

Computers and Control Systems: Pinpoint Tests

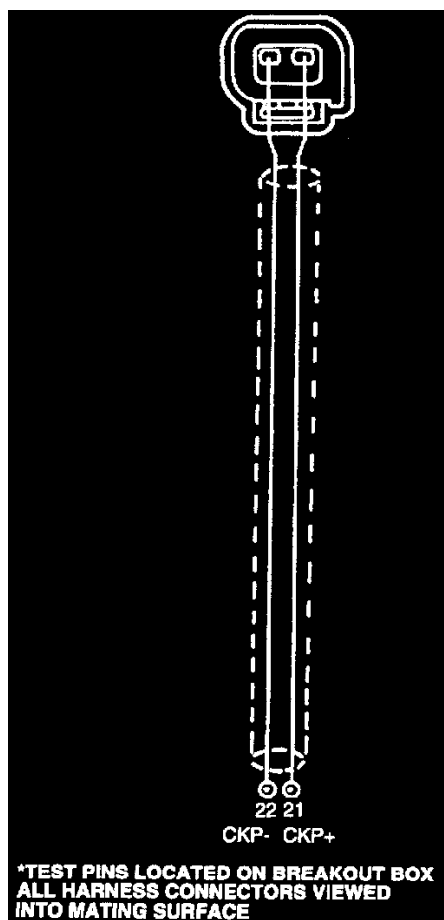
Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Spark (as related to electronic engine control)
- Powertrain control module

WARNING: Stop this test at the first sign of a fuel leak and service as required. No open flame or smoking during fuel delivery checks.



Test Step		Result	Action to Take
A1	CHECK PASSIVE ANTI-THEFT SYSTEM (SECURILOCK)		
	NOTE: This vehicle may have an anti-theft system, which may be activated, causing the no start condition. Verify by viewing anti-theft indicator light on instrument panel or a Diagnostic Trouble Code (DTC P1260) may be present. - Verify anti-theft system. Is the system activated?	Yes	Security system is the cause of the no-start condition.
		No	GO to A2 .
A2	ATTEMPT TO CRANK ENGINE		
	NOTE: Verify inertia fuel shutoff (IFS) switch is set (button pushed in). Does engine crank?	Yes	GO to A3 .
		No	DIAGNOSE cause of no-crank.
A3	IDENTIFY TYPE OF NO START		
	NOTE: The purpose of this Test Step is to identify intermittent No Starts in order to guide the technician to the proper repair procedure. Does the vehicle start now?	Yes	Vehicle is an intermittent No Start. GO to Pinpoint Test Step Z50 and prepare to use the Distributor/Less Ignition System Tester (DIST).
		No	Natural gas vehicles: GO to A15 . All others: GO to A4 .
A4	CHECK VREF VOLTAGE TO THROTTLE POSITION (TP) SENSOR		
	- Disconnect TP sensor. - Key on, engine off. - Measure voltage between VREF and SIG RTN circuit at the TP sensor harness connector. Refer to the schematic in Pinpoint Test DH. - Key off. Was voltage between 4.0 and 6.0 volts?	Yes	RECONNECT TP sensor. GO to A5 .
		No	GO to Pinpoint Test Step C1 .
A5	CHECK FEPS CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Key on, engine off. - Measure voltage between Pin 13 at the data link connector and battery negative post. - Key off. Was voltage greater than 9.0 volts?	Yes	REPAIR short to power. RESTORE vehicle. RERUN Quick Test.
		No	For coil-on-plug vehicles: GO to A17 . All others: GO to A6 .
A6	CHECK PIP IN THE PCM		
	NOTE: The scan tool must be connected to a reliable power source that is powered with the key in the START position (such as directly to the vehicle battery). Also verify that the vehicle battery is fully charged. - Connect scan tool to DCL. - Access PIP PID. - While viewing the PIP PID, crank engine. Is the PIP PID switching on and off?	Yes	GO to Pinpoint Test Step JB1 to check ignition coils, plugs and wires. If OK: Natural gas vehicles: GO to A15 . All others: GO to A7 .
		No	GO to Pinpoint Test Step JD1 .

Test Step		Result	Action to Take
A7	CHECK FUEL PRESSURE		
	WARNING: BEFORE SERVICING OR REPLACING ANY COMPONENTS IN THE FUEL SYSTEM, REDUCE THE POSSIBILITY OF INJURY OR FIRE BY FOLLOWING DIRECTIONS IN PINPOINT TEST HC WARNING, CAUTION, AND HANDLING. - Release the fuel pressure. - Install fuel pressure tester. - Scan Tool connected. - Key on, engine off. - Enter Output Test Mode and run the fuel pump to obtain maximum fuel pressure. - Key off. - Was fuel pressure between 240 and 280 kPa (35 and 40 psi)?	Yes No	GO to A8. GO to Pinpoint Test Step HC1.
A8	CHECK FUEL PRESSURE LEAKDOWN		
	- Observe WARNING, CAUTION AND HANDLING in Pinpoint Test HC. - Fuel pressure tester Installed. - Scan Tool connected. - Key on, engine off. - Access Output Test Mode and run fuel pump to obtain maximum fuel pressure. - Exit Output Test Mode. - Key off. - Verify fuel pressure remains within 16 kPa (5 psi) of the maximum pressure for 1 minute after turning pump off. - Does fuel pressure remain within 16 kPa (5 psi)?	Yes No	RERUN Quick Test. RESTORE vehicle. REPLACE PCM. GO to Pinpoint Test Step HC1.
A15	CHECK FUEL PRESSURE		
	- Connect scan tool to DLC. - Access FRP PID (fuel pressure). - Record fuel pressure. - Connect fuel pressure gauge to Schrader valve. - Key on, engine off. - Record fuel pressure. - Key off. - Was fuel pressure between 590 and 800 kPa (105 and 130 psi) on the Scan Tool and fuel pressure gauge?	Yes No	GO to A16. GO to Fuel Systems Pinpoint Test Step HB1.

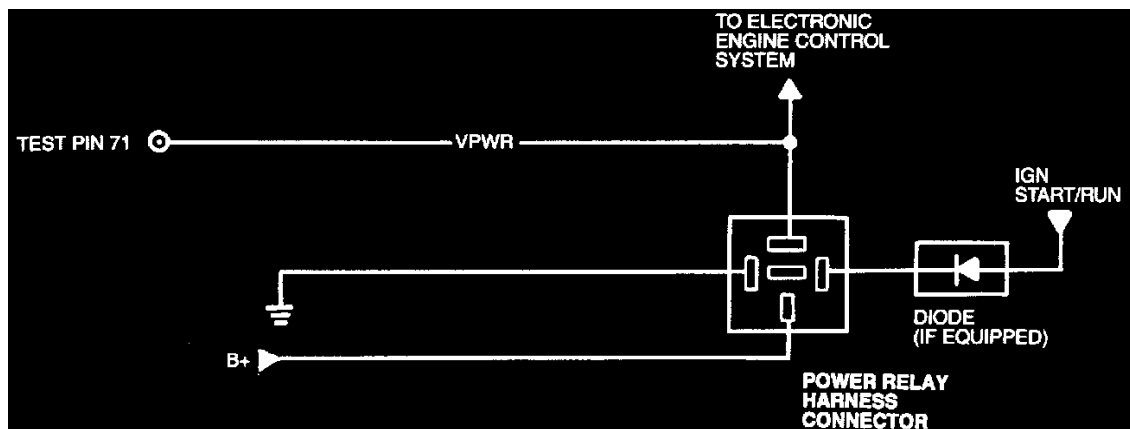
Test Step		Result	Action to Take
A16	CHECK INJECTOR SIGNAL FROM NGV MODULE		
	NOTE: This test requires a standard 12 volt test lamp. - Install breakout box, connect PCM to breakout box. - Install 60-pin breakout box to NGV module, keep NGV module connected. - Connect test lamp between PCM test pin 75 and ground. - Crank engine. NOTE: A properly operating system will show a dim glow. - Does test lamp have a dim glow while cranking?	Yes No	REPLACE PCM. RERUN Quick Test. RESTORE vehicle. GO to A6. No light or continuously bright light. GO to Fuel System Pinpoint Test Step HA47.
A17	CHECK PCM DRIVER TO COILS		
	- Install breakout box, connect PCM to breakout box. - Connect incandescent test lamp between B+ and each coil driver circuit. - Crank engine. - Does lamp blink consistently and brightly (one blink per engine revolution)?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. GO to Pinpoint Test Step JD1.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Harness Circuits: Vehicle Power (VPWR), Ignition Start/Run, Power Relay Ground, Battery Voltage Positive (B+)
- Power Relay (Electronic Engine Control Power Relay)



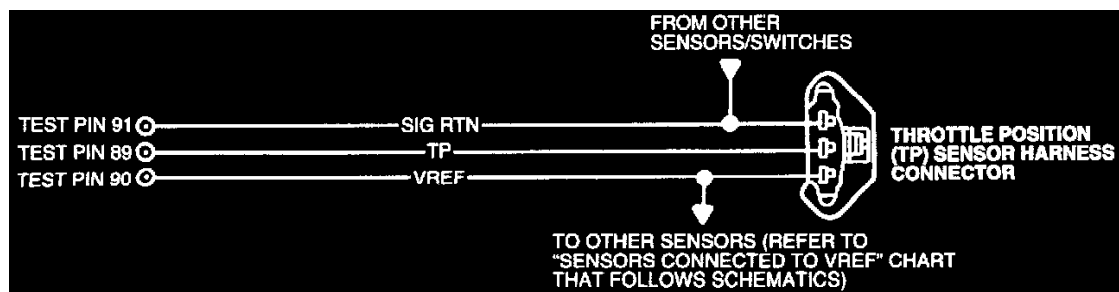
Test Step		Result	Action to Take
B1	VPWR CHECK AT IAC VALVE FAILED IN PINPOINT TEST C: CHECK FOR OPEN VPWR CIRCUIT		
	● Idle air control (IAC) valve disconnected. ● Disconnect scan tool from DLC. ● Disconnect electronic engine control power relay (referred to here as "power relay"). ● Measure resistance of VPWR circuit between IAC valve harness connector and power relay harness connector. ● Is resistance less than 5.0 ohms?	Yes No	RECONNECT IAC valve. GO to B2 . REPAIR open VPWR circuit between the power relay and the splice to the IAC valve. RESTORE vehicle. RERUN Quick Test.
B2	CHECK B+ AND IGN START/RUN VOLTAGE TO POWER RELAY		
	● Measure B+ circuit voltage at the power relay harness connector. ● Key on. ● Measure IGN START/RUN circuit voltage at power relay harness connector. ● Are both voltages greater than 10.5 volts?	Yes No	GO to B3 . Key off. B+ or IGN START/RUN circuit fault. CHECK condition of related fuse(s)/diode. If OK, REPAIR open circuit. If fuse is damaged, check IGN START/RUN or B+ and VPWR circuits for short to ground before replacing. RESTORE vehicle. RERUN Quick Test.
B3	CHECK GROUND CIRCUIT TO POWER RELAY		
	● Measure voltage between B+ and the ground circuits at the power relay harness connector. ● Key off. ● Was voltage greater than 10.5 volts?	Yes No	REPLACE power relay. RESTORE vehicle. RERUN Quick Test. REPAIR open ground circuit. RESTORE vehicle. RERUN Quick Test.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Sensor harness circuits: SIG RTN, VREF
- 3-wire sensors: Throttle Position (TP) sensor, Differential Pressure Feedback EGR sensor, A/C Pressure (ACP) sensor, Fuel Tank Pressure (FTP) sensor, Power Steering Pressure (PSP) sensor and Fuel Rail Pressure (FRP) sensor
- Powertrain Control Module



Applications	TP	EGR	FTP	ACP	PSP	FRP
3.0L FFV Ranger	X	D.P.F. EGR				
2.5L Contour/Mystique	X	D.P.F. EGR	X			
Mustang, Ranger	X	D.P.F. EGR	X			
Taurus/Sable, Taurus SHO	X	D.P.F. EGR	X			
Town Car, Windstar	X	D.P.F. EGR	X			
Explorer/Mountaineer	X	D.P.F. EGR	X			
Crown Victoria (except NGV)	X	D.P.F. EGR	X			
Grand Marquis,	X	D.P.F. EGR	X			
E/F-Series (except NGV),	X	D.P.F. EGR	X			
Expedition/Navigator	X	D.P.F. EGR	X			
Continental	X	D.P.F. EGR	X	X		
Mark VIII	X	D.P.F. EGR	X	X		
2.0L 4V Escort/Tracer	X		X	X	X	X
2.0L 2V Escort/Tracer	X	D.P.F. EGR	X		X	X
2.0L Contour/Mystique	X		X		X	
Crown Victoria w/NGV	X	D.P.F. EGR				X
5.4L E/F Series w/NGV	X					X

Test Step		Result	Action to Take
C1	CHECK VREF CIRCUIT FOR SHORT TO PWR IN HARNESS		
	- Disconnect TP sensor. - Key on. - Measure voltage between VREF and SIG RTN at the TP sensor harness connector. - Key off. Is VREF greater than 6.0 volts?	Yes No	GO to C35 (to check VREF for short to power). GO to C2 .
C2	CHECK VOLTAGE ON BATTERY		
	- Key on. - Measure voltage across battery terminals. - Key off. Is voltage greater than 10.5 volts?	Yes No	GO to C3 . Key off. Service discharged battery.
C3	CHECK VOLTAGE BETWEEN B+ AND SIG RTN		
	- Key on. - Disconnect sensor where VREF check failed. - Measure voltage between battery positive post and SIG RTN circuit at the appropriate sensor harness connector. - Key off. Is voltage greater than 10.5 volts and within 1.0 volt of battery voltage?	Yes No	GO to C4 . SIG RTN/PWR GND fault present. GO to C25 .

Test Step		Result	Action to Take
C4	CHECK VREF VOLTAGE THROUGH PCM ON TP PID		
	- Key on. - Attempt to access the TP PID. - Key off. Can the PID be accessed?	Yes No	GO to C20 (to check VREF for opens). GO to C5 (to check for VPWR, and VREF for shorts).
C5	CHECK VPWR VOLTAGE TO IAC VALVE		
	- Disconnect TP sensor. - Disconnect idle air control (IAC) valve. - Key on. - Measure voltage between the VPWR circuit at the IAC valve harness connector and the battery negative post. - Key off. Was voltage greater than 10.5 volts?	Yes No	RECONNECT IAC valve. For 2.0L Contour / Mystique: GO to C7 . All Others: GO to C6 . VPWR is not present. RECONNECT TP sensor. For application with Power Relay inside CCRM: GO to Pinpoint Test X1 . All others: GO to Pinpoint Test Step B1 .
C6	CHECK VREF CIRCUIT SHORT TO SIG RTN IN THE D.P.F. EGR OR EGR VALVE POSITION SENSOR		
	- TP sensor disconnected. - Disconnect FTP sensor. - Key on. - 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?	Yes No	REPLACE D.P.F. EGR sensor or EGR valve position sensor. RESTORE vehicle. RERUN Quick Test. For NGV applications: GO to C10 . For 3.0L FFV Ranger: GO to C11 . For all others: GO to C7 .
C7	CHECK VREF CIRCUIT SHORT TO SIG RTN IN FTP SENSOR		
	- TP and D.P.F. EGR sensors disconnected. - Disconnect FTP sensor. - Key on. - Measure voltage between the VREF and SIG RTN circuits at the TP sensor harness connector. - Key off. Was voltage between 4.0 and 6.0 volts?	Yes No	REPLACE the FTP sensor. RESTORE vehicle. RERUN Quick Test. For applications with an A/C Pressure (ACP) sensor: GO to C8 . For applications with PSP: GO to C9 . For applications with FRP: GO to C10 . All Others: GO to C11 .

Test Step		Result	Action to Take
C8	CHECK VREF CIRCUIT SHORT TO SIG RTN IN ACP SENSOR		
	- TP (FTP where applicable) and D.P.F. EGR sensor disconnected. - Disconnect ACP sensor. - Key on. - Measure voltage between the VREF and SIG RTN circuits at the TP sensor harness connector. - Key off. Was voltage between 4.0 and 6.0 volts?	Yes No	REPLACE the ACP sensor. RESTORE vehicle. RERUN Quick Test. For applications with PSP: GO to C9. For application with FRP: GO to C10. All others: GO to C11.
C9	CHECK VREF CIRCUIT SHORT TO SIG RTN IN PSP SENSOR		
	- TP, ACP where applicable and D.P.F. EGR sensors disconnected. - Disconnect PSP sensor. - Key on. - Measure voltage between the VREF and SIG RTN circuits at the TP sensor harness connector. - Key off. Was voltage between 4.0 and 6.0 volts?	Yes No	REPLACE the PSP sensor. RESTORE vehicle. RERUN Quick Test. For applications with FRP: GO to C10. All others: GO to C11.
C10	CHECK VREF CIRCUIT SHORT TO SIG RTN IN FRP SENSOR		
	- TP and D.P.F. EGR sensors disconnected. - Disconnect fuel rail pressure (FRP) sensor. - Measure voltage between the VREF and SIG RTN circuits at the TP sensor harness connector. - Key off. Was voltage between 4.0 and 6.0 volts?	Yes No	REPLACE the FRP sensor. RESTORE vehicle. RERUN Quick Test. GO to C11.
C11	CHECK VPWR VOLTAGE TO PCM		
	- TP sensor disconnected. - All other sensors wired to VREF disconnected from previous test steps (if necessary, refer to Sensors Connected To VREF chart at the beginning of this pinpoint test). - Install breakout box, leave PCM disconnected. - Key on. - Measure voltage between PCM test pins 71 and 77. Is voltage greater than 10.5 volts?	Yes No	GO to C12. REPAIR open VPWR circuit between PCM and splice to IAC valve. RESTORE VEHICLE. RERUN Quick Test.

Test Step		Result	Action to Take
C12	CHECK VREF VOLTAGE FOR SHORT TO GROUND OR SIG RTN		
	- TP sensor disconnected. - All other sensors wired to VREF disconnected. - Breakout box installed, PCM disconnected. - Disconnect Scan Tool from DLC. - Measure resistance between PCM test pin 90 and test pins 91, 51 and 103. Is each resistance greater than 10,000 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR VREF short to ground. RESTORE vehicle. RERUN Quick Test.
C20	CHECK VREF CIRCUIT FOR OPEN IN HARNESS		
	- Sensor where VREF check failed disconnected. - Install breakout box, leave PCM disconnected. - Measure resistance between PCM test pin 90 and the VREF circuit at the appropriate sensor vehicle harness connector. Is resistance less than 5.0 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR open VREF circuit. REFER to the EVTM and DTCs received to help pinpoint the location of the open. REMOVE breakout box. RESTORE vehicle. RERUN Quick Test.
C25	CHECK SIG RTN /PWR GND THROUGH PCM ON TP PID		
	- Key on. - Attempt to access the TP PID. - Key off. Can the PID be accessed?	Yes No	GO to C26 . GO to C28 .
C26	ARE KOEO DTCs PRESENT FOR TWO OR MORE SENSORS /SWITCHES CONNECTED TO THE SIG RTN CIRCUIT?		
	Are KOEO DTCs present for two or more sensors/switches connected to the SIG RTN circuit?	Yes No	GO to C27 . REPAIR open SIG RTN circuit to the sensor where the VREF check failed. RESTORE vehicle. RERUN Quick Test.
C27	CHECK SIG RTN CIRCUIT FOR OPEN IN HARNESS		
	- Scan Tool disconnected. - Sensor where VREF check failed disconnected. - Install breakout box, leave PCM disconnected. - Measure resistance between the SIG RTN circuit at the appropriate sensor vehicle harness connector and PCM test pin 91. Is resistance less than 5.0 ohms?	Yes No	RECONNECT sensor. GO to C28 . REPAIR open SIG RTN circuit. REFER to the EVTM and DTCs received to help pinpoint the location of the open. RESTORE vehicle. RERUN Quick Test.

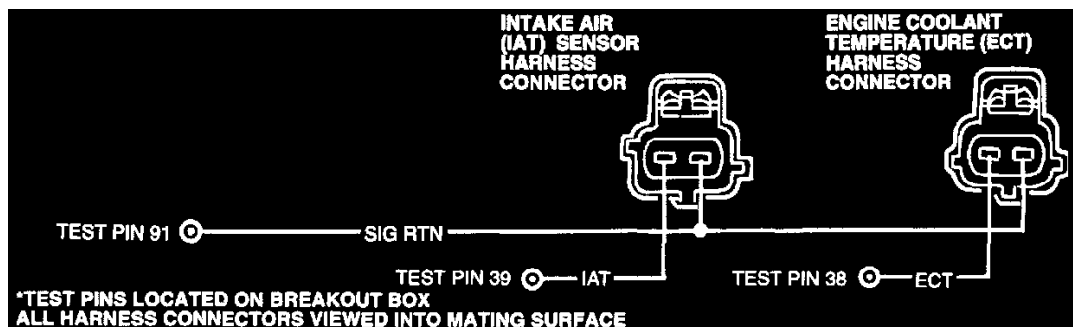
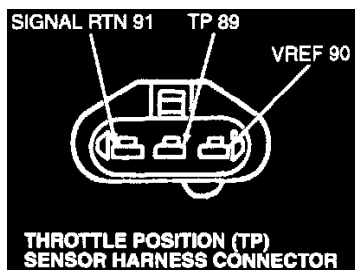
Test Step		Result	Action to Take
C28	CHECK PWR GND CIRCUITS FOR OPEN IN HARNESS		
- Disconnect scan tool from DLC. - Measure resistance between the battery negative post and PCM Test Pins 51, 77 and 103. Is each resistance less than 5.0 ohms?		Yes	▶ GO to C29 .
		No	▶ REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
C29	CHECK GROUND CIRCUITS FOR OPEN IN HARNESS		
- Connect PCM to breakout box. - Measure resistance between PCM test pin 91 and PCM test pins 51, 77 and 103. Is each resistance less than 5.0 ohms?		Yes	▶ SIG RTN /PWR GND circuits are OK in the harness and PCM. VERIFY results of previous test steps. RERUN Quick Test to verify DTC / symptom.
		No	▶ REPLACE PCM. RESTORE vehicle. RERUN Quick Test.
C35	CHECK VREF CIRCUIT FOR SHORT TO PWR		
- Sensor where VREF check failed disconnected. - Disconnect all other sensors connected to VREF (refer to Sensors Connected to VREF chart at beginning of this pinpoint test). - Disconnect PCM. - Key on. - Measure voltage between the VREF circuit at the TP sensor harness connector and the battery negative post. - Key off. Is voltage less than 0.5 volts?		Yes	▶ REPLACE PCM. RESTORE vehicle. RERUN Quick Test.
		No	▶ REPAIR VREF short to power in harness. RESTORE vehicle. RERUN Quick Test.

