| DTC | P0116 | Engine Coolant Temperature Circuit Range / Performance Problem |
|---|---|---|

## DESCRIPTION

Refer to DTC P0115 (See page ES-133).

| DTC No. | DTC Detection Condition | Trouble Area |
|---|---|---|
| P0116 | ECTs as listed below are nearly same (2 trip detection logic):<br>– ECT when engine is started at lower than 60°C (140°F) of ECT<br>– ECT when engine is warmed up | • Thermostat<br>• ECT sensor |
| | ECTs as listed below are nearly same when engine is started at higher than 60°C (140°F) of ECT (2 trip detection logic)<br>– ECT when engine is stopped after driving<br>– ECT when engine is started at lower than 60°C (140°F) of ECT | |
| | When either of following conditions is met (2 trip detection logic):<br>• When cold engine started and engine warmed up, Engine Coolant Temperature (ECT) sensor value does not change<br>• After engine is warmed up, ECT sensor value does not change when engine stopped and then next cold engine start is performed | |

## MONITOR DESCRIPTION

The ECT sensor is used to monitor the ECT. The ECT sensor has a built-in thermistor with a resistance that varies according to the temperature of the engine coolant. When the ECT becomes low, the resistance of the thermistor increases. When the temperature becomes high, the resistance drops. These variations in the resistance are reflected in the voltage output from the ECT sensor.
The ECM monitors the sensor voltage and uses this value to calculate the ECT. If the sensor voltage output deviates from the normal operating range, the ECM interprets this deviation as a malfunction in the ECT sensor and sets the DTC.
**Examples:**

- Upon starting the engine, the ECT is between 35°C and 60°C (95°F and 140°F). If the ECT remains within 3°C (5.4°F) of the stating temperature after driving for 250 seconds, the DTC is set (2 trip detection logic).
- Upon starting the engine, the ECT is over 60°C (140°F). If the ECT remains within 1°C (1.8°F) of the starting temperature after driving for 250 seconds, the DTC is set (6 trip detection logic).

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0116: Engine coolant temperature sensor output stuck at low engine coolant temperature<br>P0116: Engine coolant temperature sensor output stuck at high engine coolant temperature |
| Required Sensors / Components (Main) | Engine Coolant Temperature (ECT) sensor |
| Required Sensors / Components (Related) | Crankshaft position sensor, intake air temperature sensor and mass air flow meter |
| Frequency of Operation | Continuous |
| Duration | 5 hours |
| MIL Operation | 2 driving cycles |
| Sequence of Operation | None |

## TYPICAL ENABLING CONDITIONS

**All:**

| | |
|---|---|
| Monitor will run whenever these DTCs are not present. | P0100, P0102, P0103 (MAF Sensor) |

**ECT sensor cold start monitor:**

| | |
|---|---|
| Battery voltage | 10.5 V or more |
| Time after engine start | 1 second or more |
| ECT at engine start | Less than 60°C (140°F) |
| IAT sensor circuit | OK |
| Soak time | 5 hours or more |
| Accumulated MAF | 1421.2 g or more |
| Engine | Running |
| Fuel cut | OFF |
| Difference between ECT at engine start and IAT | Less than 40°C (72°F) |

ES

**ECT sensor soak monitor:**

| | |
|---|---|
| Battery voltage | 10.5 V or more |
| Engine | Running |
| Soak time | 5 hours or more |
| ECT at engine start | 60°C (140°F) or more |
| Accumulated MAF | 3298.1 g or more |

## TYPICAL MALFUNCTION THRESHOLDS

**ECT sensor cold start monitor:**

| | |
|---|---|
| ECT sensor value change | Less than 5°C (9°F) |

**ECT sensor soak monitor:**

| | |
|---|---|
| ECT sensor value change | Less than 5°C (9°F) |

## COMPONENT OPERATING RANGE

| | |
|---|---|
| Engine coolant temperature | Varies with actual engine coolant temperature |

## INSPECTION PROCEDURE

HINT:

- If any of DTC P0115, P0117, P0118 or P0125 are set simultaneously with DTC P0116, the ECT sensor may have an open or a short circuit. Troubleshoot those DTCs first.
- 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 be helpful in determining whether the vehicle was running or stopped, whether the engine was warmed up or not, whether the air-fuel ratio was lean or rich, as well as other data recorded at the time of a malfunction.

| | |
|---|---|
| **1** | **CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0166)** |

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position.
(c) Turn the tester on.
(d) Enter the following menus: DIAGNOSIS / ENHANCED II / DTC INFO / CURRENT CODES.
(e) Read the DTC.

**Result**

| Display (DTC output) | Proceed to |
|---|---|
| P0116 | A |
| P0116 and other DTCs | B |

B → **GO TO DTC CHART**

A

**2 INSPECT THERMOSTAT**

(a) Remove the thermostat (See page CO-16).
(b) Check the valve opening temperature of the thermostat.
**Standard:**
**80 to 84°C (176 to 183°F)**
HINT:
In addition to the above check, confirm that the valve is completely closed when the temperature is below the standard.
(c) Reinstall the thermostat (See page CO-17).

NG → **REPLACE THERMOSTAT**

OK

**REPLACE ENGINE COOLANT TEMPERATURE SENSOR**