

Computers and Control Systems: Pinpoint Tests

DL - Cylinder Head Temperature (CHT) Sensor

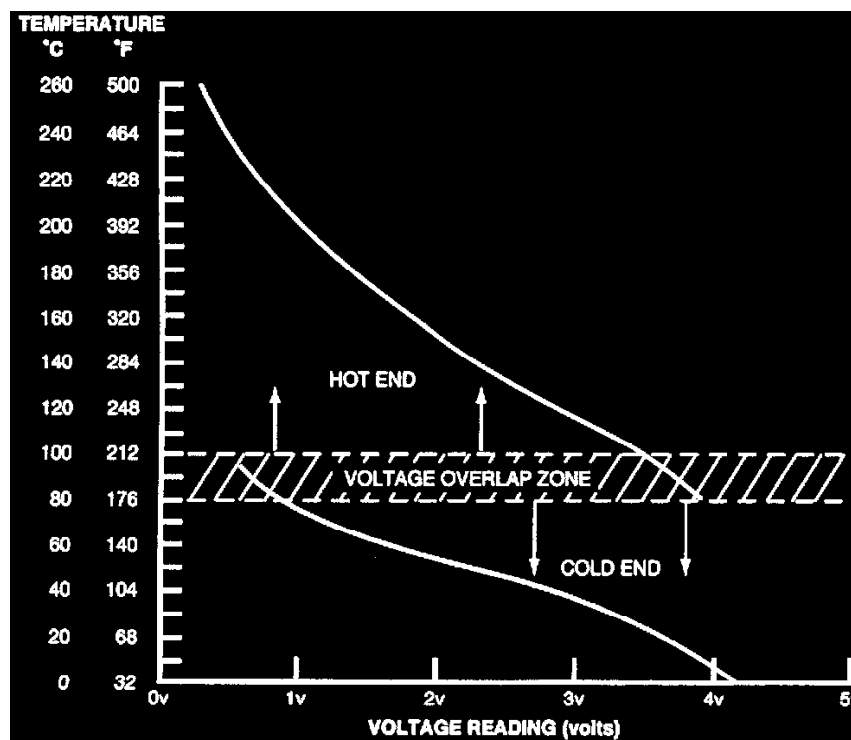
Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Cylinder Head Temperature (CHT) sensor
- Harness Circuits: CHT, VREF, SIG RTN
- Powertrain Control Module