Test Notes

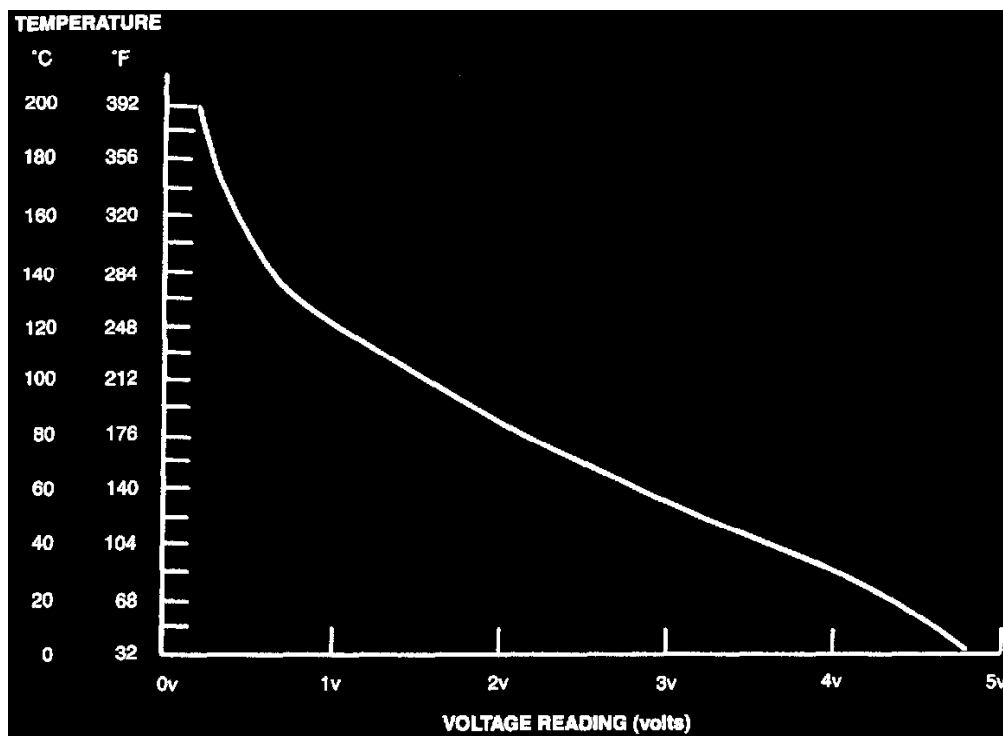
Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Intake Air Temperature (**IAT**) Sensor
- Engine Coolant Temperature (**ECT**) Sensor
- Harness Circuits: IAT, ECT and SIG RTN
- Powertrain Control Module



Tables and Graphs



Temperature		Engine Coolant/Intake Air Temperature Sensor Values	
°C	°F	Voltage (volts)	Resistance (K ohms)
120	248	0.27	1.18
110	230	0.35	1.55
100	212	0.46	2.07
90	194	0.60	2.80
80	176	0.78	3.84
70	158	1.02	5.37
60	140	1.33	7.70
50	122	1.70	10.97
40	104	2.13	16.15
30	86	2.60	24.27
20	68	3.07	37.30
10	50	3.51	58.75

NOTE:

- Engine coolant temperature must be greater than 10°C (50°F) to pass the KOEO Self-Test and greater than 82°C (180°F) to pass the KOER Self-Test. To accomplish this, the engine must be at normal operating temperature.
- Ambient temperature must be above 10°C (50°F) to receive acceptable input from the Intake Air Temperature (IAT) sensor.
- 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
DA1	DTC P1116: CHECK OPERATION OF ECT SENSOR		
	Diagnostic Trouble Code (DTC) P1116 (ECT) indicates the temperature sensor is out of Self-Test range. Correct range is 0.3 to 3.7 volts. Possible causes: — Check for overheating condition. — Low engine coolant level. — Damaged harness connector. — Damaged sensor. — Poor thermostat operation. • Run engine at 2000 rpm until engine temperature becomes stabilized. No Starts: — GO to DA3. Vehicles that stall: — Return to Symptom Charts. • Check that upper radiator hose is hot and pressurized. • Rerun Key On Engine Running (KOER) Self-Test. • Key off. • Was DTC P1116 present?	Yes No	▶ GO to DA2. ▶ Engine was not at closed loop operating conditions. REPAIR any other DTCs as necessary.
DA2	CHECK VREF VOLTAGE TO TP SENSOR		
	• Refer to schematic at the beginning of the 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?	Yes No	▶ There is sufficient VREF voltage. RECONNECT TP sensor. GO to DA3. ▶ GO to Pinpoint Test Step C1.

Test Step		Result	Action to Take
DA3	CHECK TEMPERATURE SENSOR RESISTANCE WITH ENGINE OFF		
	• Disconnect temperature sensor. • Measure temperature sensor resistance. Refer to the chart at the beginning of this Pinpoint Test for resistance specifications. • Is resistance within specification?	Yes No	▶ For ECT sensor with a No Start: Do not repair DTC P1116 at this time. RETURN to Symptom Charts. For symptoms of cooling fan concerns, overheating and lack of heat, do not repair DTC P1116. REPAIR next DTC. If no other DTC exists, RETURN to Symptom Charts. All others: GO to DA4. ▶ REPLACE suspect sensor. RESTORE vehicle. RERUN Quick Test.
DA4	CHECK TEMPERATURE SENSOR RESISTANCE WITH ENGINE RUNNING		
	NOTE: Verify that engine is at operating temperature before taking ECT readings. • Run engine for two minutes at 2000 rpm. • Measure temperature sensor resistance. Refer to the chart at the beginning of this Pinpoint Test for resistance specifications. • Is resistance within specification?	Yes No	▶ REPLACE PCM. RESTORE vehicle. RERUN Quick Test. ▶ REPLACE suspect sensor. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
DA10	DTC P0118 OR P0113: SIMULATE OPPOSITE SIGNAL TO PCM		
	Diagnostic Trouble Code (DTC) P0118 (ECT) or P0113 (IAT) indicates the sensor signal is greater than the Self-Test maximum. The maximum for ECT and IAT sensors is 4.6 volts or -50°C (-46°F). Possible causes: — Open in harness (IAT or ECT). — Improper harness connection. — Damaged sensor. — Damaged PCM. ● Disconnect temperature sensor. ● Connect a jumper wire between the sensor signal and SIG RTN circuits at the temperature sensor harness connector. ● Install scan tool. ● Key on. NOTE: If a scan tool communication concern exists, remove jumper wire immediately and go to DA12. ● Access ECT V or IAT V PID. ● Key off. ● Was the ECT V or IAT V PID less than 0.2 volt (greater than 120°C/248°F)?	Yes No	REPLACE suspect sensor. RESTORE vehicle. RERUN Quick Test. REMOVE jumper wire. GO to DA11.
DA11	CHECK TEMPERATURE SENSOR SIGNAL AND SIG RTN CIRCUITS FOR OPEN IN HARNESS		
	● Install breakout box, leave PCM disconnected. ● Measure resistance of sensor signal circuit between PCM Test Pin 38 for ECT or 39 for IAT and temperature sensor harness connector. ● Measure resistance of SIG RTN circuit between PCM Test Pin 91 and temperature sensor harness connector. ● Is each resistance less than 5.0 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR open circuits. RESTORE vehicle. RERUN Quick Test.
DA12	CHECK TEMPERATURE SENSOR SIGNAL FOR SHORT TO VREF IN HARNESS		
	● Key off. ● Install breakout box, leave PCM disconnected. ● Measure resistance between PCM Test Pin 38 for ECT or 39 for IAT and 90. ● Is each resistance greater than 10,000 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short to VREF. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
DA20	DTC P0112 OR P0117: SIMULATE OPPOSITE SIGNAL TO PCM		
	Diagnostic Trouble Code (DTC) P0117 (ECT) or DTC P0112 (IAT) indicates the sensor signal is less than Self-Test minimum. The IAT and ECT sensor minimum is 0.2 volt 121°C (250°F). Possible causes: — Grounded circuit in harness. — Damaged sensor. — Improper harness connection. — Damaged PCM. ● Disconnect harness from sensor. ● Install scan tool. ● Key on. ● Access ECT V or IAT V PID. ● Key off. ● Was the ECT V or IAT V PID greater than 4.2 volts (less than -40°C/-40°F)?	Yes No	REPLACE sensor. RESTORE vehicle. RERUN Quick Test. GO to DA21.
DA21	CHECK VREF VOLTAGE TO TP SENSOR		
	● Refer to schematic at the beginning of the pinpoint test. ● Disconnect 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 and 6.0 volts?	Yes No	There is sufficient VREF voltage. RECONNECT TP sensor. GO to DA22. GO to Pinpoint Test Step C1.
DA22	CHECK TEMPERATURE SIGNAL CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	● Install breakout box, PCM disconnected. ● Measure resistance between PCM Test Pins 38 for ECT or 39 for IAT and 24 or 51 and 91. ● Is each resistance greater than 10,000 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
DA90	DTCS P0112, P1112, P0113, P0117, P1117 OR P0118: INTERMITTENT CHECK		
	Diagnostic Trouble Codes (DTCs) P0112, P1112 or P0113 (IAT DTCs) and P0117, P1117 or P0118 (ECT DTCs) are not received during KOEO and KOER Self-Tests, but are retrieved during Continuous Memory Self-Test and can indicate an intermittent condition. Possible causes: — Damaged harness. — Damaged harness connector. — Damaged IAT or ECT sensor. — Low coolant (ECT). — Damaged PCM. ● Install scan tool. ● Key on. ● Monitor the ECT V or IAT V PID. ● While observing the PID, perform the following: — Tap on the sensor to simulate road shock. — Wiggle the sensor connector. ● Is there any large change in the temperature reading?	Yes No	Key OFF. DISCONNECT and INSPECT connectors. If OK, REPLACE the sensor. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. For Continuous DTCs P1112 and P1117, COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. GO to DA91.
DA91	CHECK ELECTRONIC ENGINE CONTROL (EC) WIRING HARNESS		
	● Still monitoring PID. ● While observing the appropriate PID, perform the following: — 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?	Yes No	ISOLATE fault. REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. For Continuous DTCs P1112 and P1117, COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. GO to DA92.

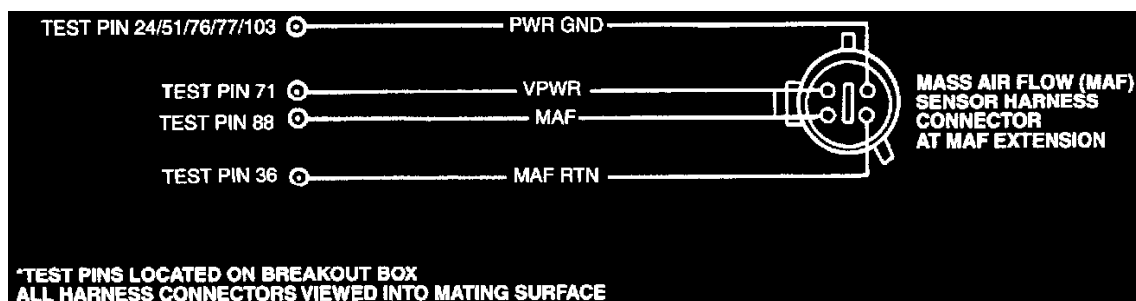
Test Step		Result	Action to Take
DA92	CHECK PCM AND VEHICLE HARNESS CONNECTOR		
	● Disconnect PCM. ● Disconnect sensor connector. ● Are connectors and terminals OK?	Yes	Fault is not present at this time. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. For Continuous Memory DTCs P1112 and P1117, COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle.
		No	REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. For Continuous Memory DTCs P1112 or P1117, COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle.
DA100	DTC P0125: CHECK ENGINE COOLANT LEVEL		
	Diagnostic Trouble Code (DTC) P0125 indicates the ECT sensor has not achieved the required temperature level to enter closed loop operating conditions within a specified amount of time after starting engine. This DTC will light the MIL. Possible causes: — Insufficient warm up time. — Leaky or stuck open thermostat. — Low engine coolant level. ● Check engine coolant level. ● Is the engine coolant level fill correct?	Yes	DIAGNOSE cooling system as necessary.
		No	FILL engine coolant to proper level. COMPLETE PCM Reset to clear DTCs. COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. RERUN Quick Test.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Mass Air Flow (MAF) Sensor
- Harness Circuits: MAF SIG, MAF RTN, Vehicle Power (VPWR), and Power Ground (PWR GND)
- Powertrain Control Module



Applications	Voltage Signal					
	0.34V	0.39V	0.60V	1.00V	1.96V	3.90V
2.0L Contour/Mystique	0.39 gm/sec	0.45 gm/sec	0.72 gm/sec	2.10 gm/sec	7.64 gm/sec	40.59 gm/sec
2.5L Contour/Mystique	0.33 gm/sec	0.95 gm/sec	1.69 gm/sec	5.53 gm/sec	22.92 gm/sec	137.98 gm/sec
3.4L Taurus SHO 4.6L Mustang 4.6L Continental 4.6L Mark VIII	1.39 gm/sec	1.60 gm/sec	2.69 gm/sec	8.36 gm/sec	32.99 gm/sec	193.69 gm/sec
4.6L F-Series/E-Series 5.4L F-Series/E-Series 6.8L E-Series 7.6L F-Series	1.35 gm/sec	1.56 gm/sec	2.66 gm/sec	8.31 gm/sec	32.99 gm/sec	190.18 gm/sec
3.8L Mustang 4.0L/5.0L Explorer 5.0L Mountaineer 4.0L Ranger	1.46 gm/sec	1.68 gm/sec	2.52 gm/sec	7.64 gm/sec	27.09 gm/sec	151.79 gm/sec
4.6L/5.4L Expedition 5.4L Navigator 5.8L F-Series	1.68 gm/sec	1.93 gm/sec	3.32 gm/sec	8.43 gm/sec	28.97 gm/sec	151.44 gm/sec
5.8L E-Series	1.24 gm/sec	1.42 gm/sec	2.98 gm/sec	8.38 gm/sec	29.88 gm/sec	151.25 gm/sec
3.0L Windstar	0.82 gm/sec	0.88 gm/sec	1.25 gm/sec	3.44 gm/sec	14.48 gm/sec	135.95 gm/sec
3.0L 4V Taurus/Sable 3.8L Windstar 4.2L F-Series/E-Series	1.43 gm/sec	1.64 gm/sec	2.58 gm/sec	7.53 gm/sec	26.57 gm/sec	154.40 gm/sec
2.0L/2.6L Cougar	1.44 gm/sec	1.66 gm/sec	2.73 gm/sec	8.06 gm/sec	20.33 gm/sec	153.31 gm/sec
3.0L 2V Taurus/Sable 3.0L Taurus FF	1.31 gm/sec	1.11 gm/sec	1.72 gm/sec	4.82 gm/sec	17.00 gm/sec	146.84 gm/sec
2.3L Ranger 3.0L Ranger	0.93 gm/sec	1.07 gm/sec	1.71 gm/sec	4.58 gm/sec	16.23 gm/sec	135.17 gm/sec
2.0L Escort/Tracer	0.94 gm/sec	1.07 gm/sec	1.68 gm/sec	4.77 gm/sec	16.87 gm/sec	88.91 gm/sec
4.6L Crown Victoria/Grand Marquis 4.6L NGV Crown Victoria 4.6L Town Car	1.28 gm/sec	1.48 gm/sec	2.37 gm/sec	6.97 gm/sec	26.16 gm/sec	148.18 gm/sec

Voltage To Mass Air Flow Conversion Tables

Test Step		Result	Action to Take
DC1	DTC P1101: CHECK FOR MAF SENSOR CONTINUOUS MEMORY DTCs		
	Key On Engine Running (KOER) Diagnostic Trouble Code (DTC) P1101 indicates the MAF sensor signal was not between 0.82 and 14.48 gm/sec. (0.34 and 1.96 volts) during KOER Self-Tests. • Drive vehicle for 6 to 10 minutes. • Rerun KOEO Self-Test and retrieve Continuous Memory DTCs. • Is a Continuous Memory DTC present with the KOER DTC P1101?	Yes ▶ No ▶	For Continuous Memory DTC P0102: GO to DC6. For Continuous Memory DTC P0103: GO to DC20 All other Continuous Memory DTCs: ADDRESS those DTCs
DC2	DTC P1101 AND KOER DTC P1101: CHECK VOLTAGE BETWEEN MAF PWR GND CIRCUITS TO MAF SENSOR		
	Diagnostic Trouble Code (DTC) P1101 indicates the mass air flow (MAF) sensor signal was greater than 0.20 volt during KOEO Self-Test. NOTE: DTC P1101 can be generated by a low charged vehicle battery or the garage exhaust ventilation system. Repair the battery as necessary. Then remove ventilation system and properly vent to outside atmosphere. Rerun KOEO Self-Test. Possible causes: — Damaged MAF sensor. — Contaminated MAF sensor. — MAF sensor partially connected. — Open PWR GND harness circuit. — Open MAF RTN harness circuit. — Damaged PCM. • Key off. • Check that the MAF sensor is connected. If not, repair as necessary. • Connect scan tool. • <i>Install breakout box, connect PCM to breakout box.</i> • Key on, engine off. • Measure voltage of the MAF circuit between PCM test pin 88 and PCM test pins 24 and 103. • Key off. • Was voltage greater than 0.20 volt?	Yes ▶ No ▶	GO to DC12. GO to DC8.

Test Step		Result	Action to Take
DC3	DTC P1100: CHECK MAF CIRCUIT INTERMITTENT VOLTAGE		
	Continuous Memory Diagnostic Trouble Code (DTC) P1100 indicates the MAF sensor signal went below 0.39 volt or above 3.90 volts (refer to Voltage to Mass Air Flow Conversion Table at beginning of this pinpoint test) sometime during the last 40 warm-up cycles. Possible causes: — MAF sensor connector with poor continuity. — MAF sensor harness with poor continuity. — MAF sensor harness intermittent short. — MAF sensor internal intermittent open or short. ● Start engine and bring to idle. ● If a stabilized idle is not at least 700 rpm, go to Symptom Charts. ● Scan tool connected. ● Run throttle up to 1500 rpm for 5 seconds, and bring back to idle. ● Access MAF PID (MAF V PID) for a fault indication while performing the following: — Lightly tap on MAF sensor and wiggle harness connector to simulate road shock. ● Key off. ● Was MAF PID (MAF V PID) at idle changing below the minimum 0.39 volt or above a maximum 3.90 volts (refer to Voltage To Mass Air Flow Conversion Table at the beginning of this pinpoint test)?	Yes No	▶ INSPECT MAF sensor connector. If OK, REPLACE the MAF sensor. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test. ▶ GO to DC4.
DC4	CHECK MAF SENSOR CIRCUIT FOR INTERMITTENT OPENS OR SHORTS		
	● Install breakout box, reconnect PCM to breakout box. ● Key on, engine off. ● Connect digital multimeter between PCM test pins 88 and 36. ● While viewing digital multimeter, do the following: — Grasp the MAF sensor harness and MAF sensor harness connector. — Shake and bend a small section of the harness all the way to the dash panel. — Wiggle, shake and bend the harness from the dash panel to the PCM. ● Key off. ● Was the voltage changing below the minimum 0.39 volt or above the maximum 3.90 volts?	Yes No	▶ ISOLATE and REPAIR as necessary. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test. ▶ Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: MAF PID (MAF V PID) and list of Possible causes.

Test Step		Result	Action to Take
DC6	DTC P0102: CHECK MAF SENSOR SIGNAL LOW INPUT TO PCM		
	Diagnostic Trouble Code (DTC) P0102 indicates the MAF sensor signal went below 0.39 volt (refer to Voltage to Mass Air Flow Conversion Table at beginning of this Pinpoint Test) sometime during normal engine operation (Continuous) or during Key On Engine Running (KOER) Self-Test. Possible causes: — Damaged MAF sensor. — MAF sensor disconnected. — MAF circuit open. — VPWR circuit open. — PWR GND circuit open. — MAF RTN circuit open. — MAF circuit shorted to ground. — Intake Air leak (near MAF sensor). — Throttle position (TP) system (possible closed throttle indication). — Damaged PCM. ● Check broken/loose air outlet tube clamps (throttle body and air cleaner assembly ends), cracks/holes in air outlet tube, worn gaskets between MAF sensor and air cleaner assembly. Repair as necessary. ● Start engine and bring to idle. ● If a KOER DTC P0505 is present, go to the Powertrain Diagnostic Trouble Code (DTC) Charts. For A/T vehicles, if the engine stalls and cannot maintain an idle, go to DC9. ● Run engine up 1500 rpm for 5 seconds, then bring it back to idle. ● Access MAF PID (MAF V PID) with a Scan Tool. ● Key off. ● Was MAF PID (MAF V PID) less than 0.39 volt (refer to Voltage to Mass Air Flow Conversion Table at beginning of this pinpoint test)?	Yes No	▶ GO to DC7. ▶ For KOER reading between 1.25 and 3.44 gm/sec. (0.60 and 1.00 volt) (refer to Voltage To Mass Air Flow Conversion Table at the beginning of this pinpoint test): GO to DC15. All others: GO to DC2.
DC7	CHECK VPWR VOLTAGE TO MAF SENSOR		
	● Disconnect MAF sensor. ● Key on, engine off. ● Measure the VPWR circuit voltage at the MAF sensor harness connector. ● Key off. ● Was voltage greater than 10.5 volts?	Yes No	▶ GO to DC8. ▶ REPAIR open circuit. RESTORE vehicle. RESET Keep Alive RandomAccess Memory (RAM). RERUN Quick Test.

Test Step		Result	Action to Take
DC8	CHECK FOR OPEN VPWR CIRCUIT BETWEEN PCM AND MAF SENSOR	Yes No	GO to DC9 . REPAIR open circuit. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
- MAF sensor disconnected. - Install breakout box, leave PCM disconnected. - Measure resistance of VPWR circuit between PCM test pin 71 and MAF sensor harness connector. - Is resistance less than 5.0 ohms?			
DC9	CHECK MAF CIRCUIT FOR SHORT TO PWR GND OR MAF RTN IN HARNESS	Yes No	GO to DC10 . REPAIR short circuit. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
- Disconnect scan tool from DLC. - Measure resistance between PCM test pin 88 and PCM test pins 51, 103 and 36. - Are all resistances greater than 10,000 ohms?			
DC10	CHECK MAF RTN CIRCUIT FOR SHORT TO PWR GND IN HARNESS	Yes No	RECONNECT scan tool to DLC. GO to DC11 . REPAIR short circuit. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
- Measure resistance between PCM test pin 36 and PCM test pins 51 and 103. - Are both resistances greater than 10,000 ohms?			
DC11	CHECK MAF CIRCUIT FOR OPEN IN HARNESS	Yes No	GO to DC12 . REPAIR open circuit. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
- Measure resistance of MAF circuit between PCM test pin 88 and MAF sensor harness connector. - Is resistance less than 5.0 ohms?			

Test Step		Result	Action to Take
DC12	CHECK VOLTAGE BETWEEN VPWR AND PWR GND CIRCUITS TO MAF SENSOR		
	- Reconnect PCM to breakout box. - Key on, engine off. - Measure voltage between VPWR and PWR GND circuits at the MAF sensor harness connector. - Key off. Was voltage greater than 10.5 volts?	Yes No	GO to DC14 . GO to DC13 .
DC13	CHECK PWR GND CIRCUIT FOR OPEN IN HARNESS		
	- Disconnect PCM. - Disconnect scan tool from DLC. - Measure resistance of PWR GND circuit between MAF sensor and battery negative post. Is resistance less than 10 ohms?	Yes No	RECONNECT scan tool. GO to DC14 . REPAIR open circuit. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
DC14	CHECK MAF RTN CIRCUIT FOR OPEN IN HARNESS		
	- Measure resistance of MAF RTN circuit between PCM test pin 36 and MAF sensor harness connector. Is resistance less than 5.0 ohms?	Yes No	GO to DC15 . REPAIR open circuit. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
DC15	CHECK MAF CIRCUIT FOR SHORTS TO PWR GND OR MAF RTN		
	- Reconnect PCM to breakout box. - Disconnect scan tool from DLC. - Measure resistance between PCM test pin 88 and PCM test pins 36, 51 and 103. Are all resistances greater than 10,000 ohms?	Yes No	GO to DC16 . REPLACE the PCM. RESTORE vehicle. RERUN Quick Test.
DC16	CHECK MAF RTN CIRCUIT FOR SHORT TO PWR GND IN PCM		
	- Measure resistance between PCM test pin 36 and PCM test pins 51 and 103. Are both resistances greater than 10,000 ohms?	Yes No	RECONNECT scan tool. GO to DC17 . REPLACE PCM. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
DC17	CHECK MAF CIRCUIT VOLTAGE TO PCM		
	● Reconnect MAF sensor. ● Key on, engine running. ● If a stabilized idle is not at least 700 rpm, go to Symptom Charts. ● Measure voltage of MAF circuit between PCM test pin 88 and battery negative post. ● Key off. ● Was voltage at idle between 0.34 and 1.96 volts?	Yes No	GO to DC18 . REPLACE MAF sensor. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
DC18	CHECK VOLTAGE BETWEEN MAF AND MAF RTN AT PCM		
	● Key on, engine running. ● Measure voltage between PCM test pins 88 and 36. ● Key off. ● Was voltage between 0.34 and 1.96 volts?	Yes No	GO to DC19 . REPLACE MAF sensor. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
DC19	CHECK MAF CIRCUIT VOLTAGE WITH SCAN TOOL		
	● Key on, engine running. ● Access MAF PID (MAF V PID) with a scan tool at idle. ● Key off. ● Was MAF PID (MAF V PID) at idle between 0.34 and 1.96 volts (refer to Voltage To Mass Air Flow Conversion Table at the beginning of this Pinpoint Test)?	Yes No	Unable to identify fault at this time. RESTORE vehicle. GO to Pinpoint Test Step Z1 . If an idle concern is not present: REPLACE PCM. RESTORE vehicle. RERUN Quick Test. If a fault was not detected and an idle concern is still present: RESTORE vehicle. Disregard DTC P0102 at this time. RETURN to Diagnostic Subroutines.

Test Step		Result	Action to Take
DC20	DTC P0103: CHECK MAF SENSOR SIGNAL HIGH INPUT TO PCM		
Diagnostic Trouble Code (DTC) P0103 indicates the MAF sensor signal went above 3.90 volts (refer to Voltage To Mass Air Flow Conversion Table at the beginning of this Pinpoint Test) sometime during normal engine operation (Continuous), during Key On Engine Off Self-Test, or during Key On Engine Running Self-Test. NOTE: DTC P0103 can be generated by foreign material blocking the MAF sensor screen causing an air flow restriction. If contaminants are found on the screen, check air cleaner element installation in air cleaner housing and proper sealing of air cleaner and air tubes before proceeding. Rerun Quick Test after service. Possible causes: — Blocked MAF sensor screen. — Damaged MAF sensor. — MAF SIG harness short to VPWR. — Damaged PCM. ● Start engine and bring to idle. ● If a KOER DTC P0505 is present, go to Powertrain Diagnostic Trouble Code (DTC) Charts. For 2.5L A/T Ranger that stalls and cannot maintain an idle, replace PCM. ● Run throttle up to 1500 rpm for 5 seconds, and bring it back to idle. ● NOTE: MAF PID (MAF V PID) should be greater than 3.90 volt (refer to Voltage To Mass Air Flow Conversion Table at the beginning of this Pinpoint Test). Access MAF PID (MAF V PID) with a scan tool. ● Key off. ● Disconnect MAF sensor. ● Jumper PWR GND and MAF RTN circuit pins at the MAF sensor vehicle harness connector. ● Key on, engine running. ● Again access MAF PID (MAF V PID) with a scan tool. ● Key off. ● Does MAF PID (MAF V PID) drop from the previous reading to below 0.39 volt (refer to Voltage To Mass Air Flow Conversion Table at the beginning of this Pinpoint Test)?		Yes	▶ REPLACE MAF sensor. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
		No	▶ RESTORE vehicle. GO to DC21 .

Test Step		Result	Action to Take
DC21	CHECK MAF CIRCUIT FOR SHORT TO VPWR IN HARNESS		
	● Install breakout box, leave PCM disconnected. ● Key on, engine off. ● Measure voltage between PCM test pins 88 and 24 or 103. ● Key off. ● Was voltage less than 1.0 volt?	Yes No	▶ GO to DC22. ▶ REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
DC22	CHECK MAF CIRCUIT FOR SHORT TO VREF IN HARNESS		
	● Measure resistance between PCM test pins 88 and 90. ● Is resistance greater than 10,000 ohms?	Yes No	▶ If an idle concern is not present: REPLACE PCM. RESTORE vehicle. RERUN Quick Test. If a fault was not detected and an idle concern is still present: RESTORE vehicle. Disregard DTC P0102 at this time. RETURN to Diagnostic Subroutines. ▶ REPAIR short circuit. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.

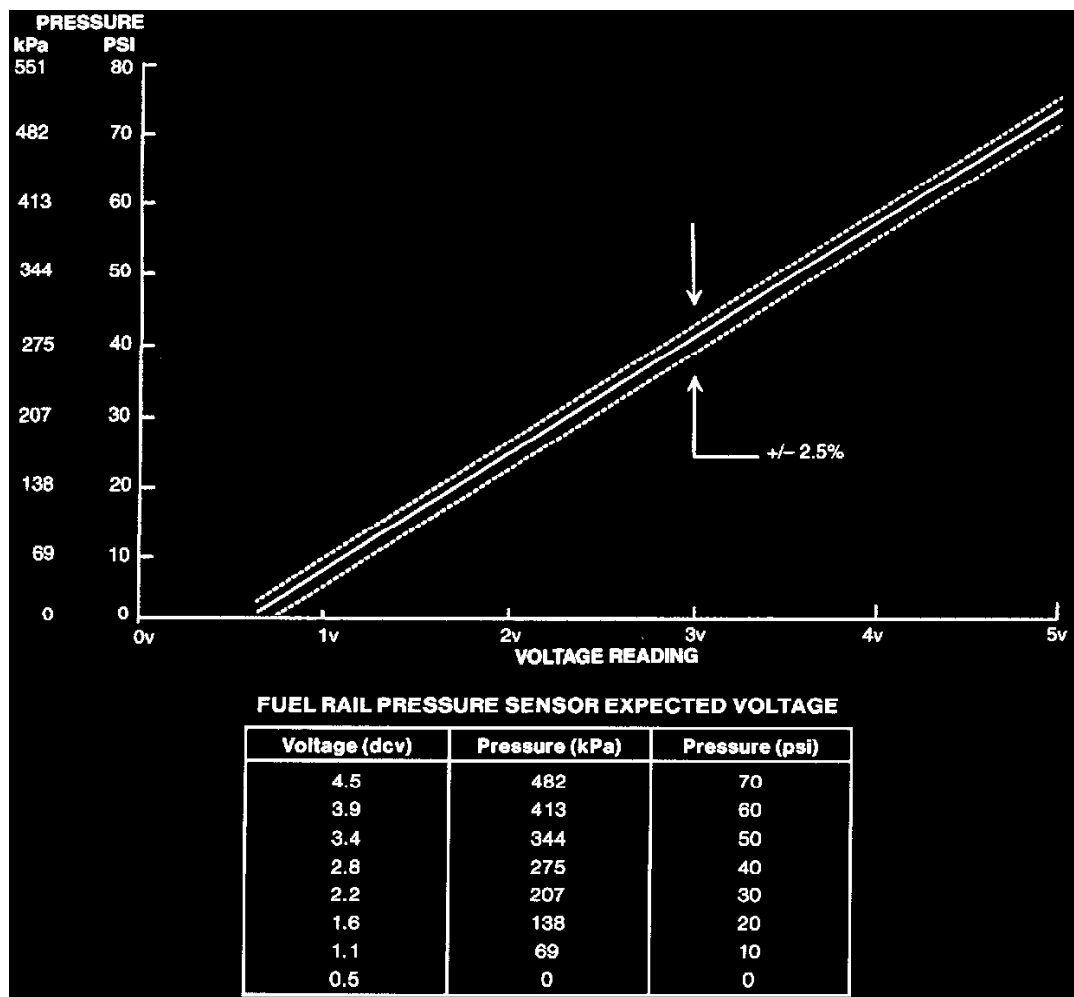
Test Notes

Enter this pinpoint test only when directed here.

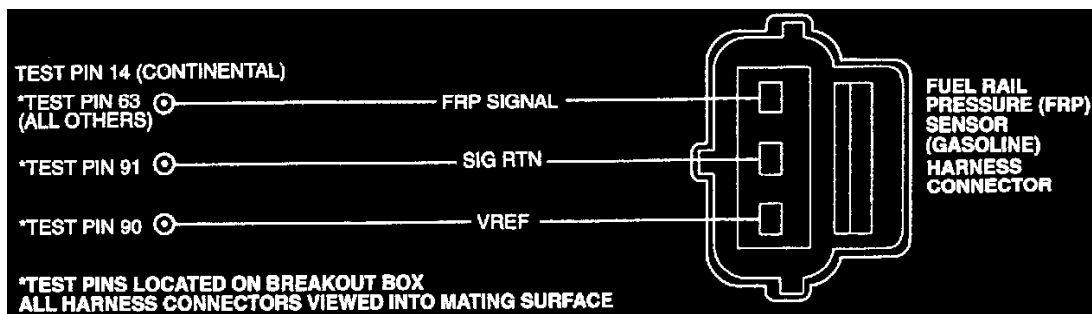
This pinpoint test is intended to diagnose the following:

- Fuel Rail Pressure (**FRP**) Sensor
- Harness Circuits: FRP and SIG RTN
- Powertrain Control Module

Tables and Graphs



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
DD1	DTC P0192: VERIFY DTC WITH FRP PID		
	Diagnostic Trouble Code (DTC) P0192 indicates the FRP sensor signal is less than Self-Test minimum. The FRP sensor minimum is 0.3 volt at 0 kPa (0 psi) (for gasoline) and 0.5 volt at 345 kPa (50 psi) for natural gas (NG) vehicle. Possible causes: — FRP signal shorted to SIG RTN or PWR GND. — FRP signal open (NG or Continental). — Low fuel pressure (NG only). — Damaged FRP sensor. — Damaged PCM. ● Key off. ● Connect scan tool. ● Key on, engine off. ● Verify there is sufficient fuel (NG only). ● Access FRP PID. ● Is the FRP PID voltage less than 0.2 volt?	Yes No	► For NG vehicles: GO to DD2. ► All others: Fault is present, GO to DD3. ► Fault may be intermittent. GO to DD12.
DD2	CHECK FUEL PRESSURE (NATURAL GAS)		
	● Install fuel pressure gauge. ● Key on engine running. ● Obtain a pressure reading. ● Key off. ● Was the fuel pressure reading greater than 345 kPa (50 psi)?	Yes No	► GO to DD3. ► GO to Pinpoint Test HB1 for NG vehicles.
DD3	GENERATE OPPOSITE SIGNAL		
	● Disconnect FRP harness connector from FRP sensor. ● Jumper FRP SIG pin to VREF pin at the FRP sensor harness connector. ● NOTE: If any scan tool communication concern exists, remove jumper and go to DD23. Access FRP V PID. ● Key on. ● Is the FRP V PID voltage greater than 4.6 volts?	Yes No	► FRP sensor is damaged. REPLACE EFTA sensor. RESTORE Vehicle. RERUN Quick Test. ► VREF or FRP SIG open in the harness or PCM, FRP SIG shorted to SIG RTN or GND in the harness or PCM. RESTORE vehicle. GO to DD4
DD4	CHECK VREF VOLTAGE TO FRP SENSOR		
	● Key on, engine off. ● Measure voltage between VREF and SIG RTN circuits at the FRP sensor harness connector. ● Key off. ● Was the voltage between 4.0 and 6.0 volts?	Yes No	► GO to DD5. ► VREF is out of range. RESTORE vehicle. GO to Pinpoint Test Step C1.

Test Step		Result	Action to Take
DD5	CHECK FRP CIRCUIT FOR OPEN IN HARNESS		
	● Install breakout box, leave PCM disconnected. ● Measure resistance of FRP SIG circuit between PCM test pin (refer to schematic at beginning of pinpoint test for PCM test pin number for FRP circuit) and FRP sensor harness connector. ● Is the resistance less than 5.0 ohms?	Yes No	► GO to DD6 . ► REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
DD6	CHECK FRP CIRCUIT FOR SHORTS TO SIG RTN AND PWR GND IN HARNESS		
	● Measure resistance of FRP circuit between PCM Test Pin (refer to schematic at the beginning of pinpoint test for PCM test pin number for FRP circuit), PCM Test Pin 91 and PCM Test Pins 24, 91 and 103. ● Are both resistances greater than 10,000 ohms?	Yes No	► REPLACE PCM. RESTORE vehicle. RERUN Quick Test. ► REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
DD7	DTC P0193: CHECK FUEL PRESSURE		
	Diagnostic Trouble Code (DTC) P0193 indicates the FRP sensor signal is greater than Self-Test maximum. The FRP sensor maximum is 4.7 volts at 482 kPa (70 psi)(for gasoline) and 4.5 volts at 1034 kPa (150 psi) for natural gas vehicles. Possible causes: — FRP signal shorted to VREF or VPWR. — FRP signal open (gasoline) (except NG and Continental). — Damaged PCM. — Damaged FRP sensor. — FRP signal shorted to VREF or VPWR. — High fuel pressure (caused by damaged fuel pressure regulator) NG. ● Connect scan tool. ● Key on. ● Access and monitor FRP V PID. ● Is the FRP V PID voltage greater than 4.5 for NG and 4.8 for all others?	Yes No	► For gasoline vehicles: GO to DD9 . For NG vehicles: GO to DD8 . ► Fault may be intermittent. GO to DD14 .
DD8	CHECK FUEL PRESSURE (NATURAL GAS)		
	● Install fuel pressure gauge. ● Key on engine running. ● Obtain a pressure reading. ● Key off. ● Was the fuel pressure reading greater than 1034 kPa (150 psi)?	Yes No	► GO to Pinpoint Test HB1 for NG vehicles. ► GO to DD9 .

Test Step		Result	Action to Take
DD9	DTC P0193: GENERATE OPPOSITE SIGNAL		
	● Disconnect FRP sensor. ● For Escort / Tracer (only) jumper FRP SIG pin (refer to schematic at beginning of pinpoint test for PCM test pin number for FRP circuit) to SIG RTN pin at the FRP sensor harness connector. ● Key on, engine off. ● Access FRP V PID. ● NOTE: If any scan tool communication concern exists, remove jumper and go to DD23. Key off. ● Was the FRP V PID voltage less than 0.2 volt?	Yes No	▶ REPLACE EFTA sensor. RESTORE Vehicle. RERUN Quick Test. ▶ GO to DD11.
DD10	DTC P0190: CHECK VREF TO FRP SENSOR		
	Possible causes: — VREF open in harness. — VREF open in sensor. ● Disconnect FRP sensor. ● Key on, engine off. ● Measure voltage between VREF and SIG RTN circuits at the FRP sensor harness connector. ● Is the voltage between 4.0 and 6.0 volts?	Yes No	▶ GO to DD12. ▶ GO to DD11.
DD11	CHECK FRP CIRCUIT, SIG RTN CIRCUIT AND VREF CIRCUIT FOR OPEN IN HARNESS		
	● Install breakout box, leave PCM disconnected. ● Measure resistance of FRP circuit between PCM test pin (refer to schematic at beginning of pinpoint test for PCM test pin number for FRP circuit) and FRP sensor at the harness connector. ● Measure resistance of SIG RTN circuit between PCM test pin 91 and FRP sensor harness connector. ● Measure resistance of VREF circuit between PCM test pin 90 and FRP sensor harness connector. ● Is each resistance less than 5.0 ohms?	Yes No	▶ GO to DD12. ▶ REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
DD12	CHECK FRP SENSOR RESISTANCE		
- Measure resistance between FRP SIG (refer to schematic at beginning of pinpoint test for PCM test pin number for FRP circuit) and VREF pins at the FRP sensor. - Measure resistance between FRP SIG and SIG RTN pins at the sensor. - Is each resistance between 30K - 40K ohms?		Yes	► For continuous memory DTC P0190 only: GO to DD14. For DTC P0192: REPLACE PCM. RESTORE vehicle. RERUN Quick Test. DTC P0193: GO to DD13.
		No	► REPLACE FRP sensor. RESTORE vehicle. RERUN Quick Test.
DD13	CHECK FRP CIRCUIT FOR SHORT TO VREF OR VPWR IN HARNESS		
- Install breakout box, leave PCM disconnected. - Measure resistance of FRP circuit between PCM Test Pin (refer to schematic at beginning of pinpoint test for PCM test pin number for FRP circuit) and PCM Test Pins 90 and 71. - Are both resistances greater than 10,000 ohms?		Yes	► REPLACE PCM. RESTORE vehicle. RERUN Quick Test.
		No	► REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
DD14	WIGGLE TEST SENSOR AND HARNESS		
- Key on, engine off. - Access FRP V with scan tool. - Observe FRP V for an indication of a fault while performing the following: - Lightly tap on the FRP sensor, wiggle the FRP sensor connector and harness between the FRP sensor and PCM. A fault is indicated by a sudden change in the FRP V PID voltage. - Is a fault indicated?		Yes	► ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
		No	► Unable to duplicate and/or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: FRP V and VREF PIDs and list of possible causes.

DD15 - DD24

DD15 - KOEO, KOER DTC P0191 AND CONTINUOUS DTCS 1168,1169: CHECK FUEL PRESSURE

Diagnostic Trouble Code (DTC) P0191 indicates the FRP sensor has exceeded the Self-Test Calibration limits and can only be retrieved during KOEO and KOER Self-Test.

DTC P0191: (FRP) circuit malfunction

low limit (gas)	1.6 volts @ 138 kPa (20 psi)
low limit (NG)	1.3 volts @ 586 kPa (70 psi)
high limit (gas)	3.9 volts @ 413 kPa (60 psi)
high limit (NG)	3.7 volts @ 724 kPa (130 psi)

Continuous DTC P1168 indicates the FRP sensor reading is too low. Continuous DTC P1169 indicates the FRP sensor reading is too high. DTC 1168 low limit is **551 kPa (80 psi)**. DTC 1169 high limit is **896 kPa (130 psi)**.

Possible causes:

- High fuel pressure.
- Low fuel pressure.
- Damaged FRP sensor.
- Excessive resistance.
- Low or no fuel.

Key on.

Verify there is sufficient fuel (one eighth tank or greater).

Key off.

Fuel pressure gauge connected to Schrader valve.

Key on engine running.

Is the pressure reading within 138 kPa (20 psi) and 413 kPa (60 psi) for gasoline, or 552 kPa (80 psi) and 827 kPa (120 psi) for natural gas vehicles (NG)?

YES GO to DD16.

NO REMOVE pressure gauge. GO to Pinpoint Test Step HC1 for gasoline or HB1 for NG vehicles. See: HC - Fuel Delivery System

DD16 - CHECK FUEL PRESSURE WITH PID

Connect scan tool.

Install fuel pressure gauge.

Key on.

Access and monitor FRP PID.

Is the FRP pressure reading within 10 PSI of the fuel pressure gauge reading?

YES For DTCS P1168 or P1169: Complete PCM Reset to clear DTCS. DRIVE vehicle 3-5 minutes at a steady speed state. CHECK for Continuous Memory DTC P1168 or P1169. IF P1168 or P1169 is displayed, GO to DD18. All others: RERUN Quick Test.

NO For NG Vehicle: GO to DD18.
All others: GO to DD19.

DD17 - CHECK FUEL PRESSURE WITH FRP PID

Connect scan tool.

Fuel pressure gauge connected.

Key on.

Access and monitor FRP PID.

Is the FRP pressure reading within 10 PSI of the fuel pressure gauge reading?

YES RERUN Quick Test.

NO For NG vehicle: GO to DD18.
All others: GO to DD19.

DD18 - CHECK THAT FUEL RAIL SOLENOID SHUT-OFF VALVE OPENS

Key on.

Access and enter the Output Test Mode.

Cycle output ON and then OFF several times.

Key off.

Was a click felt or heard from the fuel rail solenoid shut-off valve?

YES EXIT Output Test Mode. RECONNECT solenoid valve. GO to DD19.

NO GO to DD22.

DD19 - CHECK VREF VOLTAGE TO FRP SENSOR

Disconnect FRP sensor.

Key on, engine off.

Measure voltage between VREF and SIG RTN circuits at the FRP sensor harness connector.

Key off.

Was the voltage reading between 4.0 and 6.0 volts?

YES GO to DD20.

NO RESTORE vehicle. GO to Pinpoint Test Step C1. See: C - Reference Voltage (VREF)

DD20 - CHECK FRP CIRCUIT RESISTANCES IN HARNESS

Install breakout box, leave PCM disconnected.

Measure resistance of FRP circuit between PCM test pin (refer to schematic at beginning of pinpoint test for PCM test pin number for FRP circuit) and the FRP sensor at the harness connector.

Measure resistance of SIG RTN circuit between PCM test pin 91 and FRP sensor harness connector.

Measure resistance of VREF circuit between PCM test pin 90 and FRP sensor harness connector.

Is each resistance less than 5.0 ohms?

YES RESTORE vehicle. GO to DD21.

NO REPAIR open or cause of high resistance. RESTORE vehicle. RERUN Quick Test.

DD21 - MONITOR FRP V PID WITH SCAN TOOL

Key on, engine off.

Access and monitor FRP V PID.

Is the FRP V PID value less than 0.2 volt for NG and Continental, and greater than 4-8 volts for Escort/Tracer?

YES REPLACE FRP sensor. RESTORE vehicle. RERUN Quick Test.

NO REPLACE PCM. RESTORE vehicle. RERUN Quick Test.

DD22 - CHECK VPWR VOLTAGE TO FUEL RAIL SOLENOID SHUT-OFF VALVE HARNESS CONNECTOR

Key on.

Access and enter Output Test Mode on the scan tool.

Select: ALL ON.

Disconnect the fuel rail solenoid shut-off valve at the harness connector.

Note: Measurement must be made within 7 seconds of activating test mode.

Measure VPWR circuit voltage between the fuel rail solenoid shut-off valve harness connector and battery negative post.

Is the voltage reading greater than 10.5 volts?

YES GO to DD23.

NO REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

DD23 - CHECK GROUND CIRCUIT FOR OPEN IN HARNESS

Access and enter Output Test Mode on the scan tool.

Select: ALL ON.

Note: Measurement must be made within 7 seconds of activating test mode.

Measure VPWR voltage between the VPWR and ground circuits at the fuel rail solenoid shut-off valve harness connector.

Is the voltage reading greater than 10.5 volts?

YES REPLACE fuel rail solenoid shut-off valve. RESTORE vehicle. RERUN Quick Test.

NO REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

DD24 - CHECK VREF VOLTAGE TO FRP SENSOR

Disconnect FRP sensor.

Key on, engine off.

Measure voltage between VREF and SIG RTN circuits at the FRP harness connector.

Is the voltage between 4.0 and 6.0 volts?

YES GO to DD25.

NO VREF is out of range. RECONNECT FRP sensor. GO to Pinpoint Test Step C1. See: C - Reference Voltage (VREF)

DD25 - CHECK FOR FRP SIGNAL CIRCUIT SHORTED TO SIG RTN OR PWR GND IN HARNESS

Disconnect scan tool from DLC.

Install breakout box, leave PCM disconnected.

Measure resistance of FRP circuit between PCM test pin (refer to schematic at beginning of pinpoint test for PCM test pin number for FRP circuit) and PCM test pins 90, 91, 24, 103

Is the resistance greater than 10,000 ohms?

YES FRP SIG is shorted to SIG RTN or PWR GND in the PCM. REPLACE PCM. RESTORE vehicle. RERUN Quick Test.

NO FRP SIG shorted to SIG RTN or PWR GND in harness REPAIR short. RESTORE vehicle. RERUN Quick Test.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Knock Sensor (**KS**)
- Harness circuits: KS and SIG RTN
- Powertrain control module



Test Step		Result	Action to Take
DG1	CHECK VOLTAGE BETWEEN SENSOR AND SIG RTN		
	Diagnostic Trouble Codes (DTCs) P0326 and P0325 with MIL on indicate spark knock system failed. Possible causes: — Open or short in harness. — Damaged knock sensor. — Damaged PCM. NOTE: A lack of power may result and/or audible knock may occur when the vehicle is operated with a breakout box installed at the PCM. If this occurs, remove breakout box and retest for symptom. • Verify that KS is connected. Then complete comprehensive repair verification drive cycle. • Install breakout box, connect PCM to breakout box. • Key on. • Read dc voltage between PCM Test Pins 57 and 91 (SIGRTN) at the breakout box. • Key off. • Was the voltage less than 0.5 volts?	Yes No	GO to DG2. GO to DG6.
DG2	CHECK KS CIRCUIT FOR INTERMITTENT FAULT		
	• Connect ohmmeter across the KS Test Pin and SIG RTN Test Pin. • While viewing the ohmmeter, grasp the vehicle harness as close to the knock sensor(s) as possible. Shake and bend a small section of the harness from the KS sensor to the PCM. • Tap the PCM and KS connectors if possible. • Is KS reading changing?	Yes No	ISOLATE fault and REPAIR as required. RESTORE vehicle. COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. RERUN Quick Test. GO to DG3.
DG3	CHECK KS SENSOR RESISTANCE		
	• Disconnect PCM from breakout box. • KS connected. • For 4.2L F250: Measure resistance between PCM test pin 57 (KS+) and PCM test pin 32 (KS-). • All others: Measure resistance between PCM test pins 57 and 91. • Is resistance between 4.39 and 5.35 megaohm?	Yes No	For Escort/Tracer, 4.2L F-250: GO to DG8. All others: GO to DG7. For resistance greater than 5.35 megaohm: GO to DG4. For resistance less than 4.39 megaohm: GO to DG5.

Test Step		Result	Action to Take
DG4	CHECK FOR OPEN OF KS CIRCUIT BETWEEN KS SIGRTN AND SHIELD IN HARNESS		
	- Disconnect suspect KS. - Measure resistance of KS between PCM test pin 57 and KS harness connector. For 4.2L F250: Measure resistance of KS circuit between PCM test pin 32 and same pin at harness connector. All others: Measure resistance of circuit between PCM test pin 91 (SIG RTN) and at the harness connector. - Where applicable, measure resistance of shield between PCM Test Pin 24 and shield harness connector. Is each resistance less than 5.0 ohms?	Yes No	REPLACE KS. REPAIR open circuit. RESTORE vehicle. COMPLETE Comprehensive Component Repair Verification Drive Cycle. RERUN Quick Test.
DG5	CHECK KS CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- KS disconnected. Measure resistance between PCM Test Pins 32 and 91 and 77 / 103 and chassis GND. - Measure resistance between PCM Test Pin 57 (KS+) and Test Pin 91 (SIG RTN) and 77 / 103, (PWR GND) chassis GND. For 4.2L F-250 Only: Measure resistance between PCM Test Pins 57 and 32. Is each resistance greater than 10,000 ohms?	Yes No	REPLACE suspect KS. RESTORE vehicle. COMPLETE Comprehensive Component Repair Verification Drive Cycle. RERUN Quick Test. SERVICE short circuit. RESTORE vehicle. COMPLETE Comprehensive Component Repair Verification Drive Cycle. RERUN Quick Test.
DG6	CHECK KS CIRCUITS FOR SHORT TO POWER IN HARNESS		
	- Key on, engine off. - Measure voltage between the PCM Test Pins 57 (KS+) and PCM Test Pins 77 / 103, (PWR GND). For 4.2L F250 Only: Measure voltage between PCM Test Pin 32 and 77 or 103. Is voltage less than 0.5 volt?	Yes No	REPLACE PCM. RESTORE vehicle. COMPLETE Comprehensive Component Repair Verification Drive Cycle. RERUN Quick Test. SERVICE short circuit. RESTORE vehicle. COMPLETE Comprehensive Component Repair Verification Drive Cycle. RERUN Quick Test.

Test Step		Result	Action to Take
DG7	CHECK SHIELD CIRCUIT RESISTANCE		
- Measure resistance between PCM Test Pin 24 at the breakout box and the shield pin at the harness connector. - Is resistance less than 5.0 ohms?		Yes	GO to DG8 . REPLACE KS. REMOVE breakout box. RESTORE vehicle. COMPLETE Comprehensive Component Repair Verification Drive Cycle. RERUN Quick Test.
		No	REPAIR open circuit. RESTORE vehicle. COMPLETE Comprehensive Component Repair Verification Drive Cycle. RERUN Quick Test.
DG8	CHECK PCM FOR SHORT TO GROUND		
- Connect PCM to breakout box. - Measure resistance between PCM Test Pin 57 (KS+) and Test Pin 91 (SIG RTN). - For 4.2L F-250 Only: Measure resistance between PCM Test Pin 57 and 32. - Is resistance greater than 10,000 ohms?		Yes	REPLACE KS. RERUN Quick Test, if concern is still present, REPLACE PCM. REMOVE breakout box. RESTORE vehicle. COMPLETE Comprehensive Component Repair Verification Drive Cycle. RERUN Quick Test.
		No	REPLACE PCM. REMOVE the breakout box. RESTORE vehicle. COMPLETE Comprehensive Component Repair Verification Drive Cycle.
DG15	CHECK KS SENSOR VOLTAGE		
Diagnostic Trouble Codes (DTCs) P0326 (KS1) and P0331 (KS2) indicate spark knock has not been sensed. DTCs P0325 (KS1) and P0330 (KS2) with MIL on indicate spark knock system failed. Possible causes: - PCM not receiving the signal at high altitude. - Open or short in harness. - Damaged knock sensor. - Damaged PCM. - Install breakout box, connect PCM to breakout box. - Key on. - Read DC voltage between PCM Test Pin 57 (or 32) and 91 at the breakout box. - Key off. - Was the reading between 2.2 and 2.6 volts?		Yes	GO to DG16 .
		No	Less than 2.2 volts: GO to DG18. Greater than 2.6 volts: GO to DG20.

Test Step		Result	Action to Take
DG16	CHECK KS CIRCUIT FOR INTERMITTENT FAULT		
● Key on. ● While viewing the voltmeter, grasp the vehicle harness as close to the knock sensor(s) as possible. Shake and bend a small section of the harness from the KS sensor to the PCM. ● Tap the PCM and KS connectors if possible. ● Is KS reading changing?		Yes	ISOLATE fault and SERVICE as required. REMOVE breakout box. RECONNECT PCM. COMPLETE Comprehensive Component Repair Verification Drive Cycle. RERUN Quick Test.
		No	GO to DG17 .
DG17	CHECK FOR VOLTAGE INCREASE		
● Disconnect scan tool. ● Start and run engine. ● Monitor voltage on the AC setting at idle and at 3000 rpm between the suspect knock sensor Test Pin and SIG RTN Test Pin at the breakout box. ● Does the AC voltage reading increase?		Yes	RETURN to Symptom Charts. All others with DTC: REPLACE PCM. RESTORE vehicle. COMPLETE Comprehensive Component Repair Verification Drive Cycle. RERUN Quick Test.
		No	GO to DG18 .
DG18	CHECK KS CIRCUIT FOR OPEN IN HARNESS		
● PCM disconnected. ● Disconnect suspect KS. ● Measure resistance of the KS signal circuit between PCM Test Pin 57 (or 32) at the breakout box and the same signal pin at the harness connector. ● Measure resistance of the SIG RTN between Test Pin 91 at the breakout box and the same SIG RTN pin at the harness connector. ● Where applicable, measure resistance between PCM Test Pin 24 and the shield pin at the harness connector. ● Is each resistance less than 5.0 ohms?		Yes	GO to DG19 .
		No	REPAIR open circuit. RESTORE vehicle. COMPLETE Comprehensive Component Repair Verification Drive Cycle. RERUN Quick Test.
DG19	CHECK KS CIRCUIT FOR SHORT TO GROUND		
● Measure resistance between PCM Test Pins 57 (or 32) and 91 and 77 / 103 and chassis GND. ● Is each resistance greater than 10,000 ohms?		Yes	REPLACE suspect KS. RESTORE vehicle. COMPLETE Comprehensive Component Repair Verification Drive Cycle. RERUN Quick Test.
		No	REPAIR short circuit. RESTORE vehicle. COMPLETE Comprehensive Component Repair Verification Drive Cycle. RERUN Quick Test.
DG20	CHECK KS CIRCUITS FOR SHORT TO POWER		
● PCM disconnected from breakout box. ● KS disconnected. ● Key on, engine off. ● Measure voltage between the PCM Test Pins 57 (or 32) and 77 or 103. ● Is voltage less than 0.5 volt?		Yes	REPLACE PCM. RESTORE vehicle. COMPLETE Comprehensive Component Repair Verification Drive Cycle. RERUN Quick Test.
		No	REPAIR short circuit. RESTORE vehicle. COMPLETE Comprehensive Component Repair Verification Drive Cycle. RERUN Quick Test.

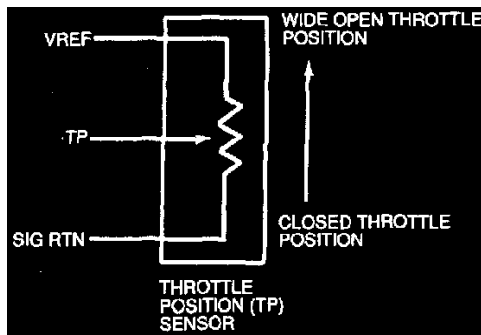
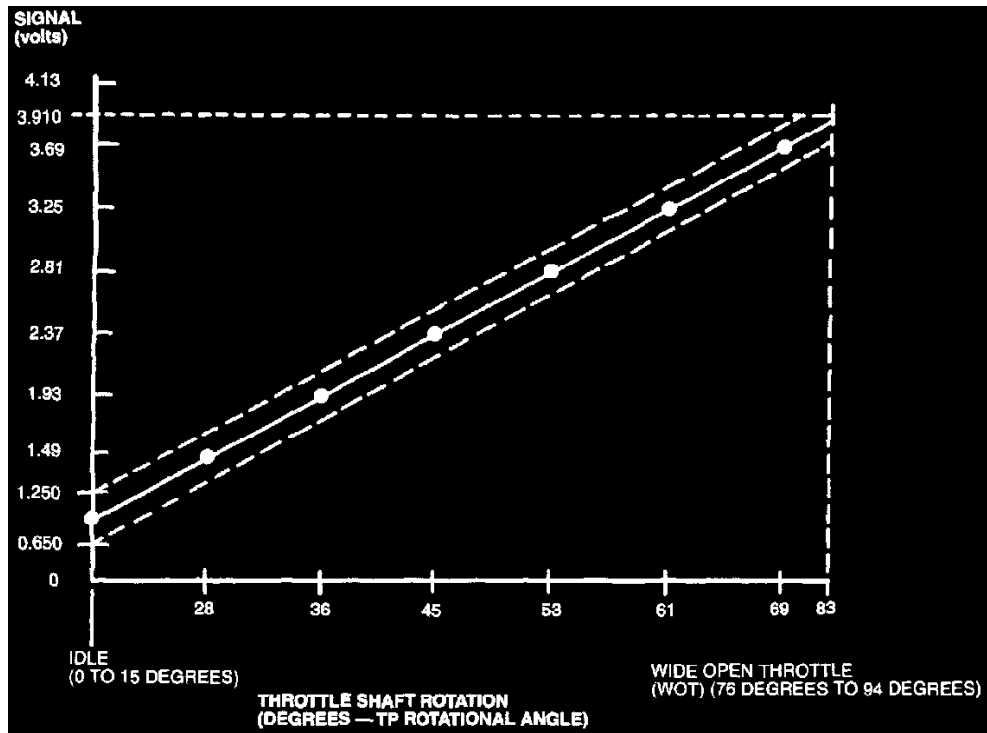
Test Notes

Enter this pinpoint test only when directed here.

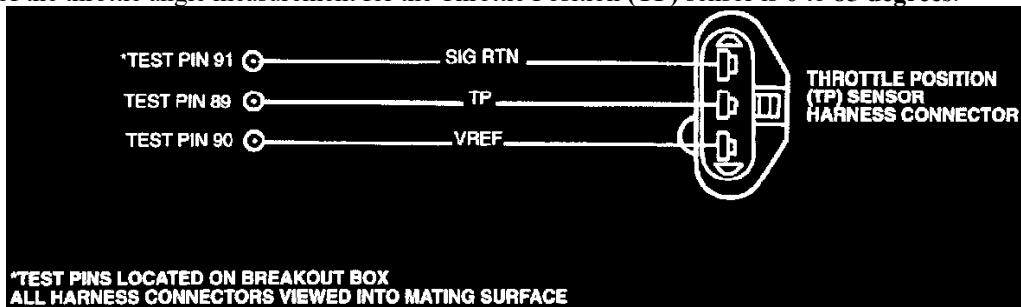
This pinpoint test is intended to diagnose the following:

- Throttle Position (TP) Sensor
- Binding and sticking throttle linkage
- Harness Circuits: TP, SIG RTN, VREF, Vehicle Power (VPWR), Power Ground (PWR GND)
- Powertrain Control Module

Tables and Graphs



NOTE: The normal range of the throttle angle measurement for the Throttle Position (TP) sensor is 0 to 85 degrees.



Test Step		Result	Action to Take
DH1	KOEO AND KOER DTC P1124: CHECK FOR OTHER DTCS		
	Key On Engine Off (KOEO) and Key On Engine Running (KOER) Diagnostic Trouble Code (DTC) P1124 indicates the throttle position (TP) sensor's rotational setting and signal are not in the Self-Test range of 13.23% to 24.02% (0.66 to 1.20 volts). Possible causes: — Binding or bent throttle linkage. — TP sensor not seated properly (tightened down). — Throttle plate below closed throttle position. — Throttle plate / screw misadjusted. — Damaged TP sensor. — Damaged PCM. • Check for DTC P1400 in KOEO or KOER Self-Test. • Is KOEO or KOER DTC P1400 present with KOEO DTC P1124?	Yes No	ADDRESS those DTCS GO to DH2.
DH2	CHECK FOR STUCK THROTTLE PLATE OR LINKAGE		
	• Visually inspect the throttle linkage and throttle plate for binding or sticking. • Verify the throttle plate and linkage is at closed throttle position. • Does the throttle move freely and return to closed throttle position?	Yes No	Throttle plate and linkage are OK. GO to DH3. REPAIR as necessary. RERUN Quick Test.
DH3	DTC P1120: CHECK TP CIRCUIT FOR FRAYED WIRES OR CORROSION ON CONNECTORS		
	Diagnostic Trouble Code (DTC) P1120 indicates the TP signal is within the Self-Test range but below the closed throttle position range of 3.43% to 9.80% (0.17 to 0.49 volt). Possible causes: — Frayed wires. — Corrosion on TP sensor, PCM or harness connectors. — VREF harness opens or shorts. — Damaged TP sensor. — Damaged PCM. • Perform a complete visual inspection of pins on harness connector at the TP sensor for corrosion. • Perform a complete visual inspection of the harness wires between the TP sensor and the PCM for insulation fraying and corrosion. • Is a fault present?	Yes No	REPAIR as necessary. COMPLETE PCM Reset to clear all DTCs. RERUN Quick Test. GO to DH4.

Test Step		Result	Action to Take
DH4	CHECK FOR STUCK TP SENSOR		
- Connect scan tool. - Key on, engine off. - Access TP PID (TP V PID). - Slowly move throttle from closed throttle position to wide open throttle position and observe the TP PID (TP V PID). - Key off. While opening the throttle, was the TP PID (TPV PID) reading below 9.80% (0.49 volt)?		Yes	GO to DH5 .
		No	GO to DH20 .
DH5	CHECK VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS TO TP SENSOR		
- 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?		Yes	GO to DH6 .
		No	RESTORE vehicle. GO to Pinpoint Test Step C1 .
DH6	CHECK TP CIRCUIT FOR OPEN IN HARNESS		
- Install breakout box, leave PCM disconnected. - Measure resistance of TP circuit between PCM test pin 89 and TP harness connector. Is resistance less than 5.0 ohms?		Yes	GO to DH7 .
		No	REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
DH7	CHECK TP SENSOR VOLTAGE TO PCM		
- Key off. - Reconnect PCM to breakout box. - Reconnect TP sensor. - Start engine and idle for 2 minutes. - Slowly open the throttle from closed position while doing next step. - Measure voltage between PCM test Pins 89 and 91. - Key off. Was voltage at any time between 0.17 to 0.49 volt?		Yes	REPLACE TP sensor. RESTORE vehicle. RERUN Quick Test.
		No	RERUN Quick Test. If DTC P1120 is still present, GO to DH20 .

Test Step		Result	Action to Take
DH8	DTC P0123 OR P1124: ATTEMPT TO GENERATE THE OPPOSITE THROTTLE POSITION ANGLE (VOLTAGE) PID READING		
	Diagnostic Trouble Code (DTC) P0123 indicates the TP sensor signal is greater than the Self-Test maximum value of 92.27 % (4.60 volts). Possible causes: — Damaged TP sensor. — TP sensor not seated properly (tightened down). — TP circuit short to VREF or VPWR. — VREF circuit short to VPWR. — Open SIG RTN circuit. — Damaged PCM. ● Connect scan tool. ● Disconnect TP sensor. ● Key on, engine off. ● Access TP PID (TP V PID). ● Key off. ● Was TP PID (TP V PID) less than 3.43% (0.17 volt)?	Yes No	▶ GO to DH9. ▶ GO to DH10.
DH9	CHECK VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS TO 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?	Yes No	▶ REPLACE TP sensor. RESTORE vehicle. RERUN Quick Test. ▶ RESTORE vehicle. GO to Pinpoint Test Step C1.
DH10	CHECK TP CIRCUIT FOR SHORT TO VREF OR VPWR IN HARNESS		
	● Install breakout box, leave PCM disconnected. ● Measure resistance between PCM test pin 89 and PCM test pins 71 and 90 at the breakout box. ● Are both resistances greater than 10,000 ohms?	Yes No	▶ REPLACE PCM. REMOVE breakout box. RESTORE vehicle. RERUN Quick Test. ▶ REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
DH11	DTC P0122: ATTEMPT TO GENERATE THE OPPOSITE THROTTLE POSITION ANGLE (VOLTAGE) PID READING		
	Diagnostic Trouble Code (DTC) P0122 indicates the TP sensor signal is less than the Self-Test minimum value of 3.43% (0.17 volts). NOTE: An intermittent fault can cause a Continuous Memory DTC P0122. If a Continuous Memory DTC P0122 is still present after DH11 through DH14, go to DH20. Possible causes: — Damaged TP sensor. — TP sensor not seated properly (tightened down). — Open TP or VREF circuits. — TP circuit short to SIG RTN or PWR GND. — Damaged PCM. ● Connect scan tool. ● Disconnect TP sensor. ● Jumper VREF circuit to TP circuit at the TP sensor harness connector. ● Key on, engine off. ● NOTE: If any scan tool communication concern exists, remove jumper and go to DH14. - Access TP PID (TP V PID). ● Key off. ● Was TP PID (TP V PID) greater than 92.27% (4.60 volts)?	Yes No	▶ REPLACE TP sensor. RESTORE vehicle. RERUN Quick Test. ▶ REMOVE jumper. GO to DH12.
DH12	CHECK VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS		
	● 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?	Yes No	▶ GO to DH13. ▶ RESTORE vehicle. GO to Pinpoint Test Step C1.
DH13	CHECK TP SENSOR CIRCUIT FOR OPEN IN HARNESS		
	● Install breakout box, leave PCM disconnected. ● Measure resistance of TP circuit between PCM test pin 89 and TP sensor harness connector. ● Is resistance less than 5.0 ohms?	Yes No	▶ GO to DH14. ▶ REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
DH14	CHECK TP CIRCUIT FOR SHORT TO PWR GND OR SIG RTN IN HARNESS OR PCM		
	● Install breakout box, leave PCM disconnected. ● Disconnect scan tool from DLC. ● Measure resistance between PCM test pin 89 and PCM test pins 24 and 91. ● Are both resistances greater than 10,000 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
DH15	CONTINUOUS MEMORY DTC P 1121: CHECK RATIONALITY OPERATION BETWEEN TP AND MAF SENSORS		
	Continuous Memory DTC P 1121 indicates the TP sensor is inconsistent with the MAF sensor. Possible causes: — Damaged TP sensor. — TP sensor not seated properly (almost completely detached from throttle body). — Air leak between MAF sensor and throttle body. ● Attempt to start engine. ● Does the engine run?	Yes No	GO to DH16 . CHECK for major leaks, cracks, and openings between MAF sensor and throttle body. If OK, GO to Pinpoint Test Step A1 .
DH16	CHECK MECHANICAL OPERATION OF TP SENSOR		
	● Connect scan tool. ● Key on, engine off. ● Access TP PID (TP V PID). ● Slowly move throttle from closed throttle position to wide open throttle position. ● Observe and record the TP PID (TP V PID). ● Key off. ● While opening and closing the throttle, was there a change in the TP PID (TP V PID) between 11.4% and 100.2% (0.53 and 4.66 volts)?	Yes No	GO to DH17 . REPLACE TP sensor. COMPLETE PCM Reset to clear DTCs. VERIFY a symptom no longer exists. RERUN Quick Test.
DH17	CHECK TP SENSOR SIGNAL HIGH VERSUS THE ENGINE LOAD WHILE DRIVING VEHICLE		
	● Key on, engine running. ● Drive vehicle, exercising the throttle and TP sensor while accessing PIDS. ● Access TP PID (TP V PID) and LOAD PID and record readings. ● Key off. ● Was TP PID (TP V PID) greater than 49.02% (2.44 volts) and the LOAD PID reading less than 25%?	Yes No	LISTEN for air noise around MAF sensor and throttle body while engine is running. REPAIR if necessary. If OK, REPLACE the TP sensor. RESTORE vehicle. RERUN Quick Test. GO to DH18 .

Test Step		Result	Action to Take
DH18	CHECK TP SENSOR SIGNAL LOW VERSUS THE ENGINE LOAD WHILE DRIVING VEHICLE		
NOTE: If the vehicle is a no start, go to Pinpoint Test Step A1 . ● Drive vehicle exercising the throttle and TP sensor near higher gears (preferably overdrive) while accessing PIDS. ● Access TP PID (TP V PID) and LOAD PID and record readings. ● Key off. ● Was TP PID (TP V PID) reading less than 4.90% (0.24 volts) and the LOAD PID reading greater than 60%?		Yes	▶ TIGHTEN TP sensor to throttle body if necessary. COMPLETE PCM Reset to clear DTCs. DRIVE vehicle exercising the throttle. RERUN Quick Test. If Continuous Memory P1121 is now present, REPLACE MAF sensor. RESTORE vehicle.
		No	▶ Unable to identify the fault at this time. If vehicle is still a No Start, GO to Pinpoint Test Step A1 .
DH20	CONTINUOUS MEMORY DTCS P1120 OR P1125: CHECK FOR TP CIRCUIT INTERMITTENT SIGNAL		
Continuous Memory Diagnostic Trouble Code (DTC) P1125 indicates the TP sensor signal went below 9.80% (0.49 volts) or above 92.27% (4.60 volts) sometime during the last 80 warm-up cycles. Possible causes: — TP sensor loose connector pin. — TP harness intermittent open. — TP harness intermittent short. — TP sensor internal electrical short. ● Scan tool connected. ● Start engine and bring to idle. ● Run throttle up to 1500 rpm for 5 seconds. ● Access TP PID (TP V PID) for a fault indication while performing the following: — Lightly tap on TP sensor and wiggle harness connector to simulate road shock. ● Key off. ● Was TP PID (TP V PID) changing below the minimum 9.80% (0.49 volt) or above the maximum 92.27% (4.60 volts)?		Yes	▶ INSPECT the TP sensor connector. If OK, REPLACE the TP sensor. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
		No	▶ GO to DH21 .

Test Step		Result	Action to Take
DH21	CHECK TP SENSOR HARNESS FOR INTERMITTENT OPENS OR SHORTS		
	● Install breakout box, reconnect PCM to breakout box. ● Key on, engine off. ● Connect digital multimeter between PCM test pins 89 and 91. ● While viewing digital multimeter, do the following: — Grasp the vehicle harness closest to the TP sensor connector. — Shake and bend a small section of the harness all the way to the dash panel. — Wiggle, shake and bend the harness from the dash panel to the PCM. ● Is the voltage changing below the minimum 0.49 volt or above the maximum 4.60 volts?	Yes No	ISOLATE and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: TP PID (TP V PID) and list of Possible causes.
DH22	DTC P0121: CHECK FOR KOER SELF-TEST COMPLETION		
	Diagnostic Trouble Code (DTC) P0121 indicates an in-range operating TP sensor circuit failure. ● Key off. ● Start engine, bring to idle (throttle closed). ● Activate Key On Engine Running (KOER) Self-Test with the scan tool. ● Is DTC P0121 present or does KOER Self-Test fail to terminate?	Yes No	GO to DH23. VERIFY a symptom no longer exists. RERUN Quick Test.
DH23	ATTEMPT TO RECREATE DTC P0121 OR DRIVEABILITY SYMPTOM		
	NOTE: If KOER Self-Test terminates when placing the transmission range selector lever in gear (DRIVE or REVERSE), GO to DH24 directly. ● Attempt to drive vehicle, while still in Key On Engine Running Self-Test on scan tool. ● Key off, wait 15 seconds. ● Start engine again. ● Activate KOER Self-Test with the scan tool. ● Is DTC P0121 still present or does KOER Self-Test again fail to terminate?	Yes No	Key off. GO to DH24. VERIFY a symptom no longer exists. RERUN Quick Test.
DH24	CHECK FOR OPEN TP OR SIG RTN CIRCUITS BETWEEN PCM AND TP SENSOR		
	● Disconnect TP sensor. ● Install breakout box, leave PCM disconnected. ● Measure resistance of TP circuit between PCM test pin 89 and TP sensor harness connector. ● Measure resistance of SIG RTN circuit between PCM test pin 91 and TP sensor harness connector. ● Are both resistances less than 5.0 ohms?	Yes No	REPAIR open circuit. RESTORE vehicle. VERIFY a symptom no longer exists. RERUN Quick Test. REPLACE TP sensor. RESTORE vehicle. RERUN Quick Test. VERIFY a symptom no longer exists.

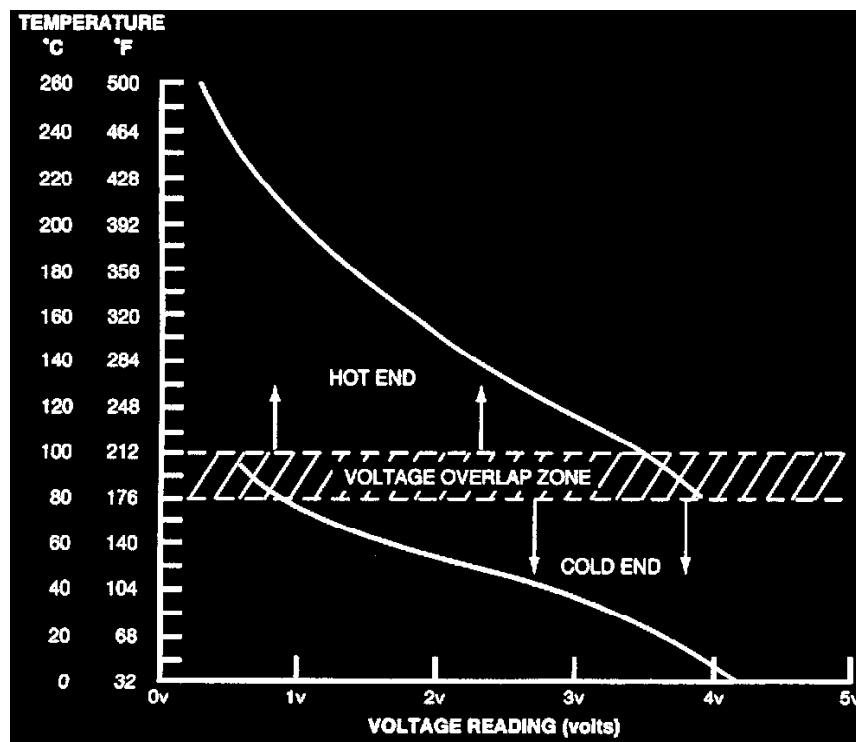
Test Notes

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

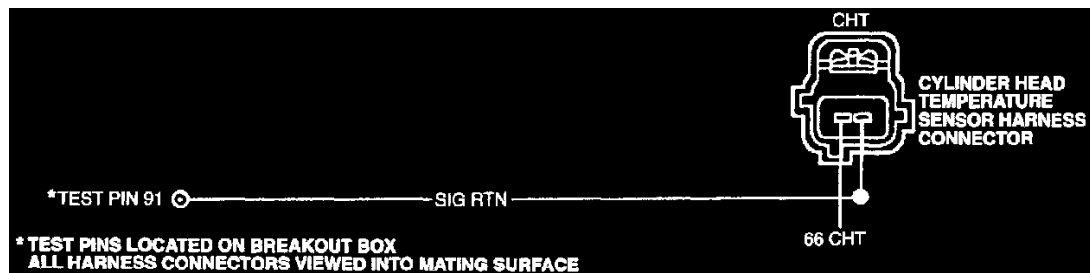
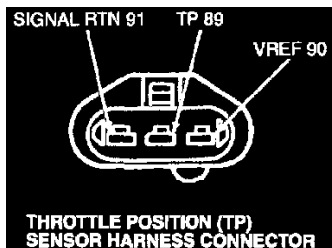


Temperature		CHT Sensor Values		
°C	°F	COLD END	HOT END	Resistance (K ohms)
-40	-40	4.89	—	965.808
-30	-22	4.81	—	513.019
-20	-4	4.67	—	283.664
-10	14	4.45	—	162.584
0	32	4.14	—	96.255
10	50	3.73	—	59.175
20	68	3.26	—	37.387
30	86	2.74	—	24.215
40	104	2.23	—	16.043
50	122	1.76	—	10.85
60	140	1.36	—	7.487
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		
	Diagnostic Trouble Code (DTC) P1228 or P1116 indicates the cylinder head temperature (CHT) sensor is out of Self-Test range. Possible causes: — 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?	Yes No	GO to DL2. Engine temperature was not stabilized. REPAIR any other DTCs as necessary.
DL2	CHECK VREF CIRCUIT VOLTAGE AT TP SENSOR		
	• 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?	Yes No	There is sufficient VREF voltage. RECONNECT TP sensor. GO to DL3. GO to Pinpoint Test Step C1.
DL3	CHECK RESISTANCE OF CYLINDER HEAD TEMPERATURE SENSOR WITH ENGINE OFF		
	• 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?	Yes No	GO to DL4. REPLACE CHT sensor. RESTORE vehicle. RERUN Quick Test.
DL4	CHECK RESISTANCE OF CHT SENSOR WITH ENGINE RUNNING		
	NOTE: Verify that engine is at operating temperature before taking CHT readings. • 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?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPLACE CHT sensor. RESTORE vehicle. RERUN Quick Test.
DL5	DTC P1289 OR P1290: ACCESS CHT PID AND CHECK VOLTAGE		
	Diagnostic Trouble Code (DTC) P1289 or P1290 indicates a CHT sensor circuit malfunction. Possible causes: — 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?	Yes No	GO to DL6. GO to DL7.

Test Step		Result	Action to Take
DL6	CHECK FOR GROUNDED CIRCUIT		
● 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		
● 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. NOTE: If a Scan Tool communication concern exists, remove jumper wire immediately and go to DL12. ● 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		
Diagnostic Trouble Code (DTC) P0118 indicates the sensor signal is greater than the Self-Test maximum. Possible causes: — 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. NOTE: If a Scan Tool communication concern exists, remove jumper wire immediately and go to DL12. ● 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		
	● 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?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR open circuits. RESTORE vehicle. RERUN Quick Test.
DL12	CHECK CHT SENSOR SIGNAL FOR SHORT TO VREF IN HARNESS		
	● Key off. ● Install breakout box, leave PCM disconnected. ● Measure resistance between PCM Test Pins 66 and 90. ● Is resistance greater than 10,000 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short to VREF. RESTORE vehicle. RERUN Quick Test.
DL20	DTC P0117: SIMULATE OPPOSITE SIGNAL TO PCM		
	Diagnostic Trouble Code (DTC) P0117 indicates the sensor signal is less than Self-Test minimum. Possible causes: — 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?	Yes No	REPLACE CHT sensor. RESTORE vehicle. RERUN Quick Test. GO to DL21 .
DL21	CHECK VREF CIRCUIT VOLTAGE AT TP SENSOR		
	● 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?	Yes No	There is sufficient VREF voltage. RECONNECT TP sensor. GO to DL22 . GO to Pinpoint Test Step C1 .
DL22	CHECK CHT SIGNAL CIRCUIT FOR SHORT TO GROUND		
	● 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?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.

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: — 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 No	▶ DIAGNOSE overheating concern as needed. ▶ 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. ● Was PCM Quick Test performed prior to entering this Pinpoint Test?	Yes No	▶ No Diagnostic Trouble Codes (DTCs) received during PCM Quick Test. GO to DL41 . ▶ 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: — 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 No	▶ Key off. REPLACE the PCM. RERUN Quick Test. ▶ 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).

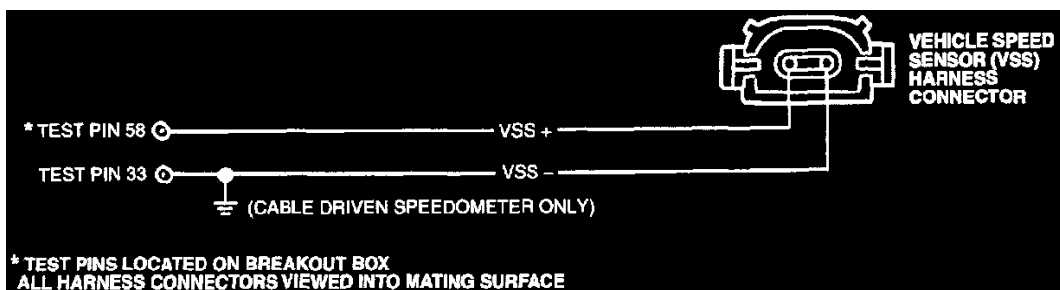
Test Step		Result	Action to Take
DL90	DTCS P0117, P0118, P1117, P1289 OR P1290: INTERMITTENT CHECK		
	Diagnostic Trouble Codes (DTCs) P0117, P0118, P1117, P1289 or P1290 were not received during KOEO and KOER Self-Tests, but are output during Continuous Memory Self-Test and can be intermittent. Possible causes: — 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: — Tap on the sensor to simulate road shock. — Wiggle the sensor connector. ● Is there any large change in the temperature reading?	Yes No	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. GO to DL91.
DL91	CHECK ELECTRONIC ENGINE CONTROL (EC) WIRING HARNESS		
	● Still monitoring PID. ● While observing the appropriate PID, perform the following: — 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?	Yes No	ISOLATE fault. REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. RERUN Quick Test. GO to DL92.
DL92	CHECK PCM AND VEHICLE HARNESS CONNECTOR		
	● Disconnect PCM. ● Disconnect CHT sensor. ● Are connectors and terminals OK?	Yes No	Fault is not present at this time. COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. RERUN Quick Test. REPAIR as necessary. COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. RERUN Quick Test.
DL100	DTCS P1299 INDICATES AN ENGINE OVERHEAT CONDITION OCCURRED		
	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. Possible causes: — 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 No	Engine Overheats. REPAIR as necessary. Loss of Engine Coolant. REPAIR as necessary.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Vehicle Speed Sensor (VSS)
- Harness circuits: VSS + and VSS -
- Powertrain control module



Test Step		Result	Action to Take
DP1	DTC P0500 / P0501: CHECK VSS CIRCUITS FOR OPEN IN HARNESS		
	Diagnostic Trouble Code (DTC) P0500 / P0501 indicates that a VSS malfunction has been detected. NOTE: Delayed engagement or no vehicle movement can be caused by a transmission concern. Harsh shifts and / or erratic speedometer can be caused by a failed speedometer or an open or intermittent ground within the instrument cluster on vehicles with electronic readout. Possible causes: — Open in VSS+ / VSS- harness circuit. — Short to GND in VSS+ / VSS- harness circuit. — Short to PWR in VSS+ / VSS- harness circuit. — Damaged VSS. — Damage in module(s) connected to VSS circuit. ● Install breakout box, leave PCM disconnected. ● Disconnect VSS. ● Measure resistance of VSS+ circuit between PCM test pin 58 and VSS harness connector. ● Measure resistance of VSS- circuit between PCM test pin 33 and VSS harness connector. ● Is each resistance less than 5.0 ohms?	Yes No	▶ GO to DP2. ▶ REPAIR open circuit. RESTORE vehicle. COMPLETE an OBD II Drive Cycle. RERUN Test.
DP2	CHECK VSS CIRCUITS FOR SHORT TO GROUND AND POWER IN HARNESS		
	● For Mustang with purge flow (PF) sensor, disconnect the PF sensor (refer to the schematics in Pinpoint Test HW to view PF sensor connector shape.) ● Measure resistance between PCM test pin 58 and PCM test pin 51 or 103. ● Measure resistance between PCM test pins 58 and 33. ● Measure resistance between PCM test pins 58 and 71. ● Measure resistance between PCM test pins 33 and 71. ● Is each resistance greater than 500 ohms?	Yes No	▶ GO to DP3. ▶ GO to DP12.
DP3	CHECK VSS RESISTANCE		
	● Measure VSS resistance. ● Is resistance between 190 and 250 ohms?	Yes No	▶ REPLACE the PCM. RESTORE vehicle. COMPLETE an OBD II Drive Cycle. RERUN Test. ▶ REPLACE the VSS. RESTORE vehicle. COMPLETE an OBD II Drive Cycle. RERUN Quick Test.

Test Step		Result	Action to Take
DP5	DTC P0500: CHECK VSS SIGNAL OUTPUT TO POWERTRAIN CONTROL MODULE (PCM)		
	Diagnostic Trouble Code (DTC) P0500 indicates that a VSS malfunction has been detected. NOTE: Delayed engagement or no vehicle movement can be caused by a transmission concern. Harsh shifts and/or erratic speedometer can be caused by a failed speedometer or an open or intermittent ground within the instrument cluster on vehicles with electronic readout. Possible causes: — Open in VSS, VPWR, PWR GND harness circuit. — Short to GND in VSS harness circuit. — Short to PWR in VSS harness circuit. — Damaged VSS. — Damaged PCM. — Damage in module(s) connected to VSS circuit. ● Install breakout box, leave PCM disconnected. ● Raise the vehicle to allow rotation of the front drive wheel. ● Key on, transmission in NEUTRAL. ● NOTE: The opposite wheel must be held stationary. Observe voltage reading between PCM test pin 58 and PCM test pins 51 or 103 while slowly rotating the drive wheel. ● The voltage should rise above 5.0 volts and fall below 1.0 volt in a regular cycle. Observe several cycles. ● Key off. ● Did the VSS output voltage rise and fall as specified while slowly rotating the drive wheel?	Yes No	REPLACE PCM. RESTORE vehicle. COMPLETE an OBD II Drive Cycle. RERUN Quick Test. GO to DP6.
DP6	CHECK VOLTAGE BETWEEN VPWR AND PWR GND CIRCUITS AT VSS		
	● Disconnect VSS. ● Key on. ● Measure voltage between VPWR and PWR GND circuits at the VSS harness connector. ● Key off. ● Was the voltage greater than 10.5 volts?	Yes No	GO to DP7. GO to DP10.

	Test Step	Result	Action to Take
DP7	CHECK VSS CIRCUIT FOR SHORT TO POWER IN HARNESS		
	● Key on. ● Measure voltage between PCM test pin 58 and PCM test pins 51 and 103. ● Key off. ● Was voltage less than 1.0 volt?	Yes No	GO to DP8 . GO to DP12 .
DP8	CHECK VSS CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	● Measure resistance between PCM test pin 58 and PCM test pins 51 and 103 (PWR GND) at the breakout box. ● Is resistance greater than 3,000 ohms?	Yes No	GO to DP9 . GO to DP12 .
DP9	CHECK VSS SIGNAL CIRCUIT FOR OPEN IN HARNESS		
	● Measure resistance of VSS signal circuit between PCM test pin 58 and VSS harness connector. ● Is resistance less than 5.0 ohms?	Yes No	REPLACE VSS. RESTORE vehicle. COMPLETE an OBD II Drive Cycle. RERUN Quick Test. REPAIR open circuit. RESTORE vehicle. COMPLETE an OBD II Drive Cycle. RERUN Quick Test.
DP10	CHECK VSS GROUND CIRCUIT FOR OPEN IN HARNESS		
	● Measure resistance of PWR GND circuit between VSS harness connector and chassis ground. ● Is resistance less than 5.0 ohms?	Yes No	REPAIR open VPWR to VSS. RESTORE vehicle. COMPLETE an OBD II Drive Cycle. RERUN Quick Test. REPAIR open VSS PWR GND circuit. RESTORE vehicle. COMPLETE an OBD II Drive Cycle. RERUN Quick Test.

Test Step		Result	Action to Take
DP12	VERIFY IF VSS CIRCUIT IS SHORTED IN HARNESS OR ANOTHER MODULE		
	- Determine which, if any, modules are connected to the VSS circuit. If no other modules are connected to the VSS circuit, GO to the "YES" Action To Take. - One at a time, disconnect the modules associated with the VSS circuit. After disconnecting each module, again test for short circuit (Refer to test step that sent you here). Repeat until each associated module has been disconnected or the short circuit has been eliminated. Did the short circuit remain after all associated modules were disconnected?	Yes No	REPAIR short circuit. RESTORE vehicle. COMPLETE an OBD II Drive Cycle. RERUN Quick Test. Diagnose the appropriate module. After repair, RESTORE vehicle RERUN Quick Test.
DP15	KOER DTC P1501: CHECK PCM VSS PID FOR INPUT SIGNAL		
	Diagnostic Trouble Code (DTC) P1501 indicates the VSS input signal is out of Self Test range. NOTE: When the PCM detects a VSS input signal any time during KOER Self Test, a DTC P1501 will be set and the testing will abort. Possible causes: - Noisy VSS input signal from Radio Frequency Interference / Electro-Magnetic Interference (RFI / EMI) external sources such as ignition wires or charging circuit. - Start the engine and idle in NEUTRAL. - Access the VSS PID with a scan tool and observe for vehicle speed input to the PCM. - Increase the engine speed, not greater than 2000 rpm, several times while observing the VSS PID. Was the reading on the VSS PID less than 5 km/h (3 mph)?	Yes No	Unable to duplicate or identify fault at this time. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. If DTC P1501 still exists. GO to Pinpoint Test Step, Z1 with the following data: the VSS PID and list of Possible causes. GO to DP22.

Test Step		Result	Action to Take
DP20	DTC P0503: INSPECT VSS AND CIRCUIT FOR AN INTERMITTENT		
	Continuous Memory DTC P0503 indicates poor VSS performance. Possible causes: - Noisy VSS input signal from Radio Frequency Interference / Electro-Magnetic Interference (RFI/EMI) external sources such as ignition wires or charging circuit. - Damaged VSS or driven gears. - Damaged wiring harness or connectors. - Check for harness intermittents by verifying that Pins are properly seated in connector shell, wiring is properly crimped, no corrosion exists in the harness and sensor is securely mounted. Are there any indications of harness intermittents?	Yes No	► REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. COMPLETE an OBDII Drive Cycle. RERUN Quick Test. ► GO to DP21.
DP21	CHECK PCM VSS PID FOR INPUT SIGNAL		
	- Access the VSS PID with a scan tool. - Drive the vehicle at several steady state speeds above and below 50 km/h (30 mph). - NOTE: For Scan Tools which have Data Record feature, record data for playback to help identify variations. During each steady state speed observe the VSS PID for variations of (+) or (-) 8 km/h (5 mph) for greater than 10 seconds. Were there any indications of a noisy or intermittent signal with the VSS PID?	Yes No	► GO to DP22. ► Unable to duplicate or identify fault at this time. REPAIR any other DTCs. COMPLETE PCM Reset to clear DTCs.
DP22	CHECK VSS HARNESS ROUTING		
	- Check VSS harness routing: - Verify that the harness is not routed adjacent to high current wires such as ignition wires or generator wiring. - Verify VSS harness is shielded and grounded, if applicable. - Check resistance of the VSS harness; refer to step DP1. Are any concerns evident?	Yes No	► REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. COMPLETE an OBDII Drive Cycle. RERUN Quick Test. ► Unable to duplicate or identify a fault at this time. GO to Pinpoint Test Step Z1 with the following data: the VSS PID and list of Possible causes.
DP25	DTC P1500: VISUAL INSPECTION		
	Diagnostic Trouble Code (DTC) P1500 indicates the VSS input signal was intermittent. Possible causes: - Intermittent VSS connections. - Intermittent open in VSS harness circuit(s). - Intermittent short in VSS harness circuit(s). - Damaged VSS. - Damaged PCM. - Visually inspect the VSS and VSS harness circuits for any potential failures. Use the following check list for reference: - Loose VSS connector. - Pushed out VSS connector pins. - Damaged VSS wiring harness insulation. - Incorrect harness routing. - Incorrect VSS mounting. Did the visual inspection reveal a potential failure?	Yes No	► REPAIR fault as necessary. COMPLETE PCM Reset to clear DTCs. COMPLETE an OBD II Drive Cycle. RERUN Quick Test. ► RESTORE vehicle. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: the VSS PID and list of Possible causes.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Camshaft Position (**CMP**) Sensor
- Harness Circuits: CMP, VPWR, SIG RTN, PWR GND, CMP/TSS GND
- Powertrain control module

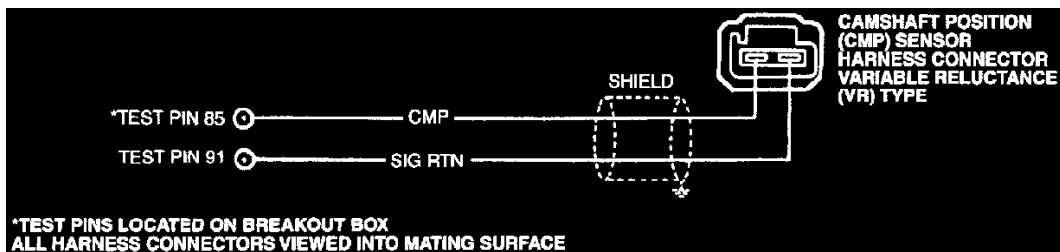
Identifying CMP Sensor Type

There are two types of camshaft position sensors used, the Variable Reluctance (**VR**) type, and the Hall Effect type.

The Hall Effect type sensor is used on:

- Mustang 3.8
- Windstar 3.8
- Explorer and Mountaineer 5.0
- E- and F-Series 4.2
- Ranger 4.0
- Explorer 4.0 OHV (VIN X)

All others use the VR type sensor.



Test Step	Result	Action to Take
DR1 DTC P0340: CHECK IF ENGINE WILL START NOTE: Diagnostic Trouble Code (DTC) P0340 indicates that Self-Test has detected a Camshaft Position (CMP) Sensor circuit failure. NOTE: Refer to the Pinpoint Test Schema to determine the type of CMP sensor. Possible causes: — CMP circuit open. — CMP circuit shorted to GND. — CMP circuit shorted to PWR. — SIG RTN or CMP / TSS GND open (VR type). — VPWR open (Hall effect type). — CMP Sensor (Hall effect type) not installed correctly. — Damaged CMP Sensor. — Damaged PCM. ● Start engine. ● Will the engine start?	Yes No	GO to DR2 . DTC P0340 is not the cause of the No Start. GO to Symptom Charts.
DR2 CLEAR AND ATTEMPT TO RE-GENERATE DTC P0340 ● Complete PCM Reset to clear DTCs. ● Start engine. ● Increase rpm to greater than 1500 rpm for 10 seconds. Repeat two times. ● Key off. ● Retrieve all Continuous Memory DTCs. ● Is DTC P0340 present?	Yes No	For VR type CMP: GO to DR5 . For Hall Effect type CMP: GO to DR3 . The fault that produced DTC P0340 is intermittent. GO to Pinpoint Test Step Z1 with the following data: List of Possible causes.
DR3 CHECK VPWR VOLTAGE TO CMP SENSOR ● Disconnect CMP sensor. ● Key on, engine off. ● Measure VPWR circuit voltage at the CMP sensor harness connector. ● Key off. ● Was voltage greater than 10.5 volts?	Yes No	GO to DR4 . REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
DR4 CHECK PWR GND TO CMP SENSOR ● Measure resistance of PWR GND circuit between CMP sensor harness connector and battery negative post. ● Is resistance less than 5.0 ohms?	Yes No	GO to DR5 . REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.

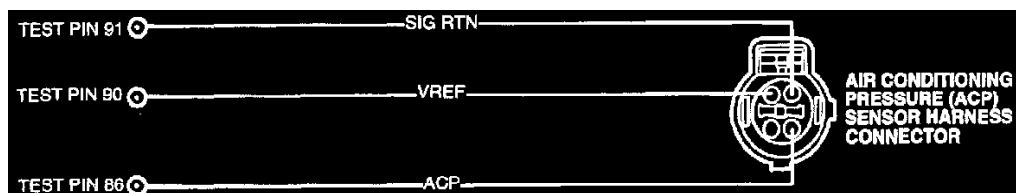
Test Step		Result	Action to Take
DR5	CHECK FOR OPEN CMP AND SIG RTN CIRCUITS BETWEEN PCM AND CMP SENSOR		
	- Install breakout box, leave PCM disconnected. - Measure resistance of CMP circuit between PCM test pin 85 and CMP sensor harness connector. For VR type CMP (Contour/Mystique, Escort/Tracer): - Measure resistance of CMP/TSS GND circuit between PCM test pin 76 and CMP sensor harness connector. For VR type CMP: (All others:) - Measure resistance of SIG RTN circuit between PCM test pin 91 and CMP sensor harness connector. - Are resistance measurements less than 5.0 ohms?	Yes No	GO to DR6 . REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
DR6	CHECK CMP CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- CMP sensor disconnected. - Key on, engine off. - Measure voltage between PCM test pin 85 and PCM test pins 51 and 103. - Key off. - Was voltage less than 1.0 volt?	Yes No	GO to DR7 . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
DR7	CHECK CMP CIRCUIT FOR SHORT TO GND AND SIG RTN IN HARNESS		
	- CMP sensor disconnected. - Disconnect scan tool from DLC. - Measure resistance between PCM test pin 85 and PCM test pins 51, 91 and 103. - Was each resistance greater than 10,000 ohms?	Yes No	GO to DR8 . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
DR8	CHECK FOR SHORTS IN PCM		
	- Reconnect PCM to breakout box. - Measure resistance between PCM test pin 85 and PCM test pins 23, 51, 71, 91, 97 and 103. - Is each resistance greater than 500 ohms?	Yes No	For VR type CMP: GO to DR9 . For Hall Effect type CMP: GO to DR10 . REPLACE PCM. RESTORE vehicle. RERUN Quick Test.
DR9	CHECK CMP SENSOR OUTPUT		
	- Reconnect CMP sensor. - Digital multimeter on ac scale (to monitor less than 5.0 volts). - Measure voltage between PCM test pins 85 and 51 while running engine at varying rpm. - Does ac voltage vary greater than 0.1 volt ac?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPLACE CMP sensor. RESTORE vehicle. RERUN Quick Test.
DR10	CHECK CMP SENSOR OUTPUT		
	- Disconnect PCM. - Reconnect CMP sensor. - Connect digital multimeter between PCM test pins 85 and 51. - Bump engine in short bursts with the starter without starting engine for at least 10 engine revolutions. - Does voltage reading switch between low (less than 2.0 volts dc) and high (greater than 8.0 volts dc)?	Yes No	A Hall effect type CMP sensor that is installed out of synchronization will product a DTC. VERIFY the correct installation. If CMP is installed properly, REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPLACE CMP sensor. RESTORE vehicle. RERUN Quick Test.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Harness circuits: ACP, VREF, SIG RTN
- Air Conditioning Pressure (ACP) Sensor
- Powertrain Control Module



Test Step		Result	Action to Take
DS1	DTC P1461: CHECK ACP V PID		
	Diagnostic Trouble Code (DTC) P1461 indicates that Self-Test has detected the ACP circuit above the maximum allowed voltage. Possible causes: — Open SIG RTN circuit to ACP sensor. — Open ACP circuit. — ACP circuit short to VREF or power. — VREF short to power. — Damaged ACP sensor. — Damaged PCM. ● Connect scan tool. ● Key on, engine off. ● Access ACP V PID. ● Key off. ● Was ACP V PID less than 4.9 volts?	Yes No	The ACP circuit voltage is now below the maximum. GO to DS18 to determine if an intermittent condition exists. A hard fault is present. GO to DS2.
DS2	CHECK VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS TO ACP SENSOR		
	● Disconnect ACP sensor. ● Key on, engine off. ● Measure voltage between VREF and SIG RTN circuits at the ACP sensor harness connector. ● Is voltage between 4.0 and 6.0 volts?	Yes No	GO to DS3. VREF is out of range, or SIG RTN circuit to ACP sensor is open. GO to Pinpoint Test Step C1.
DS3	INDUCE OPPOSITE ACP SIGNAL		
	● Key on, engine off. ● Again access ACP V PID. ● Is ACP V PID now less than 4.9 volts?	Yes No	Key off. REPLACE ACP sensor. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test. GO to DS4.
DS4	CHECK ACP CIRCUIT FOR SHORT TO VREF IN HARNESS		
	● Key off. ● Disconnect scan tool from DLC. ● Disconnect PCM. ● Measure resistance between ACP and VREF circuits at the ACP sensor harness connector. ● Is resistance greater than 10,000 ohms?	Yes No	GO to DS5. REPAIR short circuit. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test.

Test Step		Result	Action to Take
DS5	CHECK ACP CIRCUIT FOR SHORT TO POWER IN HARNESS		
● Key on, engine off. ● Measure voltage between ACP circuit at the ACP sensor vehicle harness connector and chassis ground. ● Key off. ● Was voltage less than 1.0 volt?		Yes	▶ For Escort/Tracer: GO to DS6 . All others: REPLACE PCM. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test.
		No	▶ REPAIR short circuit. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test.
DS6	CHECK FOR OPEN ACP CIRCUIT IN HARNESS		
● Install breakout box, leave PCM disconnected. ● Measure resistance of ACP circuit between PCM test pin 86 and the ACP sensor harness connector. ● Is resistance less than 5.0 ohms?		Yes	▶ GO to DS7 .
		No	▶ REPAIR open circuit. REMOVE breakout box. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test.
DS7	CHECK PCM		
● Reconnect PCM to breakout box. ● Connect a jumper wire between PCM test pins 86 and 91. ● Key on, engine off. ● Access ACP V PID. NOTE: If the scan tool is now unable to communicate, follow NO Action to Take. ● Is ACP V PID now less than 4.9 volts?		Yes	▶ REPLACE ACP sensor. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test.
		No	▶ REPLACE PCM. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test.

Test Step		Result	Action to Take
DS10	DTC P1462: CHECK ACP V PID		
	Diagnostic Trouble Code (DTC) P1462 indicates that Self-Test has detected the ACP circuit below the minimum allowed voltage. Possible causes: — Open ACP circuit. — ACP circuit short to SIG RTN or ground. — Open VREF to ACP sensor. — Damaged ACP sensor. — Damaged PCM. ● Connect scan tool. ● Key on, engine off. ● Access ACP V PID. ● Is ACP V PID greater than 0.15 volts?	Yes ► The ACP circuit voltage is now above the minimum. GO to DS18 to determine if an intermittent condition exists. No ► A hard fault is present. GO to DS11.	
DS11	CHECK VOLTAGE BETWEEN VREF AND SIG RTN TO ACP SENSOR		
	● Key off. ● Disconnect ACP sensor. ● Key on, engine off. ● Measure voltage between VREF and SIG RTN circuits at the ACP sensor harness connector. ● Is voltage between 4.0 and 6.0 volts?	Yes ► GO to DS12. No ► VREF is out of range. GO to Pinpoint Test Step C1.	
DS12	INDUCE OPPOSITE ACP SIGNAL		
	● Connect a jumper wire between ACP and VREF circuits at the ACP sensor harness connector. ● Key on, engine off. ● Access ACP V PID. ● Key off. NOTE: If any scan tool communication concern occurs, remove jumper immediately and go directly to DS13. ● Was ACP V PID greater than 4.0 volts?	Yes ► REPLACE ACP sensor. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test. No ► Key off. GO to DS13.	
DS13	CHECK ACP CIRCUIT FOR SHORT TO PWR GND OR SIG RTN IN HARNESS		
	● Disconnect scan tool from DLC. ● Disconnect PCM. ● Measure resistance between ACP and SIG RTN circuits at the ACP sensor harness connector. ● Measure resistance between the ACP circuit at the ACP sensor harness connector and the battery negative post. ● Are both resistances greater than 10,000 ohms?	Yes ► GO to DS14. No ► REPAIR short circuit. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test.	

Test Step		Result	Action to Take
DS14	CHECK ACP CIRCUIT FOR OPEN IN HARNESS		
	- Install breakout box, leave PCM disconnected. - Measure resistance of ACP circuit between PCM test pin 86 and the ACP sensor harness connector. Is resistance less than 5.0 ohms?	Yes No	GO to DS15 . REPAIR open ACP circuit. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test.
DS15	CHECK FOR THE A/C CLUTCH TO ENGAGE		
	- Reconnect ACP sensor. - Key on, engine off. - While listening for the A/C clutch to engage, turn the A/C on. Repeat if necessary. - Key off. Did the A/C clutch engage when the A/C was turned on?	Yes No	REPLACE PCM. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test. GO to DS16 .
DS16	VERIFY A/C SYSTEM HAS A REFRIGERANT CHARGE		
	- Restore vehicle. - Verify that the A/C system has a refrigerant charge. Does the A/C system have a refrigerant charge?	Yes No	REPLACE PCM. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test. REPAIR A/C system. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test.
DS18	CHECK FOR INTERMITTENT ACP CIRCUIT FAULT		
	- Key on, engine off. - Access ACP V PID. - Observe ACP V PID for an indication of a fault while performing the following (a fault will be indicated by a sudden change in ACP V PID voltage): - Shake, wiggle, bend the ACP, SIG RTN and VREF circuits between the ACP sensor and the PCM. - Lightly tap on the ACP sensor (to simulate road shock). Is a fault indicated?	Yes No	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. PERFORM PCM Reset to clear DTC(s). START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: ACP V PID and list of Possible causes.

Test Step		Result	Action to Take
DS20	DTC P1463: VERIFY A/C CLUTCH CAN DISENGAGE		
	Diagnostic Trouble Code (DTC) P1463 indicates that the A/C Pressure (ACP) Sensor did not detect a sufficient change in A/C system pressure when the A/C was turned on. Possible causes: — A/C system inoperative due to a mechanical concern. — A/C system inoperative due to an electrical concern, regardless of ACCS circuit voltage at PCM test pin 41. — A/C clutch always engaged. — Open ACP or VREF circuit. — Damaged ACP sensor. ● A/C and defroster off. ● Start engine. ● Verify that the A/C clutch disengages. ● Is the A/C clutch disengaged?	Yes No	GO to DS21. GO to Symptom Chart. (A/C Compressor Runs Continuously, A/C Always On) to diagnose the always engaged A/C clutch.
DS21	CHECK FOR VOLTAGE AND GROUND TO A/C CLUTCH (USING NON-POWERED TEST LAMP)		
	NOTE: If voltage and ground to A/C clutch has already been checked in the Symptom Charts, or the A/C clutch can be heard clicking on when the A/C is turned on, go to the question at the end of this test step. ● Key off. ● Disconnect A/C cycling switch. Install a jumper wire in the A/C cycling switch vehicle harness connector (to complete the circuit). ● Disconnect the A/C clutch. ● Connect a non-powered test lamp between the power pin and ground pin at the A/C clutch vehicle harness connector. ● Start engine. ● Turn A/C on, wait 15 seconds. ● Monitor test lamp. ● After testing turn key off, remove jumper and reconnect A/C clutch and A/C cycling switch. ● For Mark VIII, be aware that this test can set DTC P1530. If P1530 was not present until after this test step, disregard DTC and clear before returning vehicle to customer. ● Does test lamp light (or can A/C clutch be heard clicking on)?	Yes No	GO to DS22. For Escort/Tracer: GO to Pinpoint Test Step X110. For Continental: GO to Pinpoint Test Step KM15. For Mark VIII: VERIFY test results. If OK, disregard DTC P1463. RETURN to service any other DTC or to continue diagnosis.

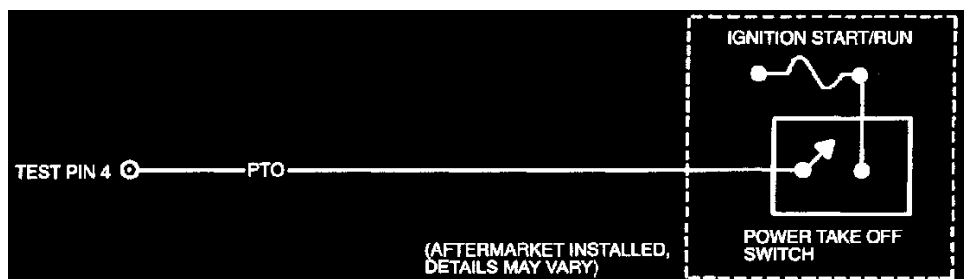
Test Step		Result	Action to Take
DS22	CHECK IF A SUFFICIENT A/C PRESSURE CHANGE CAN BE DETECTED BY THE ACP PID		
	- Scan tool connected. - Start engine. - A/C off. - Access ACP V PID. - Note ACP V PID voltage. - While monitoring ACP V PID voltage, turn A/C on. Five seconds after A/C clutch engagement, note voltage (if clutch does not engage, follow NO Action To Take). Did the ACP V PID voltage change more than 0.3 volt within five seconds of clutch engagement?	Yes No	The ACP Sensor and PCM can detect a sufficient change in A/C system pressure. For Symptom without DTC P1463: RETURN to Symptom Charts. All others: GO to Heating and Air Conditioning. After any service, RESTORE vehicle. PERFORM PCM Reset to clear DTC(s). START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test. Key off, A/C off. GO to DS23.
DS23	CHECK A/C SYSTEM PRESSURE AND PRESSURE CHANGE		
	- Key off. - Install an A/C System Manifold Gauge Set and check the A/C system high pressure readings. - Start engine. - A/C off. - Note the A/C high pressure reading. - While monitoring the A/C system high pressure reading, turn the A/C on. Five seconds after clutch engagement, note the pressure (the pressure should increase). - A/C off. Did the A/C high pressure reading change more than 207 kPa (30 psi) within five seconds of clutch engagement?	Yes No	GO to DS24. A/C system pressure did not change as expected. GO to the Heating and Air Conditioning After any service, RESTORE vehicle. PERFORM PCM Reset to clear DTC(s). START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test.
DS24	CHECK VOLTAGE BETWEEN VREF AND SIG RTN TO ACP SENSOR		
	- Key off. - Disconnect ACP sensor. - Key on, engine off. - Measure voltage between VREF and SIG RTN circuits at the ACP sensor harness connector. - Key off. Was voltage between 4.0 and 6.0 volts?	Yes No	GO to DS25. VREF is out of range. GO to Pinpoint Test Step C1.
DS25	CHECK ACP CIRCUIT FOR OPEN IN HARNESS		
	- Key off. - ACP sensor disconnected. - Install breakout box, leave PCM disconnected. - Measure resistance of ACP circuit between PCM test pin 86 and the ACP sensor harness connector. Is resistance less than 5.0 ohms?	Yes No	REPLACE ACP sensor. RESTORE vehicle. PERFORM PCM Reset to clear DTC(s) (if applicable). START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test. REPAIR open circuit. RESTORE vehicle. PERFORM PCM Reset to clear DTC(s) (if applicable). START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. Key off. RERUN Quick Test.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Power Take Off Harness circuit
- Powertrain Control Module



Test Step		Result	Action to Take
FB1	PTO PID DOES NOT CYCLE: CHECK FOR DEFECTIVE PTO SWITCH		
	The PCM uses the PTO circuit to indicate an additional load is being applied to the engine. If a concern exists with the PTO circuit or vehicle does not have a PTO circuit, the OBD II Monitors can set a false DTC. Possible causes: — PTO circuit short to power in aftermarket switch /input to the PTO harness connector. — PTO circuit short to VPWR. — Damaged PCM. ● Disconnect PTO switch harness connector. ● Measure resistance across PTO switch while in on then off position. ● Is resistance less than 5.0 ohms then greater than 10,000 ohms when cycling switch?	Yes No	PTO switch is OK. GO to FB2. Defective aftermarket PTO switch. REFER to aftermarket component manufacturer for service information. After service, RECONNECT PTO switch harness connector. PERFORM OBD II Drive Cycle and RERUN Quick Test.
FB2	CHECK PTO CIRCUIT FOR SHORT TO VPWR		
	● Install breakout box, leave PCM disconnected. ● Key on, engine off. ● Measure voltage between PCM test pin 4 and PCM test pin 51 or 103. ● Is voltage less than 1.0 volt?	Yes No	RECONNECT PCM and PTO switch harness connector. GO to FB4. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
FB3	MIL ON: CHECK PTO PID		
	The PCM uses the PTO circuit to indicate an additional load is being applied to the engine. If a concern exists with the PTO circuit or vehicle does not have a PTO circuit, the OBD II Monitors can set a false DTC. Possible causes: — Open in PTO circuit. — Short to chassis ground in PTO circuit. ● Connect scan tool to DLC. ● Key on, engine off. ● NOTE: Some vehicles do not support a PTO PID. Access the PTO PID. ● Is the PTO PID available and displaying on or off?	Yes No	GO to FB1. GO to FB9.

Test Step		Result	Action to Take
FB4	CHECK PTO CIRCUIT WITH SCAN TOOL		
	NOTE: This step requires operating the PTO component. Refer to aftermarket manufacturer for PTO operating instructions. Follow all safety precautions. - Key on (may need to start engine to engage PTO). - Cycle PTO switch / handle while viewing PTO PID. - Key off. - Did PTO PID cycle ON, delay, then turn OFF?	Yes No	PTO input is OK. RETURN to Symptom Charts. Concern is with PTO circuit. GO to FB5 .
FB5	CHECK PTO CIRCUIT FOR SHORT TO PWR GND IN HARNESS		
	- Disconnect scan tool from DLC. - Disconnect PTO switch harness connector. - Measure resistance between PCM test pin 4 and PCM test pin 77 or 103. - Reconnect PCM to breakout box. - Is resistance greater than 10,000 ohms?	Yes No	GO to FB7 . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
FB7	CHECK PTO CIRCUIT FROM PTO SWITCH HARNESS CONNECTOR TO PCM		
	- Connect scan tool. - Connect Jumper wire between B+ and PTO circuit at the PTO switch harness connector. - Key on, engine off. - Access PTO PID. - Key off. - Was PTO PID on with jumper inserted and off with jumper removed?	Yes No	PTO circuit from switch harness connector to PCM is OK. REFER to aftermarket component manufacturer for service information on PTO switch, etc. After service, PERFORM PCM Reset to clear DTC(s). RERUN Quick Test. GO to FB8 .
FB8	CHECK PTO CIRCUIT RESISTANCE		
	- Disconnect PCM. - Measure resistance of PTO circuit between PCM test pin 4 and PTO switch harness connector. - Is resistance less than 5.0 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR open PTO circuit. RESTORE vehicle. RERUN Quick Test.
FB9	PERFORM KOEO AND KOER QUICK TESTS		
	The following steps are used for PTO diagnostics when the vehicle does not support the PTO circuit or PID. - Perform KOEO Self-Test. Refer to Diagnostic Subroutine DSR3 for procedure. - Perform KOER Self-Test. Refer to Diagnostic Subroutine DSR5 for procedure. - Perform base timing check. Refer to Diagnostic Subroutine DSR4 for procedure. - Are any KOEO or KOER DTCs present or is base timing incorrect?	Yes No	FOLLOW direction in DSR3 or DSR5 to REPAIR the KOEO or KOER DTCs. Follow DSR4 for base timing check. GO to FB10 .
FB10	PERFORM OBD II DRIVE CYCLE WITH PTO DISENGAGED		
	NOTE: This test step will determine if the PTO operation resulted in any Continuous Memory DTCs stored due to the extra load of the PTO component on the engine. - Perform PCM Reset. NOTE: Make sure the PTO is disengaged. - Perform OBD II Drive Cycle - Retrieve all Continuous Memory DTCs - Are any Continuous Memory DTCs stored?	Yes No	ADDRESS the first Continuous Memory DTC. MIL can be caused by engaging the PTO, creating a load on the engine, while the OBD II Monitors were running. If the symptom persists, GO to Pinpoint Test Step Z1 with the following data: PTO, LOAD PIDs and list of Possible causes.

Test Notes

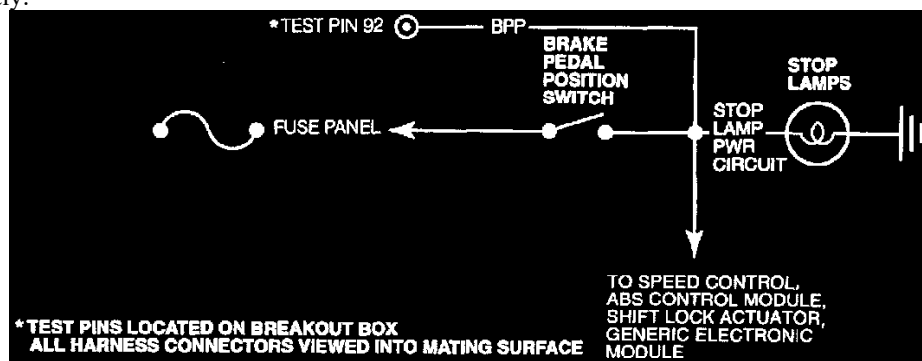
Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Brake Pedal Position (**BPP**) switch
- Harness Circuits: B +, BPP, GND and stoplamp PWR

- Powertrain control module

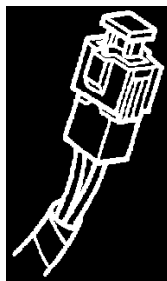
NOTE: On Continental and Towncar, the PCM receives BPP information through the SCP link. For these models, this pinpoint test will only verify Self-Test was performed correctly.



Test Step		Result	Action to Take
FD1	KOER DTC P0703 OR P1703: VERIFY BRAKE PEDAL WAS APPLIED		
	Diagnostic Trouble Code (DTC) P0703 or P1703 indicates that when the brake pedal was applied and released during the Key On Engine Running (KOER) Self-Test, the BPP signal did not cycle high and low. Possible causes: — Brake pedal not applied and released during the KOER Self-Test. — Brake pedal applied during entire KOER Self-Test. — Open or short in BPP circuit. — Open or short in stoplamp circuits. — Damaged BPP switch. — Damaged lighting control module (LCM) (Continental and Town Car). — Damaged PCM. ● Was the brake pedal applied and released during KOER Self-Test?	Yes No	► For Continental and Town Car: Diagnose Lighting control module. ► All Others: GO to FD3. ► RERUN KOER Self-Test. APPLY and RELEASE brake pedal.
FD2	KOEO DTC P0703 OR P1703: VERIFY BRAKE PEDAL WAS NOT APPLIED		
	Diagnostic Trouble Code (DTC) P0703 or P1703 indicates that during Key On Engine Off (KOEO) Self-Test, the BPP signal was high. Possible causes: — Brake pedal applied during KOEO Self-Test. — Open or short to power in BPP circuit. — Open circuit between BPP connection to stoplamp PWR circuit and stoplamps. — All stoplamps open. — Stoplamp ground. — Damaged BPP switch. ● Was the brake pedal applied during KOEO Self-Test?	Yes No	► RERUN KOEO Self-Test. Avoid applying brake pedal during test. ► For Continental and Town Car: Diagnose Lighting control module. ► All others: GO to FD3.
FD3	DTCS P0703 AND P1703: CHECK OPERATION OF STOPLAMPS		
	Continuous Memory DTC P0703 indicates a brake pedal position (BPP) switch input fault. Possible causes: — Open or short in stoplamp / BPP circuit. — Damaged BPP switch. — Damaged PCM. ● Apply and release the brake pedal several times and observe stoplamp operation. ● Do the stoplamps operate normally?	Yes No	► GO to FD4. ► GO to FD5 for stoplamps never on. ► GO to FD7 for stoplamps always on.
FD4	CHECK FOR PCM BPP PID CYCLING		
	● Connect scan tool. ● Key on, engine off. ● Access BPP PID. ● NOTE: If BPP PID is not accessible, GO to FD10. ● Apply and release the brake pedal several times while viewing the BPP PID. ● Key off. ● Did the BPP PID cycle ON/OFF?	Yes No	► GO to Pinpoint Test Step Z10 for intermittent input WIGGLE procedure. ► GO to FD10.

Test Step		Result	Action to Take
FD5	CHECK B+ VOLTAGE TO BRAKE PEDAL POSITION SWITCH		
	NOTE: Check the condition of the stoplamp bulbs before starting this test. - Disconnect BPP switch. - Measure B+ input voltage between BPP switch harness connector and chassis ground. - Is voltage greater than 10 volts?	Yes No	GO to FD6 . VERIFY integrity of fuse for B+ to brake pedal position switch. If OK, REPAIR open in B+ circuit. If fuse is damaged, check B+ circuit, BPP circuit, stop lamp PWR circuit, and any other associated circuits. REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
FD6	VERIFY INTEGRITY OF BRAKE PEDAL POSITION SWITCH		
	- Connect digital multimeter test probes to BPP switch terminals at the BPP switch. - Apply brake pedal while monitoring reading. - Is the resistance less than 5.0 ohms?	Yes No	REPAIR open circuit between BPP switch and stoplamp ground. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. REPLACE BPP switch. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
FD7	VERIFY BRAKE PEDAL POSITION SWITCH IS NOT ALWAYS CLOSED		
	- Disconnect BPP switch. - Key on, engine off. - Key off. - Were stoplamps still on with key on?	Yes No	GO to FD8 . VERIFY proper installation of BPP switch. If OK, REPLACE switch. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
FD8	CHECK FOR SHORT TO POWER IN PCM		
	- Disconnect PCM. - Key on. - Key off. - Were stoplamps still on with key on?	Yes No	GO to FD9 . REPLACE PCM. RESTORE vehicle. RERUN Quick Test.
FD9	CHECK STOPLAMP CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- One at a time, disconnect all modules associated with the stoplamp circuit. After disconnecting each module, turn key on and observe stoplamps. Turn key off. Repeat until each associated module has been disconnected or stoplamps turn off. - Did stoplamps turn off when any of the modules were disconnected?	Yes No	Diagnosis the appropriate module. After repair, RESTORE vehicle. RERUN Quick Test. REPAIR short to power in stoplamp circuit. RESTORE vehicle. RERUN Quick Test.
FD10	CHECK FOR BPP CIRCUIT CYCLING		
	- Install breakout box, leave PCM disconnected. - Measure the voltage between PCM Test Pin 92 and ground while applying and releasing the brake. - Does the voltage cycle?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR open in BPP circuit between PCM and BPP connection to stop lamp PWR circuit. RESTORE vehicle. RERUN Quick Test.

