

## Engine Coolant Temperature (ECT) Sensor

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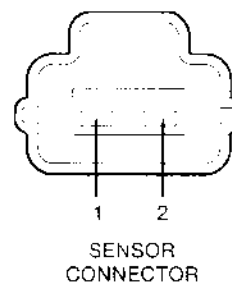
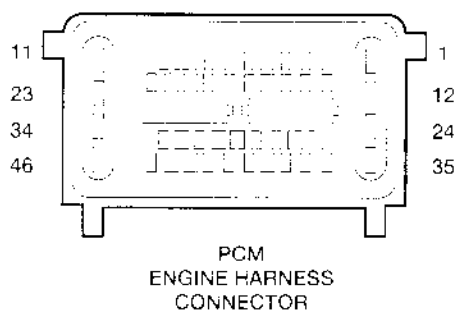
### Circuit Functions

The engine coolant temperature (ECT) sensor is a thermistor device in which resistance changes with temperature. The electrical resistance of a thermistor decreases as the temperature increases, and increases as the temperature decreases. The varying resistance affects the voltage drop across the sensor terminals and provides electrical signals to the powertrain control module (PCM) corresponding to temperature.

The engine coolant sensor is used as the primary input to the electronic control system to enable adaptive cooling. This provides a means of providing adequate cooling in severe engine temperature conditions. The PCM will limit the fueling rate of the engine to provide cooling protection and prevent engine damage due to overheating.

### Fault Detection/Management

The ECT sensor is located on the left side of the front cover. The PCM supplies a five volt reference signal that the ECT sensor uses to produce an analog voltage, indicating temperature. The PCM continuously monitors the signal of the ECT sensor to determine if the signal is within an expected range. If the PCM detects an out of range high or low, the PCM will ignore the ECT signal and substitute the EOT signal. If both ECT and EOT signals are out of range, the PCM will assume an engine coolant temperature of  $-34^{\circ}\text{C}$  ( $-29^{\circ}\text{F}$ ) for starting and  $82^{\circ}\text{C}$  ( $180^{\circ}\text{F}$ ) for engine running conditions.



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**CAUTION:** The PCM harness connectors must be properly seated and the connector latch properly attached to eliminate possible driveability concerns or a no start condition. Installing the PCM connectors on an angle may cause an improper connection, misdiagnosis and damaged components. Install the connector until the lever pivots and seats itself. Apply light pressure to get the connector into position on the PCM and then fully seat the connector.

**Note:** Visually inspect the harness connectors for corrosion, damage, proper mating and correct pin tension.

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Note: When the PCM is disconnected additional DTCs will be set. Clear all DTCs after restoring the vehicle.

### TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)

°C	F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1,188
40	104	1,459
35	95	1,802
30	86	2,238
25	77	2,796
20	68	3,520
15	59	4,450
10	50	5,670
5	41	7,280
0	32	9,420
-5	23	12,300
-10	14	16,180
-15	5	21,450
-20	-4	28,680
-30	-22	52,700
-40	-40	100,700

### DTC Descriptions

- P0117 = ECT Sensor Circuit Low Input
- P0118 = ECT Sensor Circuit High Input

	Test Steps	Results	Action to Take
<b>K1</b>	PRELIMINARY DIAGNOSIS FOR DTCs P0117, P0118		
	<ul style="list-style-type: none"> <li>• Perform the visual inspection.</li> <li>• Connect the scan tool.</li> <li>• Retrieve and record all DTCs.</li> <li>• Clear all DTCs.</li> <li>• Perform On-Demand Self Test.</li> <li>• <b>Are DTCs P0117 or P0118 present?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>→ For DTC P0117, GO to <b>K2</b>. For DTC P0118, GO to <b>K4</b>.</p> <p>Unable to duplicate condition. CHECK for loose connection, damaged or corroded pins. WIGGLE harness attempting to recreate the fault. REFER to Section 3 if a driveability concern exists.</p>

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Test Steps		Results	Action to Take
<b>K2</b>	<b>DIAGNOSTIC TROUBLE CODE (DTC) P0117</b> <ul style="list-style-type: none"> <li>Possible causes: <ul style="list-style-type: none"> <li>ECT signal circuit ground short</li> <li>ECT sensor</li> <li>PCM</li> <li>induce opposite DTC</li> </ul> </li> <li>Disconnect ECT harness connector.</li> <li>Perform KOEO On-Demand Self Test.</li> <li><b>Is DTC P0118 present?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>→ INSTALL a new ECT sensor. RESTORE the vehicle. CLEAR DTCs and RETEST the system.</p> <p>→ GO to <b>K3</b>.</p>
<b>K3</b>	<b>CHECK ECT SIGNAL CIRCUIT FOR A SHORT TO GROUND</b> <ul style="list-style-type: none"> <li>Disconnect the PCM engine harness connector.</li> <li>Measure the resistance between the ECT harness connector pin 2 and ground.</li> <li><b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>→ INSTALL a new PCM. RESTORE the vehicle. CLEAR DTCs and RETEST system.</p> <p>→ REPAIR short to ground in the ECT signal circuit. RESTORE the vehicle. CLEAR the DTCs and RETEST the system.</p>
<b>K4</b>	<b>DIAGNOSTIC TROUBLE CODE (DTC) P0118</b> <p>Note: Refer to the PCM and component connector pin numbers at the beginning of this pinpoint test.</p> <ul style="list-style-type: none"> <li>Possible causes: <ul style="list-style-type: none"> <li>short to voltage in the ECT signal circuit</li> <li>open in signal return circuit</li> <li>ECT sensor</li> <li>PCM</li> </ul> </li> <li>Key off.</li> <li>Disconnect the ECT electrical connector.</li> <li>Measure the resistance between ECT electrical connector pin 1 and ground.</li> <li><b>Is the resistance less than 5 ohms?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>→ GO to <b>K5</b>.</p> <p>→ REPAIR open in ECT return circuit. RESTORE the vehicle. CLEAR DTCs and RETEST the system.</p>
<b>K5</b>	<b>INDUCE OPPOSITE FAILURE</b> <ul style="list-style-type: none"> <li>Key on, engine off.</li> <li>Install a jumper between pins 1 and 2, of the ECT electrical connector.</li> <li>Perform KOEO On-Demand Self Test.</li> <li><b>Is DTC P0117 present?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>→ INSTALL a new ECT sensor. CLEAR DTCs and RETEST the system.</p> <p>→ GO to <b>K6</b>.</p>
<b>K6</b>	<b>CHECK ECT SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE</b> <ul style="list-style-type: none"> <li>Disconnect the PCM engine harness electrical connector.</li> <li>Measure the voltage on ECT electrical connector pin 2 and ground.</li> <li><b>Is the voltage less than 0.2 volts?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>→ GO to <b>K7</b>.</p> <p>→ REPAIR short to voltage in the ECT signal circuit. RESTORE the vehicle. CLEAR DTCs and RETEST the system.</p>

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Test Steps		Results	Action to Take
<b>K7</b>	CHECK ECT SIGNAL CIRCUIT FOR AN OPEN		
	<ul style="list-style-type: none"> <li>• Key off.</li> <li>• Measure the resistance between the PCM engine harness connector pin 32 and ECT harness connector pin 2.</li> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	Yes No	→ GO to <b>K8</b> . → REPAIR open in the ECT signal circuit. RESTORE the vehicle. CLEAR DTCs and RETEST the system.
<b>K8</b>	CHECK ECT SIGNAL RETURN CIRCUIT FOR AN OPEN		
	<ul style="list-style-type: none"> <li>• Measure the resistance between PCM engine harness connector pin 25 and ECT sensor harness connector pin 1.</li> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	Yes No	→ INSTALL a new PCM. RESTORE the vehicle. CLEAR DTCs and RETEST the system. → REPAIR open in ECT signal return circuit. RESTORE the vehicle. CLEAR DTCs and RETEST the system.