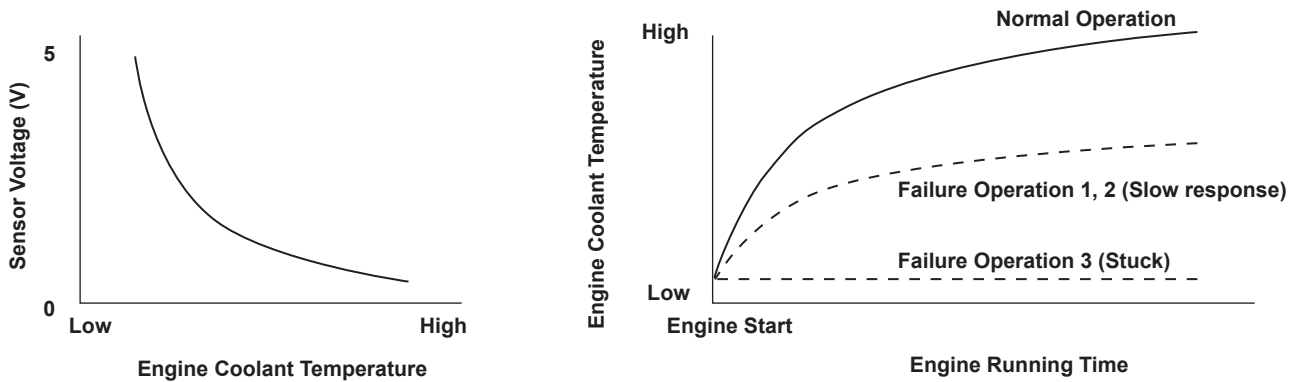# Advanced Diagnostics

DTC P0116: Engine Coolant Temperature (ECT) Sensor Circuit Range/Performance Problem

Engine Coolant Temperature Sensor

P0116-9772

General Description

The engine control module (ECM) supplies voltage to the engine coolant temperature (ECT) signal circuit (about 5 V) through a pull-up resistor. As the engine coolant cools, the ECT sensor resistance increases, and the ECM detects a high signal voltage. As the engine coolant warms, the ECT sensor resistance decreases, and the ECM detects a low signal voltage. The ECM detects a malfunction if either of these conditions is met.

Malfunction determination 1, 2: Slow response

If the ECT output voltage does not reach a specified temperature at which the closed-loop control for stoichiometric air/fuel ratio starts within a predetermined time period depending on the initial coolant temperature after starting the engine, the ECM detects a malfunction and a DTC is stored.

Malfunction determination 3: Stuck

If the change of the ECT output voltage within a set time period after starting the engine is less than a specified value, the ECM detects a malfunction and a DTC is stored.

Monitor Execution, Sequence, Duration, DTC Type

Execution	Once per driving cycle
Sequence	None
Duration	1,200 seconds or less
DTC Type	Two drive cycles, MIL ON

Enable Conditions

Malfunction determination 1 (slow response)

Condition	Minimum	Maximum
Initial engine coolant temperature	20ºF (-7ºC)	50ºF (10ºC)
Initial intake air temperature	20ºF (-7ºC)	—
Fuel feedback	Other than fuel cut-off operation	
No active DTCs	ECM, A/F Sensor, A/F Sensor Heater, MAP, CKP, ECT, TP, IAT, EGR, BARO, IAC, VTEC System, Fuel System	
Other	Other than while the auto idle stop system is in operation	

Malfunction determination 2 (slow response)

Condition		Minimum	Maximum
Initial engine coolant temperature	A*	—	19ºF (-7ºC)
Initial engine coolant temperature and initial intake air temperature	B*	—	50ºF (10ºC)**
			19ºF (-7ºC)***
MAP value	800 rpm	101 kPa (760 mmHg, 30.0 in.Hg)	—
	1,500 rpm	32 kPa (240 mmHg, 9.5 in.Hg)*1	
		34 kPa (250 mmHg, 9.9 in.Hg)*2	
Fuel feedback		Other than fuel cut-off operation	
No active DTCs		ECM, A/F Sensor, A/F Sensor Heater, MAP, CKP, ECT, TP, IAT, EGR, BARO, IAC, VTEC System, Fuel System	
Other		Other than while the auto idle stop system is in operation	

*   : Either A or B must be met.
**   : Initial engine coolant temperature.
*** : Initial intake air temperature.
*1: CVT
*2: M/T

Enable Conditions (cont'd)

Malfunction determination 3 (stuck)

Condition			Minimum	Maximum
Initial engine coolant temperature****		C	—	19ºF (-7ºC)
		D	50ºF (10ºC)	68ºF (20ºC)
Initial intake air temperature		E	—	19ºF (-7ºC)
MAP value	800 rpm		—	101 kPa (760 mmHg, 29.9 in.Hg)
	1,500 rpm			31 kPa (240 mmHg, 9.4 in.Hg)[1]
				33 kPa (250 mmHg, 9.8 in.Hg)[2]
Fuel feedback			Other than fuel cut-off operation	
No active DTCs			ECM, A/F Sensor, A/F Sensor Heater, MAP, CKP, ECT, TP, IAT, EGR, BARO, IAC, VTEC System, Fuel System	
Other			Other than while the auto idle stop system is in operation	

**** : Any of conditions C, D and E must be met.

Malfunction Threshold

Malfunction determination 1 (slow response):
The engine running time until the engine coolant temperature reaches 50ºF (10ºC) is as shown in the table.
MAP value is 80 kPa (600 mmHg, 23.7 in.Hg) at an engine speed of 800 rpm.

Initial engine coolant temperature	19ºF (-7ºC)	41ºF (5ºC)
Engine running time	180 seconds or more	90 seconds or more

MAP value is 33 kPa (250 mmHg, 9.8 in.Hg) at an engine speed of 1,500 rpm.

Initial engine coolant temperature	19ºF (-7ºC)	41ºF (5ºC)
Engine running time	130 seconds or more	80 seconds or more

Malfunction determination 2 (slow response):
The ECT sensor output does not exceed an engine coolant temperature of 50ºF (10ºC) within 20 minutes.

Malfunction determination 3 (stuck):
The ECT sensor output does not vary by 60 mV or more within 20 minutes.

Driving Pattern

Start the engine at an engine coolant temperature and intake air temperature as specified under Enable Conditions, then let it idle until the engine coolant temperature reaches a set value or for at least 20 minutes.

Diagnosis Details

Conditions for illuminating the MIL

When a malfunction is detected during the first drive cycle with the ECT and IAT at engine start-up within the specified temperature range, a Temporary DTC is stored in the ECM memory. If the malfunction recurs during the next (second) drive cycle with the ECT and IAT at engine start-up within the specified temperature range, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL

The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.
The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.