DTC	P0115	ENGINE COOLANT TEMPERATURE CIRCUIT

DTC	P0117	ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC	P0118	ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

A thermistor is built in the Engine Coolant Temperature (ECT) sensor and changes the resistance value according to the engine coolant temperature.
The structure of the sensor and connection to the ECM is the same as the Intake Air Temperature (IAT) sensor.
HINT:
If the ECM detects the DTC P0115, P0117 or P0118, it operates the fail−safe function in which the ECT is assumed to be 80°C (176°F).

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0115	Step 1	Open or short in ECT sensor circuit for 0.5 seconds (1 trip detection logic)	• Open or short in ECT sensor circuit • ECT sensor • ECM
P0117	Step 4	Short in ECT sensor circuit for 0.5 seconds (1 trip detection logic)	• Open or short in ECT sensor circuit • ECT sensor • ECM
P0118	Step 2	Open in ECT sensor circuit for 0.5 seconds (1 trip detection logic)	• Open or short in ECT sensor circuit • ECT sensor • ECM

HINT:
After confirming DTC P0115, P0117 or P0118, use the hand−held tester or the OBD II scan tool to confirm the ECT from the ALL menu (to reach the ALL menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL).

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

MONITOR DESCRIPTION

The ECT sensor is used to monitor the engine coolant temperature. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected in the voltage output from the sensor.
The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the ECT sensor and sets a DTC.
Example:
When the ECM calculates that the ECT is −40°C (−40°F) or more than 140°C (284°F) and if either condition continues 0.5 seconds or more, the ECM will set a DTC.

MONITOR STRATEGY

Related DTCs	P0115: ECT Sensor Range Check (Chattering) P0117: ECT Sensor Range Check (Low Resistance) P0118: ECT Sensor Range Check (High Resistance)
Required sensors / components (Main)	ECT sensor
Required sensors / components (Related)	−
Frequency of operation	Continuous
Duration	0.5 seconds
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page 05−507

TYPICAL MALFUNCTION THRESHOLDS

P0115:

ECT sensor voltage	Less than 0.14 V, or more than 4.91 V

P0117:

ECT sensor voltage [ECT]	Less than 0.14 V

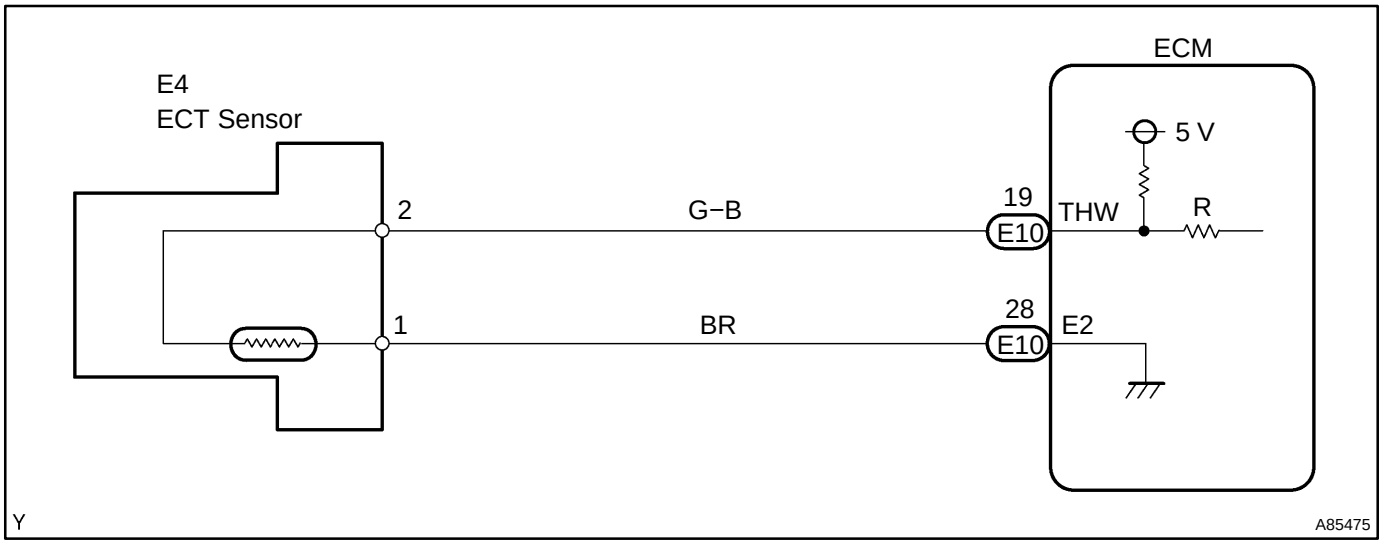
P0118:

