DTC	P0115	Engine Coolant Temperature Circuit

DTC	P0117	Engine Coolant Temperature Circuit Low Input

DTC	P0118	Engine Coolant Temperature Circuit High Input

DESCRIPTION

A thermistor is built into the Engine Coolant Temperature (ECT) sensor, of which the resistance value varies according to the ECT.
The structure of the sensor and connection to the ECM is the same as the Intake Air Temperature (IAT) sensor.
HINT:
When any of DTCs P0115, P0117 and P0118 are set, the ECM enters fail-safe mode. During fail-safe mode, the ECT is estimated to be 80°C (176°F) by the ECM. Fail-safe mode continues until a pass condition is detected.

ES

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)	• 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 in ECT sensor circuit • ECT sensor • ECM

HINT:
When any of these DTCs are set, check the ECT by selecting the following menu items on an intelligent tester: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / COOLANT TEMP.

Temperature Displayed	Malfunctions
-40°C (-40°F)	Open circuit
140°C (284°F)	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 ECT. 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:
If the sensor voltage output is more than 4.91 V for 0.5 seconds or more, the ECM determines that there is an open in the ECT sensor circuit, and sets DTC P0118. Conversely, if the voltage output is less than 0.14 V for 0.5 seconds or more, the ECM determines that there is a short in the sensor circuit, and sets DTC P0117.
If the malfunction is not repaired successfully, a DTC is set 0.5 seconds after the engine is next started.

MONITOR STRATEGY

Related DTCs	P0115: ECT sensor range check (Fluctuating) P0117: ECT sensor range check (Low voltage) P0118: ECT sensor range check (High voltage)
Required Sensors/Components (Main)	ECT sensor

Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	0.5 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not present	None

TYPICAL MALFUNCTION THRESHOLDS

P0115:

ECT sensor voltage [Engine coolant temperature]	Less than 0.14 V or more than 4.91 V

P0117:

ECT sensor voltage [Engine coolant temperature]	Less than 0.14 V [more than 140°C (284°F)]

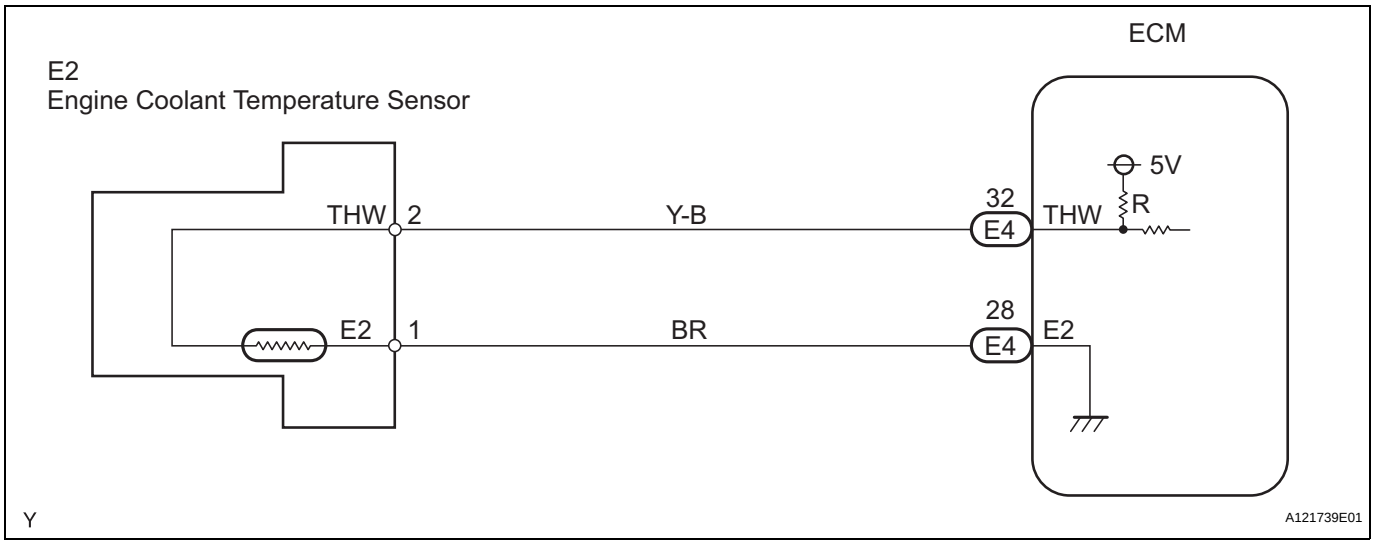
P0118:

ECT sensor voltage [Engine coolant temperature]	More than 4.91 V [less than -40°C (-40°F)]

COMPONENT OPERATING RANGE

ECT sensor voltage [ECT]	0.14 V to 4.91 V [-40 to 140°C (-40 to 284°F)]

WIRING DIAGRAM



HINT:

- If other DTCs relating to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using an intelligent tester. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, 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 DATA LIST (ENGINE COOLANT TEMPERATURE)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester ON.
(c) Select the following menus items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / COOLANT TEMP.
(d) Read the value displayed on the tester.

Standard:

Between 80°C and 97°C (176°F and 207°F) with warm engine.

Result

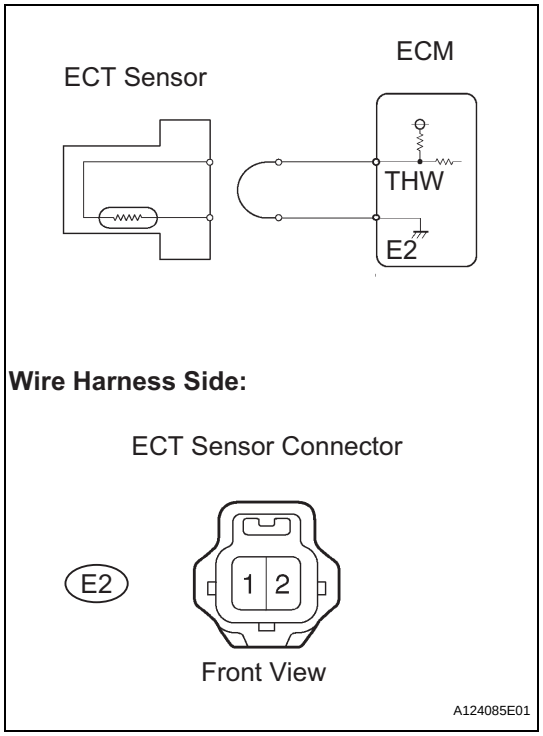
Temperature Displayed	Proceed to
-40°C (-40°F)	A
140°C (284°F)	B
Between 80°C and 97°C (176°F and 207°F)	C

HINT:
If there is an open circuit, the intelligent tester indicates -40°C (-40°F).
If there is a short circuit, the intelligent tester indicates 140°C (284°F).

B	Go to step 4
C	CHECK FOR INTERMITTENT PROBLEMS

A

2 READ DATA LIST (CHECK FOR OPEN IN WIRE HARNESS)

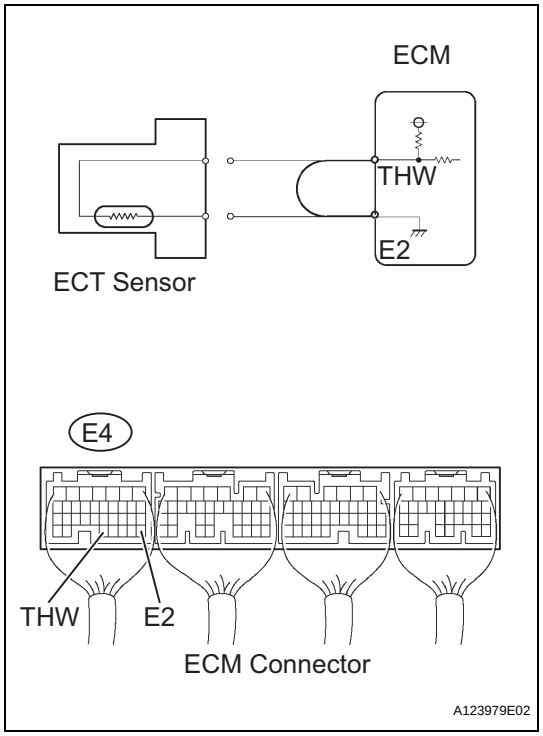


(a) Disconnect the E2 Engine Coolant Temperature (ECT) sensor connector.
(b) Connect terminals 1 and 2 of the ECT sensor connector on the wire harness side.
(c) Connect the intelligent tester to the DLC3.
(d) Turn the ignition switch to ON and turn the intelligent tester ON.
(e) Select the following menus items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / COOLANT TEMP.
(f) Read the value displayed on the tester.
Standard:
140°C (284°F)
(g) Reconnect the ECT sensor connector.

