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|------------|--------------|---|
| DTC | P0115 | Engine Coolant Temperature Circuit Malfunction |
| 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 voltage value varies according to the ECT.

ES

The structure of the sensor and its connection to the ECM are the same as those of 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.

| DTC No. | Proceed to | DTC Detection Condition | Trouble Area |
|---------|------------|---|--|
| P0115 | Step 1 | Open or short in Engine Coolant Temperature (ECT) sensor circuit for 0.5 seconds (1 trip detection logic) | <ul style="list-style-type: none"> Open or short in ECT sensor circuit ECT sensor ECM |
| P0117 | Step 4 | Short in Engine Coolant Temperature (ECT) sensor circuit for 0.5 seconds (1 trip detection logic) | <ul style="list-style-type: none"> Short in ECT sensor ECT sensor ECM |
| P0118 | Step 2 | Open in Engine Coolant Temperature (ECT) sensor circuit for 0.5 seconds (1 trip detection logic) | <ul style="list-style-type: none"> Open in ECT sensor circuit ECT sensor ECM |

HINT:

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

| Temperature Displayed | Malfunction |
|-------------------------|---------------|
| -40°C (-40°F) | Open circuit |
| 140°C (284°F) or higher | Short circuit |

MONITOR DESCRIPTION

The Engine Coolant Temperature (ECT) sensor is used to monitor the ECT. The ECT sensor has a thermistor with a resistance that varies according to 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. These variations in resistance are reflected in the output voltage 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 output voltage is -40°C (-40°F) 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 more than 140°C (284°F) 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: Engine coolant temperature sensor open/short (Fluctuating) P0117: Engine coolant temperature sensor short (Low electrical voltage) P0118: Engine coolant temperature sensor open (High electrical voltage) |
| Required Sensors/Components (Main) | Engine coolant temperature 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:

| | |
|---|--------------------------------------|
| Engine coolant temperature sensor voltage | Less than 0.14 V or more than 4.91 V |
|---|--------------------------------------|

P0117:

| | |
|---|------------------|
| Engine coolant temperature sensor voltage | Less than 0.14 V |
|---|------------------|

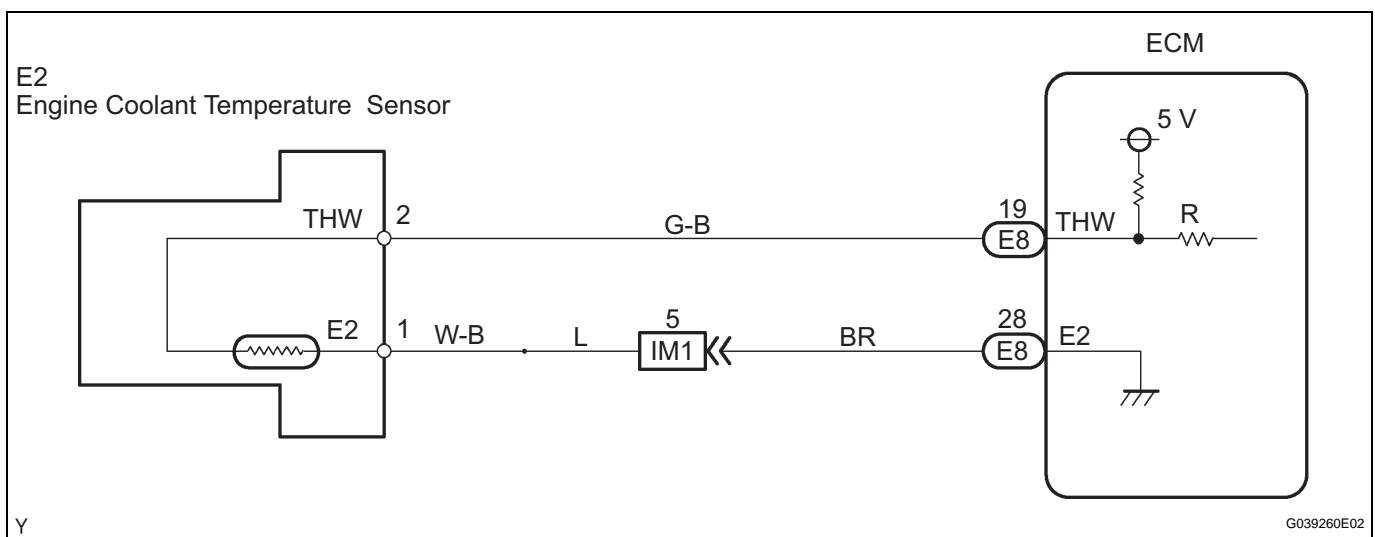
P0118:

| | |
|---|------------------|
| Engine coolant temperature sensor voltage | More than 4.91 V |
|---|------------------|

COMPONENT OPERATING RANGE

| | |
|---|--|
| Engine coolant temperature sensor voltage | 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 the intelligent tester. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. 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 VALUE OF INTELLIGENT TESTER OR OBD II SCAN TOOL (ENGINE COOLANT TEMPERATURE) |
|---|---|

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

Standard:

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

Result

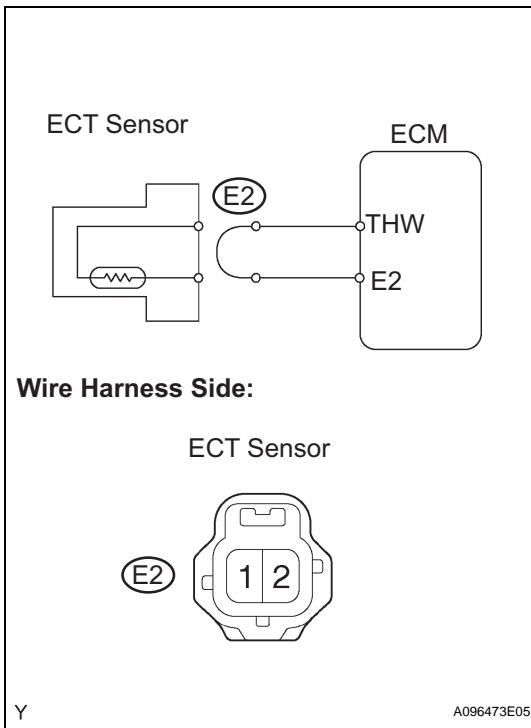
| Temperature Displayed | Proceed to |
|---|------------|
| -40°C (-40°F) | A |
| 140°C (284°F) or higher | B |
| Between 80°C and 97°C (176°F and 207°F) | C |

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) or higher.

| | |
|---|---------------------------------|
| B | Go to step 4 |
| C | CHECK FOR INTERMITTENT PROBLEMS |

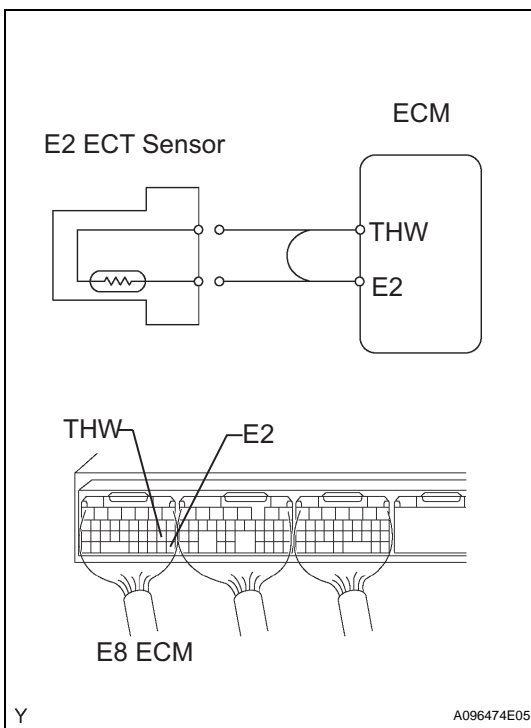


2**READ VALUE OF INTELLIGENT TESTER OR OBD II SCAN TOOL (CHECK FOR OPEN IN WIRE HARNESS)**

- Disconnect the E2 ECT sensor connector.
- Connect terminals 1 and 2 of the E2 ECT sensor wire harness side connector.
- Turn the ignition switch ON.
- On the intelligent 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 TO SENSOR. IF OK, REPLACE ENGINE COOLANT TEMPERATURE SENSOR

ES**NG****3****READ VALUE OF INTELLIGENT TESTER OR OBD II SCAN TOOL (CHECK FOR OPEN IN ECM)**

- Disconnect the E2 ECT sensor connector.
 - Connect terminals THW and E2 of the E8 ECM connector.
- HINT:**
Before checking, do a visual and contact pressure check for the ECM connector.
- Turn the ignition switch ON.
 - On the intelligent 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 OR CONNECTOR

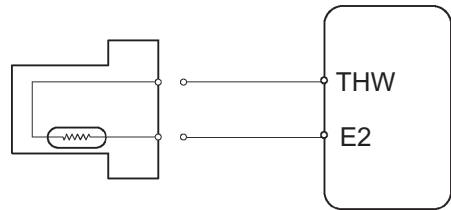
NG

CONFIRM GOOD CONNECTION TO ECM. IF OK, REPLACE ECM

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

E2 ECT Sensor

ECM



A075766E22

- (a) Disconnect the E2 ECT sensor connector.
- (b) Turn the ignition switch ON.
- (c) On the intelligent tester or the OBD II scan tool, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP. Read the values.

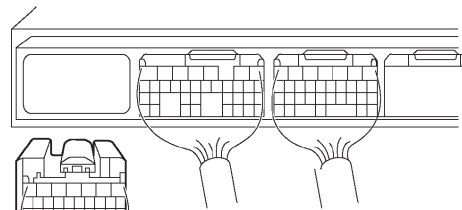
OK:

Temperature value: -40°C (-40°F)

OK

REPLACE ENGINE COOLANT TEMPERATURE SENSOR

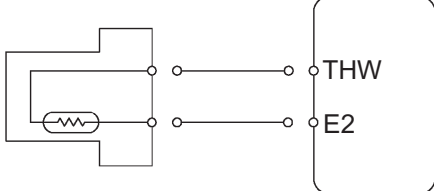
NG

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

E8 ECM

E2 ECT Sensor

ECM



A096476E10

- (a) Disconnect the E8 ECM connector.
- (b) Turn the ignition switch ON.
- (c) On the intelligent 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

REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

REPLACE ECM