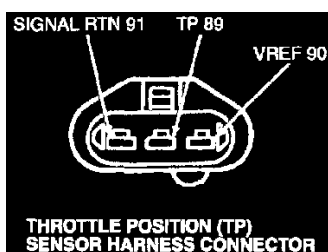
Tables and Graphs

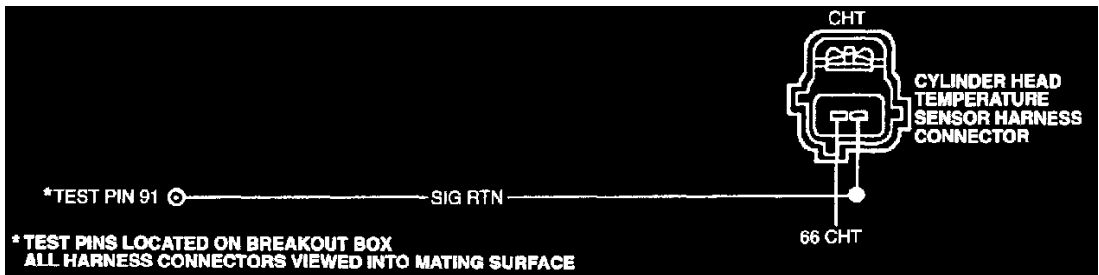


Temperature		CHT Sensor Values		
°C	°F	COLD END	HOT END	Resistance (K ohms)
-40	-40	4.89	—	965.808
-30	-22	4.81	—	513.019
-20	-4	4.67	—	283.664
-10	14	4.45	—	162.584
0	32	4.14	—	96.255
10	50	3.73	—	59.175
20	68	3.26	—	37.387
30	86	2.74	—	24.215
40	104	2.23	—	16.043
50	122	1.76	—	10.85
60	140	1.36	—	7.487
70	158	1.04	—	5.268
80	176	0.79	3.99	3.775
85	185	0.69	3.86	3.215
90	194	0.60	3.71	2.75
95	203	0.53	3.56	2.361
100	212	0.46	3.41	2.034
110	230	—	3.07	1.523
120	248	—	2.74	1.155
130	266	—	2.41	0.8866
140	284	—	2.10	0.6891
150	302	—	1.81	0.5417
160	320	—	1.55	0.4301
170	338	—	1.33	0.3449
180	356	—	1.13	0.2791
190	374	—	0.96	0.2278
200	392	—	0.82	0.1875
210	410	—	0.70	0.155
220	428	—	0.60	0.130
230	446	—	0.51	0.109
240	464	—	0.44	0.092
250	482	—	0.35	0.078
260	500	—	0.33	0.067

NOTE: The Cylinder Head Temperature (CHT) sensor is used to determine the engine coolant temperature in place of the ECT sensor. In this case the PCM may store both CHT and ECT Diagnostic Trouble Codes (DTCs). To cover the entire temperature range of both the CHT and ECT sensors, the PCM has a dual switching resistor circuit on the CHT input. A graph showing the temperature switching from the COLD END line to the HOT END line with increasing temperature and back with decreasing temperature is included. Note the temperature to voltage overlap zone. Within this zone it is possible to have either a COLD END or HOT END voltage at the same temperature. For example, at 90°C(194°F) the voltage could read either 0.60 volt or 3.71 volts. Refer to the table for the temperature to voltage expected values.

Voltage values were calculated for VREF = 5.0 volts. These values can vary 15 percent due to sensor and VREF variations.





Test Step		Result	Action to Take
DL1	DTC P1288 OR P1116: CHECK OPERATION OF CYLINDER HEAD TEMPERATURE SENSOR		
	<p>Diagnostic Trouble Code (DTC) P1228 or P1116 indicates the cylinder head temperature (CHT) sensor is out of Self-Test range.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> — Engine overheating. — Low engine coolant level. — Damaged harness connector. — Damaged CHT sensor. — Poor thermostat operation. ● Run engine at 2000 rpm until engine temperature becomes stabilized. ● Check that upper radiator hose is hot and pressurized. ● Rerun Key On Engine Running (KOER) Self-Test. ● Is DTC P1288 or P1116 present? 	<p>Yes</p> <p>No</p>	<p>▶ GO to DL2.</p> <p>▶ Engine temperature was not stabilized. REPAIR any other DTCs as necessary.</p>
DL2	CHECK VREF CIRCUIT VOLTAGE AT TP SENSOR		
	<ul style="list-style-type: none"> ● Refer to schematic at the beginning of this Pinpoint Test. ● Disconnect throttle position (TP) sensor. ● Key on, engine off. ● Measure the voltage between VREF and SIG RTN circuits at the TP sensor harness connector. ● Key off. ● Was voltage between 4.0 volts and 6.0 volts? 	<p>Yes</p> <p>No</p>	<p>▶ There is sufficient VREF voltage. RECONNECT TP sensor. GO to DL3.</p> <p>▶ GO to Pinpoint Test Step C1.</p>
DL3	CHECK RESISTANCE OF CYLINDER HEAD TEMPERATURE SENSOR WITH ENGINE OFF		
	<ul style="list-style-type: none"> ● Disconnect CHT sensor. ● Measure resistance between CHT signal and SIG RTN pins at the CHT sensor. Refer to the table at the beginning of this Pinpoint Test for resistance specifications. ● Is resistance within specification? 	<p>Yes</p> <p>No</p>	<p>▶ GO to DL4.</p> <p>▶ REPLACE CHT sensor. RESTORE vehicle. RERUN Quick Test.</p>
DL4	CHECK RESISTANCE OF CHT SENSOR WITH ENGINE RUNNING		
	<p>NOTE: Verify that engine is at operating temperature before taking CHT readings.</p> <ul style="list-style-type: none"> ● Run engine for two minutes at 2000 rpm. ● Measure resistance between CHT signal and SIG RTN pins at the CHT sensor. Refer to the table at the beginning of this Pinpoint Test for resistance specifications. ● Key off. ● Was resistance within specification? 	<p>Yes</p> <p>No</p>	<p>▶ REPLACE PCM. RESTORE vehicle. RERUN Quick Test.</p> <p>▶ REPLACE CHT sensor. RESTORE vehicle. RERUN Quick Test.</p>
DL5	DTC P1289 OR P1290: ACCESS CHT PID AND CHECK VOLTAGE		
	<p>Diagnostic Trouble Code (DTC) P1289 or P1290 indicates a CHT sensor circuit malfunction.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> — Grounded circuit in harness. — Open in harness. — Improper harness connection. — Damaged CHT sensor. — Damaged PCM. ● Key on, engine off. ● Access CHT V PID. ● Key off. ● Was the CHT V PID less than 0.2 volt? 	<p>Yes</p> <p>No</p>	<p>▶ GO to DL6.</p> <p>▶ GO to DL7.</p>

Test Step		Result	Action to Take
DL6	CHECK FOR GROUNDED CIRCUIT		
	<ul style="list-style-type: none"> ● Disconnect CHT sensor. ● Scan Tool installed. ● Key on. ● Access CHT V PID. ● Key off. ● Was the CHT V PID more than 4.6 volts? 	Yes	▶ REPLACE CHT sensor. RESTORE vehicle. RERUN Quick Test.
		No	▶ GO to DL21 .
DL7	CHECK FOR OPEN HARNESS		
	<ul style="list-style-type: none"> ● Disconnect CHT sensor. ● Connect a jumper wire between the CHT signal circuit and SIG RTN circuit at the CHT sensor vehicle harness connector. ● Scan Tool installed. ● Key on. <p>NOTE: If a Scan Tool communication concern exists, remove jumper wire immediately and go to DL12.</p> <ul style="list-style-type: none"> ● Access CHT V PID. ● Key off. ● Was the CHT V PID less than 0.2 volt? 	Yes	▶ REPLACE CHT sensor. RESTORE vehicle. RERUN Quick Test.
		No	▶ REMOVE jumper wire. GO to DL11 .
DL10	DTC P0118: SIMULATE OPPOSITE SIGNAL TO PCM		
	<p>Diagnostic Trouble Code (DTC) P0118 indicates the sensor signal is greater than the Self-Test maximum.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> — Open in harness. — Improper harness connection. — Damaged CHT sensor. — Damaged PCM. ● Disconnect CHT sensor. ● Connect a jumper wire between the CHT signal circuit and SIG RTN circuit at the CHT sensor vehicle harness connector. ● Scan Tool installed. ● Key on. <p>NOTE: If a Scan Tool communication concern exists, remove jumper wire immediately and go to DL12.</p> <ul style="list-style-type: none"> ● Access CHT V PID. ● Key off. ● Was the CHT V PID less than 0.2 volt? 	Yes	▶ REPLACE CHT sensor. RESTORE vehicle. RERUN Quick Test.
		No	▶ REMOVE jumper wire. GO to DL11 .