OK → **CONFIRM GOOD CONNECTION TO SENSOR. IF OK, REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

NG

3 READ DATA LIST (CHECK FOR OPEN IN ECM)



(a) Disconnect the E2 ECT sensor connector.
(b) Connect terminals THW of the E2 of the ECM connector.
HINT:
Before checking, do a visual and contact pressure check for the ECM connector.
(c) Connect the intelligent tester to the DLC3.
(d) Turn the ignition switch to ON and turn the intelligent tester ON.
(e) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / COOLANT TEMP.
(f) Read the value displayed on the tester.
Standard:
140°C (284°F)
(g) Reconnect the ECT sensor connector.

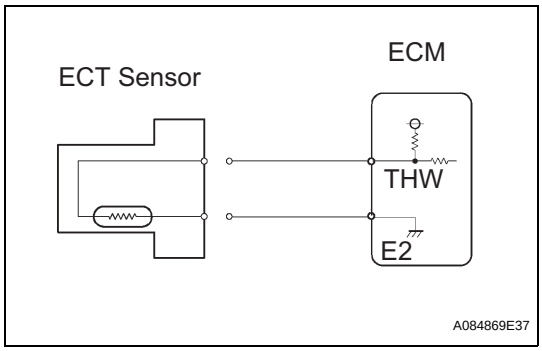
NG → **CONFIRM GOOD CONNECTION TO ECM. IF OK, REPLACE ECM**

ES

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

4	READ DATA LIST (CHECK FOR SHORT IN WIRE HARNESS)

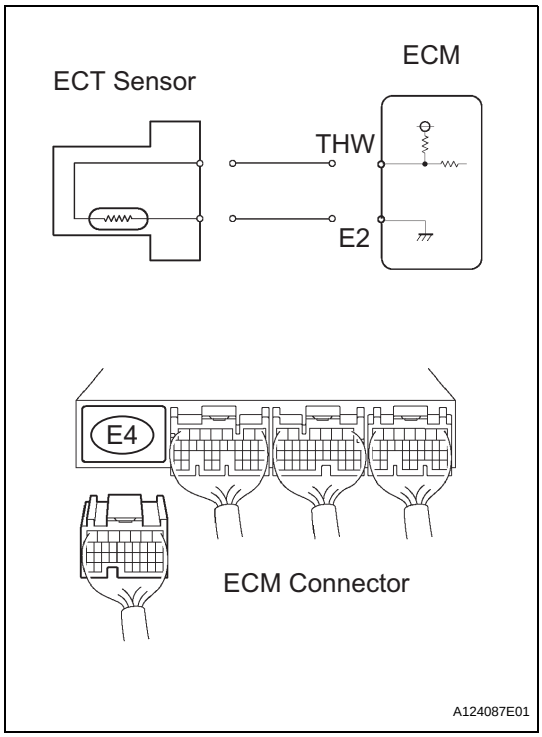


(a) Disconnect the E2 ECT sensor connector.
(b) Connect the intelligent tester to the DLC3.
(c) Turn the ignition switch to ON and turn the intelligent tester ON.
(d) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / COOLANT TEMP.
(e) Read the value displayed on the tester.
Standard:
-40°C (-40°F)
(f) Reconnect the ECT sensor connector.

OK → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

NG

5	READ DATA LIST (CHECK FOR SHORT IN ECM)



(a) Disconnect the E4 ECM sensor connector.
(b) Connect the intelligent tester to the DLC3.
(c) Turn the ignition switch to ON and turn the intelligent tester ON.
(d) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / COOLANT TEMP.
(e) Read the value displayed on the tester.
Standard:
-40°C (-40°F)
(f) Reconnect the ECM sensor connector.

NG → **REPLACE ECM**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR