ}\text{C}$ ($^{\circ}\text{F}$)	Resistance
20 (68)	2 – 3 k Ω
80 (176)	0.2 – 0.4 k Ω

NOTICE:

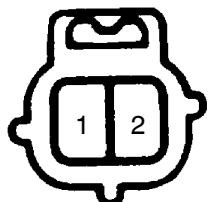
When checking the water temperature sensor directly in the water, be careful not to allow water to come into the sensor. After the checking, wipe out the sensor.

NG

**REPLACE DIESEL ENGINE
ENGINE COOLANT TEMPERATURE SENSOR**

OK

3 CHECK HARNESS AND CONNECTOR(ECM-WATER TEMP.SENSOR)



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- (a) Disconnect the water temp. sensor connector.
- (b) Disconnect the ECM E10 connector.
- (c) Check for open between the terminals 2 of the water temp. sensor harness side connector and THW of the ECM E10 connector.

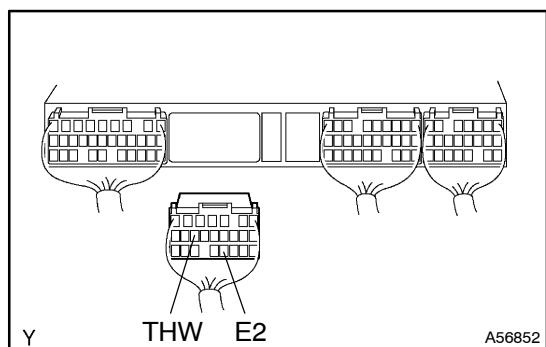
Resistance: 1 Ω or less

- (d) Check for short between the terminals THW and E2 of the ECM E10 connector.

Resistance: 1 M Ω or more

- (e) Check for open between the terminals 1 of the water temp. sensor harness side connector and E2 of the ECM E10 connector.

Resistance: 1 Ω or less



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NG

**REPAIR OR REPLACE
HARNESS AND CONNECTOR**

OK

CHECK AND REPLACE ECM