ECT sensor voltage [ECT]	More than 4.91 V

COMPONENT OPERATING RANGE

ECT sensor resistance [ECT]	79 Ω to 156 kΩ [−40 to 140°C (−40 to 284°F)]

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs related to different system that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand−held tester or the OBD II scan tool. 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, if the air−fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	READ VALUE OF HAND−HELD TESTER OR OBD II SCAN TOOL (ENGINE COOLANT TEMPERATURE)

(a) Connect the hand−held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON. Push the hand−held tester or the OBD II scan tool main switch ON.
(c) On the hand−held tester or the OBD II scan tool, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP. Read the values.
Temperature: Same value as the actual engine coolant temperature.
Result:

Temperature Displayed	Proceed to
−40˚C (−40˚F)	A
140˚C (284˚F) or more	B
OK (same as present temperature)	C

HINT:

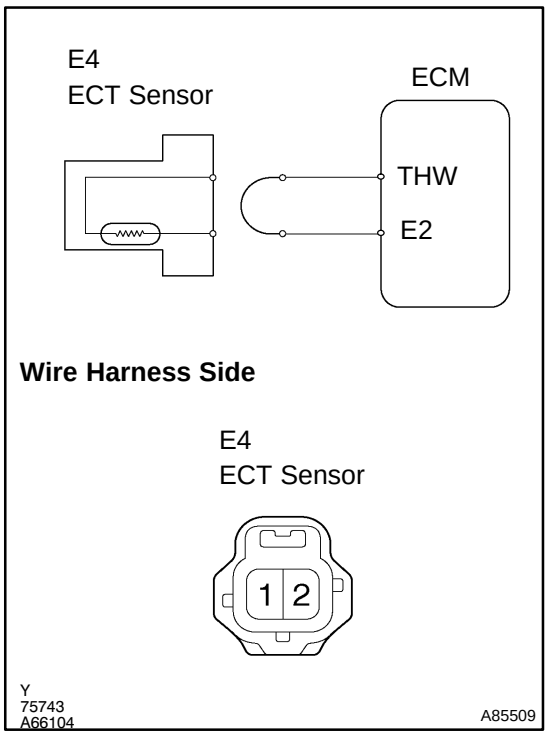
- If there is an open circuit, the hand−held tester or the OBD II scan tool indicates −40˚C (−40˚F).
- If there is a short circuit, the hand−held tester or the OBD II scan tool indicates 140˚C (284˚F) or more.

B → **Go to step 4**

C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05−500)**

A

2	READ VALUE OF HAND−HELD TESTER OR OBD II SCAN TOOL (CHECK FOR OPEN IN WIRE HARNESS)

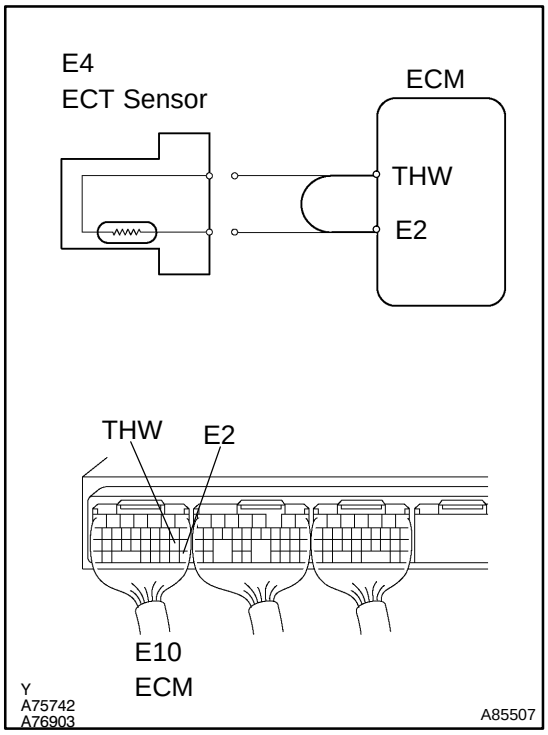


(a) Disconnect the E4 ECT sensor connector.
(b) Connect terminals 1 and 2 of the E4 ECT sensor wire harness side connector.
(c) Turn the ignition switch ON.
(d) On the hand−held tester or the OBD II scan tool, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP. Read the values.
OK: Temperature value: 140°C (284°F) or more

OK	CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE ENGINE COOLANT TEMPERATURE SENSOR

NG

3	READ VALUE OF HAND−HELD TESTER OR OBD II SCAN TOOL (CHECK FOR OPEN IN ECM)



(a) Disconnect the E4 ECT sensor connector.
(b) Connect terminals THW and E2 of the E10 ECM connector.

HINT:
Before checking, do a visual and contact pressure check for the ECM connector.

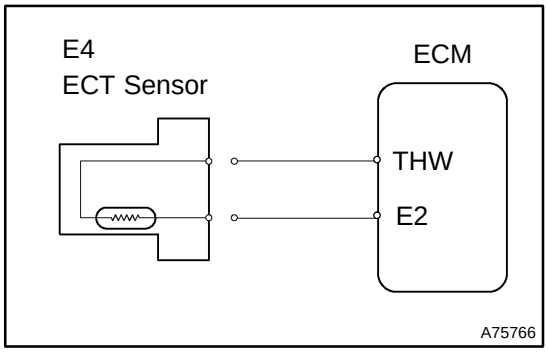
(c) Turn the ignition switch ON.
(d) On the hand−held tester or the OBD II scan tool, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP. Read the values.
OK: Temperature value: 140°C (284°F) or more

OK	REPAIR OR REPLACE HARNESS AND CONNECTOR

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 01−32)

4	READ VALUE OF HAND−HELD TESTER OR OBD II SCAN TOOL (CHECK FOR SHORT IN WIRE HARNESS)

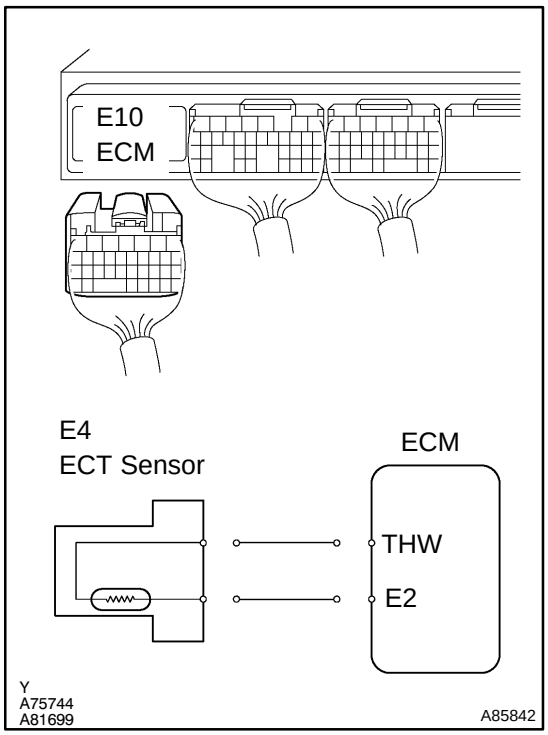


(a) Disconnect the E4 ECT sensor connector.
(b) Turn the ignition switch ON.
(c) On the hand−held tester or the OBD II scan tool, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP. Read the values.
OK: Temperature value: −40°C (−40°F)

OK	REPLACE ENGINE COOLANT TEMPERATURE SENSOR

NG

5	READ VALUE OF HAND−HELD TESTER OR OBD II SCAN TOOL (CHECK FOR SHORT IN ECM)



(a) Disconnect the E10 ECM connector.
(b) Turn the ignition switch ON.
(c) On the hand−held tester or the OBD II scan tool, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP. Read the values.
OK: Temperature: −40°C (−40°F)

OK	REPAIR OR REPLACE HARNESS AND CONNECTOR

NG

REPLACE ECM (See page 10−25)