Test Step		Result	Action to Take
DL11	CHECK CHT SENSOR SIGNAL AND SIG RTN CIRCUITS FOR OPEN IN HARNESS		
	<ul style="list-style-type: none"> ● Install breakout box, leave PCM disconnected. ● Measure resistance of CHT signal circuit between PCM Test Pin 66 and CHT sensor harness connector. ● Measure resistance of SIG RTN circuit between PCM Test Pin 91 and CHT sensor harness connector. ● Is each resistance less than 5.0 ohms? 	<p>Yes ▶</p> <p>No ▶</p>	<p>REPLACE PCM. RESTORE vehicle. RERUN Quick Test.</p> <p>REPAIR open circuits. RESTORE vehicle. RERUN Quick Test.</p>
DL12	CHECK CHT SENSOR SIGNAL FOR SHORT TO VREF IN HARNESS		
	<ul style="list-style-type: none"> ● Key off. ● Install breakout box, leave PCM disconnected. ● Measure resistance between PCM Test Pins 66 and 90. ● Is resistance greater than 10,000 ohms? 	<p>Yes ▶</p> <p>No ▶</p>	<p>REPLACE PCM. RESTORE vehicle. RERUN Quick Test.</p> <p>REPAIR short to VREF. RESTORE vehicle. RERUN Quick Test.</p>
DL20	DTC P0117: SIMULATE OPPOSITE SIGNAL TO PCM		
	<p>Diagnostic Trouble Code (DTC) P0117 indicates the sensor signal is less than Self-Test minimum. Possible causes:</p> <ul style="list-style-type: none"> — Grounded circuit in harness. — Damaged CHT sensor. — Improper harness connection. — Damaged PCM. ● Disconnect CHT sensor. ● Scan Tool installed. ● Key on. ● Access CHT V PID. ● Key off. ● Was the CHT V PID more than 4.6 volts? 	<p>Yes ▶</p> <p>No ▶</p>	<p>REPLACE CHT sensor. RESTORE vehicle. RERUN Quick Test.</p> <p>GO to DL21.</p>
DL21	CHECK VREF CIRCUIT VOLTAGE AT TP SENSOR		
	<ul style="list-style-type: none"> ● Refer to schematic at the beginning of this Pinpoint Test. ● Disconnect TP sensor. ● Key on, engine off. ● Measure voltage between VREF and SIG RTN circuits at the TP sensor harness connector. ● Key off. ● Was voltage between 4.0 and 6.0 volts? 	<p>Yes ▶</p> <p>No ▶</p>	<p>There is sufficient VREF voltage. RECONNECT TP sensor. GO to DL22.</p> <p>GO to Pinpoint Test Step C1.</p>
DL22	CHECK CHT SIGNAL CIRCUIT FOR SHORT TO GROUND		
	<ul style="list-style-type: none"> ● Install breakout box, leave PCM disconnected. ● Measure resistance between PCM Test Pin 66 and PCM Test Pins 24, 51 and 91. ● Is each resistance greater than 10,000 ohms? 	<p>Yes ▶</p> <p>No ▶</p>	<p>REPLACE PCM. RESTORE vehicle. RERUN Quick Test.</p> <p>REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.</p>

Test Step		Result	Action to Take
DL30	DTC P1285: EARLY WARNING OF ENGINE OVERHEAT CONDITION		
	Diagnostic Trouble Code (DTC) P1285 indicates an engine overheat condition was sensed by the cylinder head temperature sensor. The PCM has grounded Circuit 39 causing the Engine Temperature warning indicator to illuminate and forcing the temperature gauge to full H (hot) zone. Possible causes: <ul style="list-style-type: none"> — Engine cooling system concerns. — Base engine concerns. — Low engine coolant level or loss of coolant. ● Check engine coolant level. ● Is the engine coolant level fill correct? 	Yes	▶ DIAGNOSE overheating concern as needed.
		No	▶ DIAGNOSE coolant leak.
DL40	ENGINE TEMPERATURE WARNING INDICATOR LAMP ALWAYS ON, ENGINE IS NOT OVERHEATING		
	NOTE: PCM Quick Test must be performed prior to entering this Pinpoint Test. <ul style="list-style-type: none"> ● Was PCM Quick Test performed prior to entering this Pinpoint Test? 	Yes	▶ No Diagnostic Trouble Codes (DTCs) received during PCM Quick Test. GO to DL41 .
		No	▶ PERFORM PCM Quick Test. REPAIR any DTCs as necessary.
DL41	ENGINE TEMPERATURE INDICATOR LAMP ALWAYS ON AND NO DIAGNOSTIC TROUBLE CODE (DTC)		
	The Engine Temperature Warning Indicator is an early warning of an engine overheating condition. The PCM monitors the cylinder head temperature (CHT) sensor and grounds Circuit 39 when the engine is beginning to overheat. This causes the indicator to illuminate and forces the temperature gauge to H (hot) zone. A DTC P1285 will also be stored in the PCM. This test diagnoses Engine Temperature Warning Lamp ON/temperature gauge is in the H (hot) zone with no PCM DTCs. Possible causes: <ul style="list-style-type: none"> — Damaged PCM. — Damaged engine coolant temperature sensor. — Instrument cluster concern. — Wiring harness fault, Circuit 39. ● Disconnect the PCM. ● Key on. ● Is the engine temperature warning indicator light OFF and the temperature gauge in the normal zone with the PCM disconnected? 	Yes	▶ Key off. REPLACE the PCM. RERUN Quick Test.
		No	▶ The PCM has not attempted to ground Circuit 39 and turn the engine temperature indicator light ON. DIAGNOSE the indicator light and/or temperature gauge circuit(s).

	Test Step	Result	Action to Take
DL90	DTCS P0117, P0118, P1117, P1289 OR P1290: INTERMITTENT CHECK		
	<p>Diagnostic Trouble Codes (DTCs) P0117, P0118, P1117, P1289 or P1290 were not received during KOEO and KOER Self-Tests, but are output during Continuous Memory Self-Test and can be intermittent.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> — Damaged harness. — Damaged harness connector. — Damaged CHT sensor. — Low engine coolant. — Damaged PCM. ● Scan Tool connected. ● Key on. ● Monitor the CHT PID. ● While observing the PID, perform the following: <ul style="list-style-type: none"> — Tap on the sensor to simulate road shock. — Wiggle the sensor connector. ● Is there any large change in the temperature reading? 	<p>Yes</p> <p>No</p>	<p>▶ Key off. DISCONNECT and INSPECT connectors. If OK, REPLACE CHT sensor. COMPLETE PCM Reset to clear DTCs. COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. RERUN Quick Test.</p> <p>▶ GO to DL91.</p>
DL91	CHECK ELECTRONIC ENGINE CONTROL (EC) WIRING HARNESS		
	<ul style="list-style-type: none"> ● Still monitoring PID. ● While observing the appropriate PID, perform the following: <ul style="list-style-type: none"> — Hold the vehicle harness close to the sensor connector. Wiggle, shake and bend small sections of wiring harness while working toward the PCM. ● Key off. ● Was there any change in the temperature reading? 	<p>Yes</p> <p>No</p>	<p>▶ ISOLATE fault. REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. RERUN Quick Test.</p> <p>▶ GO to DL92.</p>
DL92	CHECK PCM AND VEHICLE HARNESS CONNECTOR		
	<ul style="list-style-type: none"> ● Disconnect PCM. ● Disconnect CHT sensor. ● Are connectors and terminals OK? 	<p>Yes</p> <p>No</p>	<p>▶ Fault is not present at this time. COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. RERUN Quick Test.</p> <p>▶ REPAIR as necessary. COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. RERUN Quick Test.</p>
DL100	DTC P1299 INDICATES AN ENGINE OVERHEAT CONDITION OCCURRED		
	<p>Diagnostic Trouble Code (DTC) P1299 indicates an engine overheat condition was detected by the cylinder head temperature (CHT) sensor. An FMEM Strategy called Failsafe Cooling was activated to cool the engine.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> — Engine cooling system concerns. — Base engine concerns. — Low engine coolant level or loss of coolant. ● Check engine coolant level. ● Is the engine coolant level fill correct? 	<p>Yes</p> <p>No</p>	<p>▶ Engine Overheats. REPAIR as necessary.</p> <p>▶ Loss of Engine Coolant. REPAIR as necessary.</p>