Test Notes



Shorting Bar For Harness Circuit Without Power Steering Pressure Switch

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Power Steering Pressure (**PSP**) switch
- Harness circuits: PSP and SIG RTN
- Powertrain Control Module



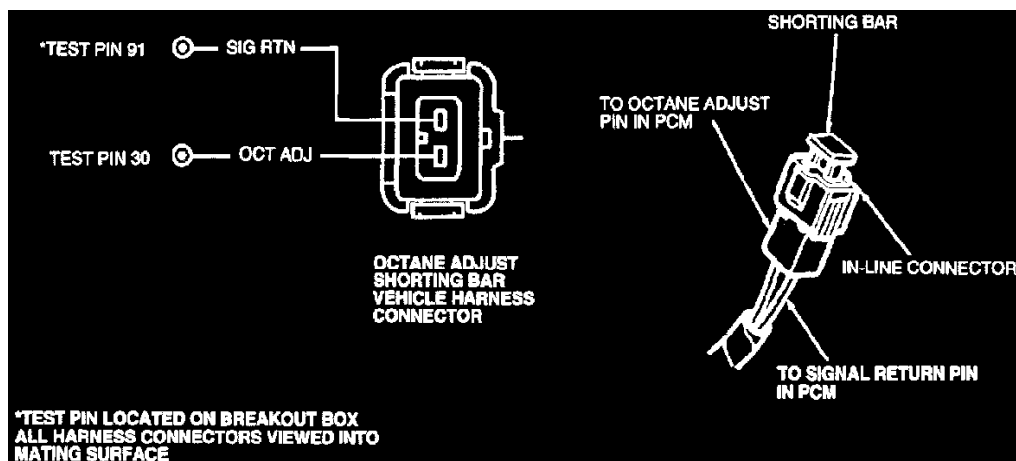
Test Step		Result	Action to Take
FF1	VERIFY ELECTRICAL FUNCTION Diagnostic Trouble Code (DTC) P1650 Indicates PSP signal out of Self-Test range. DTC P1651 indicates PSP signal malfunction. Possible causes: — PSP switch / shorting bar damaged. — SIG RTN circuit open. — PSP circuit open or shorted to SIG RTN. — PCM damaged. ● Connect scan tool. ● Key on, engine running. ● Access PSP PID (PSP V PID for Taurus / Sable). ● Turn the steering wheel back and forth. ● Key off. ● Did the PSP PID or PSP V PID indicate a change?	Yes No	Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: PSP and a list of possible causes. GO to FF2.
FF2	CHECK FOR PSP SWITCH CYCLING ● Disconnect PSP switch or remove the shorting bar. ● Install a jumper wire across the PSP harness connector. ● Key on, engine running. ● Record the PID reading. ● Remove the jumper wire and record the PID reading. ● Key off. ● Did the PSP PID change from high to low or PSP V PID change from 0.0 volts to 3.8 volts?	Yes No	REPLACE the PSP switch or shorting bar. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. GO to FF3.
FF3	CHECK PSP CIRCUIT FOR OPEN IN HARNESS ● Install breakout box, leave PCM disconnected. ● Measure resistance of PSP circuit between PCM Test Pin 31 and PSP switch harness connector. ● Measure resistance of SIG RTN circuit between PCM Test Pin 91 and PSP switch harness connector. ● Is each resistance less than 5.0 ohms?	Yes No	GO to FF4. REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
FF4	CHECK PSP CIRCUIT AND SIG RTN CIRCUIT FOR SHORT IN HARNESS ● Measure resistance between PCM Test Pin 31 and 91. ● Measure resistance between PCM Test Pin 31 and chassis ground. ● Is either resistance less than 10,000 ohms?	Yes No	REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. REPLACE PCM. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Harness circuits: SIG RTN, Octane Adjust (**OCT ADJ**)
- OCT ADJ shorting bar connector



Test Step		Result	Action to Take
FG1	DTC P1390: VISUALLY INSPECT OCTANE ADJUST IN-LINE CONNECTOR		
	Diagnostic Trouble Code (DTC) P1390 indicates OCT ADJ shorting bar is not installed or the OCT ADJ circuit is open.	Yes	GO to FG2 .
	- Visually inspect in-line connector. Is shorting bar removed?	No	GO to FG4 .
FG2	CHECK FOR MODIFICATION DECAL		
	Is there a modification decal attached to the vehicle indicating that OCT ADJ shorting bar was removed?	Yes	Testing complete. If vehicle has spark knock concern, RETURN to Symptom Charts.
		No	GO to FG3 .
FG3	CHECK KEY ON ENGINE OFF SELF-TEST		
	- Replace OCT ADJ shorting bar. - Connect scan tool. - Activate Key On Engine Off Self-Test. Is DTC P1390 present?	Yes	GO to FG4 .
		No	Testing complete, Electronic Engine Control (EC) system OK.
FG4	CHECK OCTANE ADJUST CIRCUIT FOR OPEN		
	NOTE: There must be continuity from OCT ADJ circuit through the in-line connector and shorting bar to SIG RTN circuit.	Yes	REPLACE PCM. RESTORE vehicle. RERUN Quick Test.
	- Install breakout box, leave PCM disconnected. - Measure resistance between PCM test pins 91 and 30. Is the resistance less than 5.0 ohms?	No	REPAIR open OCT ADJ circuit, shorting bar or SIG RTN circuit. RESTORE vehicle. RERUN Quick Test.
FG5	CHECK FOR DTC P1390		
	- Start engine and idle vehicle at operating temperature. - Key off. - Connect scan tool. - Activate Key On Engine Off Self-Test. Is DTC P1390 present?	Yes	GO to FG1 .
		No	GO to FG6 .
FG6	VERIFY IN-LINE CONNECTOR SHORTING BAR IS INSTALLED		
	- Visually inspect OCT ADJ in-line connector. Is shorting bar installed?	Yes	GO to FG8 .
		No	GO to FG7 .
FG7	CHECK FOR MODIFICATION DECAL		
	Is there a modification decal attached to vehicle indicating that OCT ADJ shorting bar was removed?	Yes	GO to FG10 .
		No	REPLACE shorting bar. RETURN to Symptom Chart to address spark knock concern.

Test Step		Result	Action to Take
FG8	CHECK FOR TSB		
	Is there a Technical Service Bulletin (TSB) authorizing removal of the shorting OCT ADJ bar?	Yes No	GO to FG9 . RETURN to Symptom Charts to address spark knock concern.
FG9	REMOVE OCT ADJ SHORTING BAR		
	- Remove OCT ADJ shorting bar only if there is a TSB authorization. - Drive vehicle to verify spark knock. - Is spark knock present?	Yes No	GO to FG10 . Testing complete. Electronic Engine Control (EC) system OK.
FG10	CHECK OCTANE ADJUST CIRCUIT FOR A SHORT TO GROUND IN HARNESS		
	- Install breakout box, leave PCM disconnected. - Measure resistance between OCT ADJ circuit at the in-line connector and PCM test pins 51, 91 and 103. - Is each resistance greater than 10,000 ohms?	Yes No	GO to FG11 . REPAIR short circuit. VERIFY symptom. RESTORE vehicle. If spark knock is still present, RETURN to Symptom Charts.
FG11	CHECK PCM INTEGRITY		
	- OCT ADJ shorting bar removed because of TSB authorization. - Reconnect PCM. - Key on. - Measure voltage between PCM test pin 30 and PCM test pins 51 and 103. - Key off. - Was voltage greater than 4.0 volts?	Yes No	RESTORE vehicle. VERIFY symptom. If spark knock is still present, RETURN to Symptom Charts. REPLACE PCM. RESTORE vehicle. VERIFY symptom. If spark knock is still present, RETURN to Symptom Charts.

Test Notes

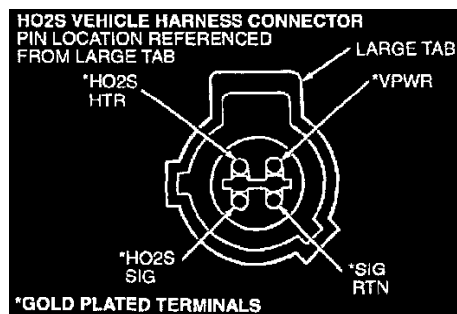
Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Heated Oxygen Sensor (**HO2S**)/Heater
- Fuel Injector(s)
- HO2S Connections
- Harness Circuits: HO2S GND, HO2S, INJ 1-8, VPWR and SIG RTN
- Vacuum Systems
- Powertrain Control Module

CAUTION: Probing or piercing wiring insulation is not permitted and may allow water entry, causing corrosion and shorting which may result in HO2S failure.

HO2S Connector and Test Pin Numbers

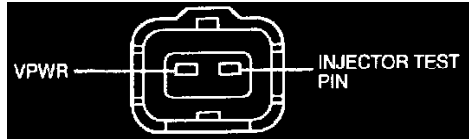


Connector View

HO2S Location	Signal Pin	Heater Ground Pin	Heater Power (VPWR) Pin	Signal Return Pin
HO2S-11	60	93	71	91
HO2S-12	35	95	71	91
HO2S-21	87	94	71	91
HO2S-22	61	96	71	91

HO2S Heater Test Pin Numbers

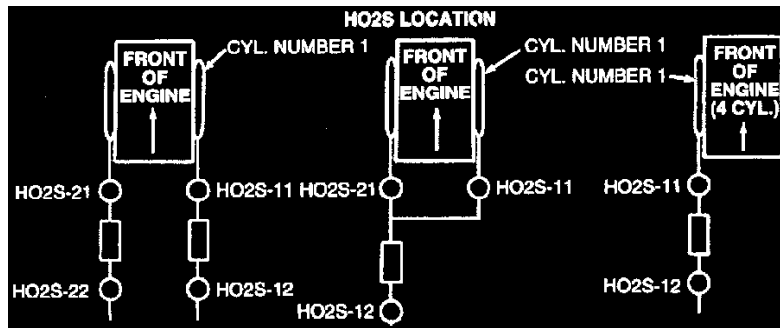
Injector Connector Pin Numbers and Test Pins



Connector View

Cylinder Number	Injector Pin	Injector Power (VPWR) Pin
1	75	71
2	101	71
3	74	71
4	100	71
5	73	71
6	99	71
7	72	71
8	98	71
9	68	71
10	42	71

Injector Connector Test Pin Numbers



Test Step		Result	Action to Take
H20	PERFORM KOER SELF-TEST		
	- Key on, engine running and engine at operating temperature. - Activate Key On, Engine Running (KOER) Self-Test. - Is DTC P1127, P1128 or P1129 present during KOER Self-Test?	Yes ▶ No ▶	DIAGNOSE DTC P1127, P1128 or P1129. GO to H21.
H21	DIAGNOSTIC TROUBLE CODE (DTC) P0133: HO2S RESPONSE TEST		
	Diagnostic Trouble Code (DTC) P0133 and P0153 indicates the response rate of the upstream HO2S is below some calibrated window. The test measures the HO2S amplitude and output frequency. This is accomplished by superimposing a 1.5 to 2.5 Hz square wave over Lambse. The HO2S switching is monitored during this time to see if the calibration limit is met. DTC/HO2S Reference List: DTC P0133 = HO2S-11 DTC P1053 = HO2S-21 Possible causes: - Contaminated HO2S. - Exhaust leaks. - Shorted / open wires. - Improper fueling. - MAF sensor. - Deteriorating HO2S. - Air leaks. - Scan Tool connected. - Key on, engine off. - Select Generic OBD II Function from the menu and trigger. - Press Continue. - Select Diagnostic Monitoring Test Results from the menu and trigger. - Scroll to Test ID: 01 trigger and press start. - Key off. - Does the measured value indicate greater than 614?	Yes ▶ No ▶	COMPLETE PCM Reset to clear DTCs. COMPLETE HO2S Monitor Drive Cycle. REPEAT Test Step H20. If test results indicate a pass, testing is complete. Oxygen Sensor test results indicate a fail. GO to H22.
H22	CHECK FOR SOURCE OF POTENTIAL HO2S CONTAMINATION		
	- Investigate the following items as potential sources of HO2S contamination: - Use of unapproved silicon sealers. - Fuel contaminated by silicon additives. - Excessive oil burning (i.e. rings, valve seals and oil overfill). - Glycol (antifreeze) leaking internally in the engine. - Lead contaminated fuel. - Use of unapproved cleaning agents. - Are any of the above conditions present?	Yes ▶ No ▶	REPAIR source of contamination. REPLACE HO2S and oil/filter. COMPLETE PCM Reset to clear DTCs. COMPLETE HO2S Monitor Drive Cycle. GO to H23.

	Test Step	Result	Action to Take
H23	CHECK FOR UNMETERED AIR LEAKS		
	Fuel calculations can be affected by unmetered air leaks. ● Carefully inspect the following areas for potential air leaks: — Hoses connecting to MAF sensor assembly. — Hoses connecting to throttle body. — Intake manifold gasket leaks. — PCV disconnected. — Vacuum lines disconnected. — Improperly seated engine oil dipstick and tube. — Exhaust leaks at flanges and gaskets. ● Are there any air leaks?	Yes No	Air leaks located. REPAIR source of air leak. COMPLETE PCM Reset to clear DTCs. COMPLETE HO2S Monitor Drive Cycle. GO to H24 .
H24	CHECK HO2S CIRCUIT WIRING		
	● PCM connected. ● Disconnect suspect HO2S. ● Jumper HO2S signal to VPWR at the HO2S harness connector. ● Scan Tool connected. ● Key on, engine off. ● NOTE: HO2S displayed as O2S on Scan Tool. Access the correct HO2S PID. ● Key off. ● Is the voltage greater than 1.50 volts?	Yes No	HO2S signal circuit is OK. REPLACE HO2S. CHANGE oil/filter. COMPLETE PCM Reset to clear DTCs. COMPLETE HO2S Monitor Drive Cycle. REMOVE jumper wire. GO to H25 .
H25	CHECK HO2S SIGNAL CIRCUIT FOR OPEN IN HARNESS		
	● Install breakout box. Leave PCM disconnected. ● Measure resistance of HO2S Signal circuit between PCM test pin and HO2S harness connector. ● Measure resistance of HO2S Signal RTN circuit PCM test pin and HO2S harness connector: — HO2S-11 = SIG Pin 60 — HO2S-21 = SIG Pin 87 — HO2S-11 = SIG RTN Pin 91 — HO2S-21 = SIG RTN Pin 91 ● Is the resistance less than 5.0 ohms?	Yes No	GO to H26 . Resistance is high. REPAIR open circuit. RESTORE vehicle. RECONNECT all components. COMPLETE HO2S Monitor Drive Cycle.

Test Step		Result	Action to Take
H26	CHECK HO2S CIRCUIT FOR SHORT TO VPWR IN HARNESS		
	● Disconnect Scan Tool from DLC. ● Measure resistance between the HO2S Signal circuit PCM test pin and VPWR circuit PCM test pin: ● Measure resistance between HO2S Signal circuit PCM test and: — HO2S-11 = SIG Pin 60 — HO2S-21 = SIG Pin 87 — VPWR = 71 — SIG RTN = 91 ● Is the resistance greater than 10,000 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. COMPLETE HO2S Monitor Repair Verification Drive Cycle. REPAIR short circuit. RESTORE vehicle. COMPLETE HO2S Monitor Drive Cycle.
H27	DTC P0131 AND P0151: CONTAMINATED HO2S / VOLTAGE SHIFT		
	Diagnostic Trouble Code (DTC) P0131 is set when the HO2S generates a negative voltage. — DTC P0131 = HO2S-11 — DTC P1051 = HO2S-21 Possible causes: — Contaminated HO2S (water, fuel, etc.). — Crossed HO2S signal / signal return wiring. ● Check for water in HO2S connector. ● Is there water in the HO2S connector?	Yes No	REPAIR source of water entry. Dry out connector. REPLACE HO2S. RESTORE vehicle. RERUN Quick Test. GO to H28.
H28	VERIFY WIRING IS IN PROPER PIN LOCATION		
	● Use the following list to measure the resistance between the appropriate PCM test pins and the HO2S Signal circuit and SIG RTN circuit at the harness connector(s): — HO2S-11 = DTC P0131 — HO2S SIG Test Pin 60 — HO2S SIG RTN Test Pin 91 — HO2S-21 = DTC P0151 — HO2S SIG Test Pin 87 ● Is the resistance less than 5.0 ohms?	Yes No	REPLACE HO2S. RESTORE vehicle. RERUN Quick Test. REPAIR wiring as necessary. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
H30	DTCS P0135, P0141 and P0155 AND P0161: HO2S HEATER CIRCUIT IS OPEN, SHORTED TO GROUND, SHORTED TO VPWR OR EXCESSIVE CURRENT DRAW		
	Diagnostic Trouble Codes (DTCs) P0135 P0141, P0155 and P0161 indicate a short to ground, open, or short to VPWR in the HO2S heater circuit. DTC/HO2S Reference List: DTC P0135 = HO2S HTR-11 DTC P0141 = HO2S HTR-12 DTC P0155 = HO2S HTR-21 DTC P0161 = HO2S HTR-22 Possible causes: — Shorts to VPWR in harness or HO2S. — Water in connectors. — Cut or pulled wires. — Disconnected wiring. — Open VPWR circuit. — Open GND circuit. — Low battery voltage. — Corrosion or poor mating terminals. — Damaged HO2S heater. — Damaged PCM. ● NOTE: On some applications, a vehicle hoist is required to access the HO2S harness. Visually inspect the HO2S circuit for exposed wiring, contamination, corrosion and proper assembly. ● Were any concerns found during the visual inspection?	Yes ▶ No ▶	REPAIR any concerns found in the visual inspection. COMPLETE PCM Reset to clear DTCs. RESTORE vehicle. RERUN Quick Test. GO to H31.
H31	PERFORM KEY ON ENGINE OFF (KOEO) SELF-TEST		
	● Scan Tool connected. ● Key on. ● Run engine at 2000 rpm for 1 minute. ● Key off. ● Key on, engine off. ● Perform KOEO Self-Test. ● Key off. ● Are DTCs P0135, P0141, P0155 or P0161 present?	Yes No ▶ ▶	GO to H32. No DTCs present. Fault may be intermittent. GO to Pinpoint Test Step Z1 with the following data: HO2S PIDs and a list of Possible causes.

Test Step		Result	Action to Take
H32	CHECK VPWR VOLTAGE TO HO2S HARNESS CONNECTOR		
NOTE: If DTCs P0135 and P0155 or P0141 and P0161 are displayed, both heater circuits will require testing. DTCs displayed separately are tested individually. - Disconnect the appropriate HO2S(s). - Key on, engine off. - Measure voltage between VPWR circuit and SIG RTN circuit at the HO2S harness connector(s) (refer to schematic at the beginning of this Pinpoint Test). - Is the voltage greater than 10.5 volts?		Yes No	GO to H34 . GO to H33 .
H33	CHECK VPWR CIRCUIT FOR OPEN IN HARNESS		
- Key off. - Install breakout box. Leave PCM disconnected. - Measure resistance of the VPWR circuit between PCM test pin 71 and VPWR circuit at the HO2S harness connector. - Is the resistance less than 4.0 ohms?		Yes No	GO to H34 . CHECK fuse in circuit. If fuse is OK, REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
H34	CHECK HO2S HEATER RESISTANCE		
- Measure the resistance of the HO2S heater (refer to schematic at the beginning of this Pinpoint Test). - Is the resistance between 3 and 30 ohms?		Yes No	GO to H35 . REPLACE HO2S. RESTORE vehicle. RERUN Quick Test.
H35	CHECK HO2S CASE FOR SHORT TO VPWR AND HEATER GND		
- Measure resistance between HO2S Heater GND at HO2S connector and the HO2S case. - Measure resistance between the HO2S Heater GND and the SIG RTN Pin at the HO2S sensor. - Measure the resistance between the HO2S VPWR at the HO2S connector and the HO2S case. - Is the resistance greater than 10,000 ohms?		Yes No	GO to H36 . REPLACE HO2S. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
H36	CHECK HO2S HEATER CIRCUIT FOR SHORT TO VPWR AND GND		
- Disconnect Scan Tool from DLC. - Breakout box installed, leave PCM disconnected. - Use the following list to measure the resistance between the appropriate test pins at the breakout box: — DTC P0135 = HO2S HTR-11 (HTR GND) PCM Test Pin 93 and PCM Test Pins 24, 103, 91 and 71. — DTC P0141 = HO2S HTR-12 (HTR GND) PCM Test Pin 95 and PCM Test Pins 24, 103, 91 and 71. — DTC P0155 = HO2S HTR-21 (HTR GND) PCM Test Pin 94 and PCM Test Pins 24, 103, 91 and 71. — DTC P0161 = HO2S HTR-22 (HTR GND) PCM Test Pin 96 and PCM Test Pins 24, 103, 91 and 71. - Is the resistance greater than 10,000 ohms?		Yes No	GO to H37 . REPAIR shorted circuit. RESTORE vehicle. RERUN Quick Test.
H37	CHECK HO2S HEATER GROUND FOR OPEN IN HARNESS		
- Use the following list to measure resistance between the appropriate PCM test pins at the breakout box and the HO2S HTR GND at the vehicle harness connector: — HO2S HTR-11=Test Pin 93 (HTR GND) — HO2S HTR-12=Test Pin 95 (HTR GND) — HO2S HTR-21=Test Pin 94 (HTR GND) — HO2S HTR-22=Test Pin 96 (HTR GND) - Is the resistance less than 4.0 ohms?		Yes No	Open or shorted or excessive resistance in the heater circuit in the PCM. REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR open or excessive resistance in the heater circuit in harness. RESTORE vehicle RERUN Quick Test.

Test Step		Result	Action to Take
H40	DTCs P1131, P1132, P1151 AND P1152: UPSTREAM HO ₂ S NOT SWITCHING. DTC P1130: FUEL SYSTEM NOT SWITCHING AT FUEL TRIM (RICH OR LEAN)		
	Diagnostic Trouble Codes (DTCs) P1131 bank 1 (Cylinder 1) and P1151 bank 2 indicate the fuel / air ratio is correcting rich for an overly lean condition. The HO₂S voltage is less than 0.45 volt. DTCs P1132 bank 1 (Cylinder 1) and P1152 bank 2 indicate the fuel / air ratio is correcting lean for an overly rich condition. The HO₂S voltage is greater than 0.45 volt. DTC P1130 and P1150 indicate the fuel control system has reached maximum compensation for a lean or rich condition and the HO₂S is not switching. DTC/HO₂S Reference List — HO₂S-11 = DTCs P1131, P1132 and P1130 — HO₂S-21 = DTCs P1151, P1152 and P1150 Possible causes: Fuel system — Excessive fuel pressure. — Leaking fuel injector(s). — Leaking fuel pressure regulator. — Low fuel pressure or running out of fuel. — Contaminated fuel injector(s) — Vapor recovery system Induction system — Air leaks after the MAF. — Vacuum leaks (vacuum lines and gaskets). — Restricted air inlet. — PCV system. — Improperly seated engine oil dipstick. EGR System — Leaking gasket. — Stuck open EGR valve. — Leaking diaphragm. Base engine — Oil overfill. — Cam timing. — Cylinder compression. — Exhaust leaks before or near the HO₂Ss. ● Check intake air system for leaks, obstructions and damage. ● Check air cleaner element, air cleaner housing for blockage. ● Verify integrity of the PCV system. ● Check for vacuum leaks. ● Are any of the above concerns present?	Yes No	▶ REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. ▶ GO to H42.

Test Step		Result	Action to Take
H41	DTCs P0172, P0171, P0174 AND P0175: FUEL SYSTEM AT THE CORRECTED FUEL TRIM		
	Diagnostic Trouble Codes (DTCs) P0171 bank 1 (Cylinder 1) and DTC P0174 bank 2 indicate the fuel/air ratio is too lean. The fuel trim system is at the rich correction limit. DTC P0172 bank 1 and DTC P0175 bank 2 indicate the fuel/air ratio is too rich. The fuel trim system is at the lean correction limit. DTCs HO2S Reference list: — HO2S-11 = DTCs P0171 and P0172 — HO2S-21 = DTCs P0174 and P0175 Possible causes: Fuel system — Excessive fuel pressure. — Leaking fuel injector(s). — Leaking fuel pressure regulator. — Low fuel pressure or running out of fuel. — Contaminated fuel injector(s). — Vapor management valve (VMV) leaking. Induction system — Air leaks after the MAF. — Vacuum leaks (vacuum lines and gaskets). — Restricted air inlet. — PCV system. — Fuel purge system. — Improperly seated engine oil dipstick. EGR System — leaking gasket. — Stuck open EGR valve. — Leaking diaphragm. Base engine — Oil overfill. — Cam timing. — Cylinder compression. — Exhaust leaks before or near the HO2S(s). ● Check intake air system for leaks, obstructions and damage. ● Check air cleaner element, air cleaner housing for blockage. ● Verify integrity of the PCV system. ● Check for vacuum leaks. ● Are any of the above concerns present?	Yes No	REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. GO to H42.

Test Step		Result	Action to Take
H42	PERFORM KOER SELF-TEST		
• Scan Tool connected. • Disconnect fuel vapor hose from intake manifold and plug fitting at intake manifold. • Start engine and run at 2000 rpm for 5 minutes and return to idle. • Perform Key On Engine Running (KOER) Self-Test. • Key off. • Are any HO2S DTCs P1127, P1128, P1129, P1131, P1132, P1151 or P1152 present?		Yes	If DTC P1127, P1128 or P1129 is present, DIAGNOSE these DTCs first. If DTC P0131 or P0151 is present in Continuous Memory, GO to H27. DTCs P1131, P1130, P1151 or P1150: GO to H43. DTCs P1132, P1130, P1152 or P1150: GO to H49.
		No	For Continuous Memory DTCs Only P1130, P1150, P0171, P0174, P0172 and P0175: GO to H52. If DTC(s) P1132 and/or P1152 are no longer present, RECONNECT fuel vapor line. Ranger (Flex Fuel), Mustang (Federal): GO to HW12. Vehicles experiencing DTC 1132 or 1152: GO to HX22. Vehicles experiencing DTC 1131 or 1151: GO to HX58. All others without reccuring DTCs: The fault that produced the DTC is an intermittent. GO to Pinpoint Test Step Z1 with the following data: HO2S-11, 21 PIDs and list of Possible causes.

Test Step		Result	Action to Take
H43	HO2S CIRCUIT TEST (WITH LEAN DTCs)		
	- Scan Tool connected. - Disconnect the HO2S related to the DTC. - Key on, engine off. - Access the correct HO2S PID. - NOTE: If a spark occurs, (indicating a short) remove jumper and go to Pinpoint Test Step H47 (check fuse in the heater circuit). Jumper the HO2S Signal circuit to the HO2S Heater VPWR circuit at the HO2S vehicle harness connector. - Is the reading 1.30 volts or greater?	Yes No	CHECK SIG RTN circuit. GO to H44. An open or short to ground exists in the vehicle harness or PCM. GO to H46.
H44	CHECK SIGNAL RETURN CIRCUIT FOR OPEN		
	- Install breakout box. PCM connected. - Measure the resistance of HO2S SIG RTN circuit between the HO2S harness connector and the battery ground terminal. - Is the resistance reading less than 5.0 ohms?	Yes No	RESTORE vehicle. GO to H52. GO to H45.
H45	CHECK HO2S SIGNAL RETURN CIRCUIT FOR OPEN IN HARNESS		
	- Disconnect PCM. - Measure resistance of the HO2S SIG RTN circuit between the HO2S harness connector and PCM test pin 91. - Is the resistance reading less than 5.0 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
H46	CHECK HO2S SIG AND HO2S GND CIRCUITS FOR OPEN IN HARNESS		
	- Disconnect PCM. - Install breakout box, leave PCM disconnected. - Measure resistance of HO2S Signal circuit between PCM test pin and the HO2S harness connector. Use the Pin assignment below and record the reading: - HO2S-11 SIG = test pin 60 - HO2S-021 SIG = test pin 87 - HO2S SIG RTN = test pin 91 - Is the resistance reading less than 5.0 ohms?	Yes No	GO to H47. REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
H47	CHECK HO2S CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Measure resistance between the HO2S Signal circuit PCM test pin and PCM test pins 24, 51, 77, 103 (PWR GND) and 91 (SIG RTN). - Is each resistance greater than 10,000 ohms?	Yes No	GO to H48. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
H48	CHECK HO2S SIGNAL CIRCUIT FOR SHORT TO GROUND		
	- Reconnect HO2S. - Measure resistance between PWR GND and SIG RTN circuit PCM Test Pins and HO2S Signal circuit PCM test pin: HO2S-11 SIG = test pin 60 HO2S-21 SIG = test pin 87 HO2S GND = test pin 24 and 103 HO2S SIG RTN = test pin 91 - Is resistance greater than 10,000 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPLACE HO2S. RESTORE vehicle. RERUN Quick Test.
H49	HO2S CIRCUIT CHECK (FOR RICH DTCS)		
	- Key off. - Disconnect the HO2S related to the DTC received. - Scan Tool connected. - Key on. - Access the HO2S PID(s). - Is the reading 0.2 volt or less?	Yes No	GO to H51 . A short to power exists. GO to H50 .
H50	CHECK HO2S CIRCUIT FOR SHORT TO VPWR AND HO2S HEATER GROUND IN HARNESS		
	- Key off. - Disconnect Scan Tool from DLC. - Disconnect PCM. - Install breakout box, leave PCM disconnected. - Use the following list to measure resistance between the appropriate PCM test pins in the harness: — DTC P1130, P1132=HO2S-11 test pin 60 and test pins 71 and 93. — DTC P1150, P1152=HO2S-21 test pin 87 and test pins 71 and 94. - Is the resistance greater than 10,000 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPLACE HO2S. REPAIR short to power. RESTORE vehicle. RERUN Quick Test.
H51	CHECK HO2S SIGNAL FOR SHORT TO HO2S HEATER CIRCUIT IN THE SENSOR		
	- Suspect HO2S sensor connected. - Scan Tool connected. - Key on, engine off. - NOTE: HO2S displayed as O2S on Scan Tool. - Access HO2S PID corresponding to DTCs received. - Is the HO2S voltage greater than 0.45 volt?	Yes No	REPLACE HO2S. RESTORE vehicle. RERUN Quick Test. RESTORE vehicle. GO to H52 .

Test Step		Result	Action to Take																		
H52	CHECK FUEL PRESSURE																				
WARNING: THE FUEL SYSTEM IS PRESSURIZED WHEN THE ENGINE IS NOT RUNNING. TO PREVENT INJURY OR FIRE, USE CAUTION WHEN WORKING ON THE FUEL SYSTEM. BECOME FAMILIAR WITH THE WARNING CAUTION AND NOTE IN PINPOINT TEST HC BEFORE SERVICING. ● Connect battery charger. ● Install fuel pressure gauge. ● Verify vacuum source to fuel pressure regulator (returnable fuel system only). ● Key on, engine off. ● Access Output Test Mode on scan tool and run the fuel pump to obtain maximum fuel pressure. NOTE: The fuel pump will only operate for approximately 8 seconds when Output Test Mode is selected and activated. ● Key off. FUEL PRESSURE CHART <table border="1"><thead><tr><th></th><th>KPA</th><th>PSI</th></tr></thead><tbody><tr><td>Contour / Mystique Cougar (2.5L)</td><td>310-415</td><td>45-60</td></tr><tr><td>Escort / Tracer, Continental</td><td>517-862</td><td>55-85</td></tr><tr><td>Ranger</td><td>386-496</td><td>56-72</td></tr><tr><td>Ranger (Flex Fuel)</td><td>324-434</td><td>47-63</td></tr><tr><td>All Others</td><td>207-310</td><td>30-45</td></tr></tbody></table> ● Is the fuel pressure within the range for the vehicle being diagnosed?			KPA	PSI	Contour / Mystique Cougar (2.5L)	310-415	45-60	Escort / Tracer, Continental	517-862	55-85	Ranger	386-496	56-72	Ranger (Flex Fuel)	324-434	47-63	All Others	207-310	30-45	Yes	Fuel system is capable of required fuel pressure. For mechanical and electronic returnless fuel systems: GO to H55. All others: GO to H53.
	KPA	PSI																			
Contour / Mystique Cougar (2.5L)	310-415	45-60																			
Escort / Tracer, Continental	517-862	55-85																			
Ranger	386-496	56-72																			
Ranger (Flex Fuel)	324-434	47-63																			
All Others	207-310	30-45																			
		No	GO to Pinpoint Test HC1.																		

Test Step		Result	Action to Take
H53	CHECK FUEL SYSTEM FOR PRESSURE STABILITY		
	• Cycle key on and off several times. • Verify there are no external leaks (repair as necessary). • Does the fuel pressure remain within 34 kPa (5 psi) of the highest reading after one minute?	Yes No	▶ For Continuous Memory DTCs P1130, P1150, P0171 and P0172, P0174 and P0175: GO to H54. ▶ For No Starts: GO to H55. ▶ For HO2S DTCs displayed with misfire DTCs: GO to H56. ▶ All other DTCs: GO to H60. ▶ Excessive pressure loss. GO to Pinpoint Test Step HC5.
H54	CHECK FUEL SYSTEM FOR PRESSURE STABILITY WITH KEY ON		
	• Cycle key on then off several times. • Turn key on and engine off, monitor fuel pressure gauge. • Does the fuel pressure remain within 34 kPa (5 psi) of the highest reading after 10 seconds?	Yes No	▶ For Continuous Memory DTCs P1130, P1150, P0171 and P0174 and P0171: GO to H56. ▶ For DTC P0172 and P0175: GO to H58.
H55	CHECK FUEL INJECTOR(S) ABILITY TO DELIVER FUEL		
	• Cycle key several times. • Locate and disconnect the inertia fuel shutoff (IFS) switch. • Monitor pressure gauge while cranking the engine for at least five seconds. • Key off. • Was there a pressure drop greater than 34 kPa (5 psi) while cranking the engine?	Yes No	▶ The Electronic Engine Control System is not the cause of the no start. RESTORE vehicle. Refer to Symptom Charts for further diagnosis ▶ RESTORE vehicle. GO to H56.
H56	CHECK FUEL INJECTOR(S) AND HARNESS RESISTANCE		
	• NOTE: This erases Continuous Memory DTCs. • Install breakout box, leave PCM disconnected. • NOTE: If misfire DTCs are displayed with the Fuel Control DTCs, use the misfire DTCs to determine the fuel injector circuits requiring testing. • Measure resistance between suspect fuel injector circuit PCM Test pin(s) and Test Pin 71 (VPWR) (refer to chart the the beginning of test for fuel injector pin location). • Is the resistance between 11.0-18.0 ohms?	Yes No	▶ Fuel injector and harness resistance is OK. GO to H59. ▶ GO to H57.

Test Step		Result	Action to Take
H57	CHECK FUEL INJECTOR HARNESS RESISTANCE		
● Disconnect fuel injector harness connector at the suspect fuel injector. ● Measure resistance of fuel injector circuit between PCM Test Pin 71 (VPWR) and the VPWR pin at the fuel injector harness connector. ● Measure resistance of the Fuel Injector circuit between PCM test pin(s) and the fuel injector signal pin at the fuel injector harness connector. (Refer to chart at the beginning of test for Fuel Injector Pin location.) ● Is each resistance less than 5.0 ohms?		Yes No	GO to H58 . REPAIR open harness circuit. RESTORE vehicle. RERUN Quick Test.
H58	CHECK FUEL INJECTOR HARNESS CIRCUIT FOR SHORT TO POWER OR GROUND		
● Measure resistance between fuel injector circuit PCM test pin(s) and PCM Test Pin 71 (VPWR), 24 and 103 (PWR GND) (refer to chart at the beginning of test for fuel injector pin location). ● Is each resistance greater than 10,000 ohms?		Yes No	GO to H59 . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
H59	CHECK FUEL INJECTOR DRIVER SIGNAL		
This test requires a standard 12 volt test lamp. ● Connect PCM to breakout box. ● Connect test lamp between PCM test pin 71 (VPWR) and suspect fuel injector Test Pin(s) (refer to chart at the beginning of test for fuel injector pin location). ● NOTE: Properly operating system will show a dim glow or flicker at idle on the test lamp. Crank or start engine. ● Does test lamp have a dim glow while cranking or running engine?		Yes No	RESTORE vehicle. GO to H60 . No light/ Continuous bright light: REPLACE PCM. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
H60	FLOW TEST FUEL INJECTOR(S)		
- Use the Rotunda Injector Tester, SBDS® Injector Tester or equivalent to flow test the fuel injectors according to the instructions for the fuel injector tester. - Is the leakage and flow within specification?		Yes	DTC P0171 and P0174: GO to H62. DTC P0172 and P0175: The fault that produced the DTC is an intermittent. GO to Pinpoint Test Step Z1 with the following data: SF1, SF2, LFT1, LFT2 PIDs and list of Possible causes. For DTC P1130 and P1150: GO to H62. For DTC P1131 and P1151: GO to H61. For DTC P1132 and P1152: GO to H65.
		No	REPLACE fuel injector. COMPLETE PCM Reset to clear DTCs. RESTORE vehicle. RERUN Quick Test.
H61	CHECK FOR SECONDARY AIR INTRUSION		
NOTE: If the vehicle is not equipped with Secondary Air Injection System, GO to H62. An HO2S always lean condition can be caused by: - Leak in hoses from secondary air injection pump to engine. - Secondary Air diverted upstream of HO2S. - Disconnect secondary air injection hose(s) from engine and plug engine side of secondary air injection system. - Key on, engine running and at operating temperature. - Activate Key On, Engine Running (KOER) Self-Test. - Is DTC P1131 or P1151 present?		Yes	RESTORE vehicle. GO to H62 .
		No	Cause of DTC(s) is in the Secondary Air Injection System. GO to HM7 for Secondary Air Injection System diagnostics.

Test Step		Result	Action to Take
H62	INSPECT INDUCTION SYSTEM FOR AIR LEAKS		
- Inspect the following areas for signs of air leaks: - Inlet tube(s) from air cleaner to the throttle body. - Gaskets which seal the upper and lower intake manifold. - Vacuum hoses and lines for cracks and proper connections. - PCV system. - Are there any signs of leaks or damage?		Yes	REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
		No	CONTINUOUS DTCs P0171, P0174, P1130 or P1150: The fault that produced the DTC is an intermittent. GO to Pinpoint Test Step Z1 with the following data: SF1, SF2, LFT1, LFT2, HO2S-11 and HO2S-21 PIDs and a list of Possible causes. DTCs P1131 and P1130 or P1151 and P1150: GO to H63.
H63	CHECK CYLINDER COMPRESSION		
NOTE: Use the Misfire DTC(s) displayed on prior DTC retrieval to determine which cylinder's compression to check. Check cylinder compression.		Yes	For DTCs P1131, P1130, P1151 and P1150: GO to H64. For DTCs P1132 and P1152: GO to H65. Misfire DTCs displayed with fuel control DTCs: GO to HD20.
Are cylinder compression readings within specification?		No	REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.

Test Step		Result	Action to Take
H64	CHECK HO2S'S ABILITY TO GENERATE A VOLTAGE GREATER THAN 0.5 VOLT		
	Any vacuum or air leaks can cause DTCs P1131, P1130, P1151 and P1150. Possible causes: — Leaking vacuum actuators. — Engine sealing (Intake and IAC). — EGR system (valve). — PCV system (hose and valve). — Unmetered air leaks between throttle body and mass air flow (MAF) sensor assembly. — Silicone contaminated HO2S. ● Inspect HO2S harness for chafing, burned wires or other damage and repair as necessary. ● Disconnect the suspect HO2S from vehicle harness. ● Connect digital multimeter to the HO2S Signal and HO2S SIG RTN or HO2S GND at the HO2S sensor connector. ● Run engine at 2000 rpm for three minutes. ● Rerun KOER Self-Test and monitor HO2S voltage. ● Key off. ● Is the voltage greater than 0.5 volt during or at the end of Self-Test?	Yes No	▶ GO to H70. ▶ REPLACE HO2S. RESTORE vehicle. RERUN Quick Test.
H65	ATTEMPT TO GENERATE DTC P1131 OR P1151		
	● HO2S disconnected. ● Jumper HO2S Signal at the HO2S harness vehicle connector to the battery negative post. ● Activate Key On Engine Running (KOER) Self-Test. ● Key off. ● Is DTC P1131 or P1151 present?	Yes No	▶ REMOVE jumper. GO to H66. ▶ REMOVE jumper. RECONNECT HO2S. DISCONNECT PCM. INSPECT both ends of connector for damaged or pushed out pins, moisture, corrosion, loose pins and REPAIR as necessary. If OK, REPLACE PCM. RESTORE vehicle. RERUN KOER Self-Test.
H66	HO2S SENSOR VOLTAGE CHECK		
	● Suspect HO2S disconnected. ● Connect digital multimeter to HO2S SIG circuit and HO2S SIG RTN at the HO2S sensor connector. ● Disconnect vacuum hose from vacuum tree. ● Start engine and run at 2000 rpm. ● Key off. ● Does the voltage reading indicate less than 0.4 volt within 30 seconds?	Yes No	▶ RECONNECT vacuum hose and HO2S. GO to H70. ▶ REPLACE HO2S. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
H70	MONITOR HO2S (PID) FOR PROPER SWITCHING		
	- Key on, engine running. - Engine at operating temperature. - NOTE: HO2S displayed as O2S on Scan Tool. Monitor suspect HO2S PID using Scan Tool. - Access HO2S PID while wiggling, bending, and shaking small sections of the Electronic Engine Control harness from the PCM to the HO2S. - Key off. - Did the HO2S voltage stay high (greater than 0.45 volt) or low (less than 0.45 volt)?	Yes ▶ No ▶	ISOLATE cause of lack of HO2S switches and repair. COMPLETE PCM Reset to clear DTCs. RESTORE vehicle. RERUN Quick Test. GO to H71.
H71	TEST DRIVE WHILE MONITORING HO2S PID FOR PROPER SWITCHING		
	NOTE: This test step requires an observer to monitor PID for proper operation. - Scan Tool still attached. - Access HO2S PID. - While observer views PID, test drive vehicle under different road conditions in an attempt to simulate the original fault. - Does HO2S appear to switch properly?	Yes ▶ No ▶	UNABLE to duplicate fault. COMPLETE PCM Reset to clear DTCs. RESTORE vehicle. Testing complete at this time. REPLACE HO2S. COMPLETE PCM Reset to clear DTCs. RESTORE vehicle. RERUN Quick Test.
H80	DTC P0136 AND P0156 MONITOR DOWNSTREAM HO2S OUTPUT VOLTAGE FOR ACTIVITY. DTCs P1137, P1138, P1157 AND/OR P1158 INDICATE LACK OF HO2S SWITCHING		
	DTC P0136 and / or P0156 indicates the output voltage of the downstream HO2S is less than some calibratable functional window. KOER DTCs P1137, P1138, P1157 and P1158 can only be retrieved during KOER Self-Test when the fuel control is ramped rich and lean and monitored for a voltage change on the downstream HO2S. — DTC P0136, P1137 and P1138=HO2S-12 — DTC P0156, P1157 and P1158=HO2S-22 Possible causes: - Wiring Concerns: - Pinched, shorted, and corroded wiring and pins - Crossed sensor wires - Other Concerns: - Exhaust leaks - Contaminated or damaged sensor - Are any of the above concerns present?	Yes ▶ No ▶	REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. Continuous Memory DTC P0136 and P0156: GO to H81. All others: GO to H82.

Test Step		Result	Action to Take
H81	CHECK FOR KOER DTCS P1137, P1138 AND P1158		
	• Scan Tool connected. • Key on. • Engine at 2000 rpm for 3 minutes. • Activate KOER Self-Test. • Check for DTCs. • Key off. • Is DTC P1137, P1138, P1157 or P1158 present?	Yes No	GO to H82 . For DTC P0136 and P0156: The fault that produced the DTC is intermittent. GO to Pinpoint Test Step Z1 with the following data: HO2S-12,22 PIDs and list of Possible causes.
H82	CHECK EXHAUST SYSTEM FOR LEAKS		
	NOTE: Any exhaust leaks between the engine and the end of the catalyst can cause DTC P0136 and P0156. • Key off. • Place vehicle on a hoist, transmission in PARK, emergency brake applied, raise vehicle. • Inspect the following: — Exhaust flanges for leaks. — HO2S torque. — Check for punctures and cracks in catalyst and pipes leading to them. • Are there any exhaust leaks?	Yes No	REPLACE or REPAIR as required. COMPLETE PCM Reset to clear DTCs. RESTORE vehicle. RERUN Quick Test. GO to H83 .
H83	CHECK HO2S HARNESS CIRCUIT FOR SHORT TO VPWR AND GROUND		
	• Disconnect Scan Tool from DLC. • Disconnect PCM. • Install breakout box, leave PCM disconnected. • Disconnect suspect HO2S. • Measure resistance between HO2S Signal circuit PCM test pin and SIG RTN circuit PCM test pin. • Measure resistance between HO2S Signal circuit PCM test pin and VPWR and VREF circuit PCM test Pin. • Measure resistance between HO2S Signal circuit PCM test pin and PWR GND circuit PCM test pin. — HO2S-12 SIG = Test Pin 35 — HO2S-22 SIG = Test Pin 61 — HO2S SIG RTN = Test Pin 91 — PWR GND = Test Pins 24 and 103 — VPWR = Test Pin 71 — VREF = Test Pin 90 • Is resistance greater than 10,000 ohms?	Yes No	GO to H84 . REPAIR short in harness. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take									
H84	CHECK HO2S SIGNAL CIRCUIT AND HO2S SIGNAL RETURN CIRCUITS FOR OPEN IN HARNESS											
● Measure resistance of HO2S Signal circuit between PCM test pin and the HO2S harness connector. ● Measure resistance of SIG RTN circuit between PCM test pin and HO2S SIG RTN vehicle harness connector. — HO2S-12 SIG = Test Pin 35 — HO2S-22 SIG = Test Pin 61 — HO2S SIG RTN = Test Pin 91 ● Is the resistance reading less than 5.0 ohms?		Yes No	GO to H85 . REPAIR open circuit in harness. RESTORE vehicle. RERUN Quick Test.									
H85	CHECK HO2S CIRCUIT VOLTAGE											
● Connect PCM to harness. ● Suspect HO2S connected to harness. ● Scan Tool connected. ● Key on, engine off. ● NOTE: HO2S displayed as O2S on Scan Tool. Access the correct HO2S PID. <table border="1"><thead><tr><th>DTC</th><th>HO2S</th><th>PINS</th></tr></thead><tbody><tr><td>P0136, P1137 and P1138</td><td>HO2S-12</td><td>35 and 71</td></tr><tr><td>P0156, P1175 and P1158</td><td>HO2S-22</td><td>61 and 71</td></tr></tbody></table> ● Key off. ● Is the voltage greater than 1.5 volts?		DTC	HO2S	PINS	P0136, P1137 and P1138	HO2S-12	35 and 71	P0156, P1175 and P1158	HO2S-22	61 and 71	Yes No	GO to H88 . GO to H86 .
DTC	HO2S	PINS										
P0136, P1137 and P1138	HO2S-12	35 and 71										
P0156, P1175 and P1158	HO2S-22	61 and 71										
H86	CHECK HO2S GROUND CIRCUIT IN THE PCM											
● Connect PCM to breakout box. Harness disconnected from breakout box. ● Measure resistance between SIG RTN circuit PCM test pin and PWR GND circuit PCM test pin. ● Is the resistance reading less than 5.0 ohms?		Yes No	REMOVE breakout box. RECONNECT PCM. GO to H87 . REPLACE PCM. RESTORE vehicle.									

Test Step		Result	Action to Take
H87	HO2S CIRCUIT CHECK		
	● Suspect HO2S disconnected. ● Jumper VPWR to HO2S signal circuit at the harness connector. ● Key on. ● Access HO2S PID and monitor. ● Is the PID value greater than 1.5 volts?	Yes No	REPLACE HO2S. RESTORE vehicle. COMPLETE an HO2S Monitor Repair Verification Drive Cycle. RERUN Test. REPLACE PCM. RESTORE vehicle. COMPLETE an HO2S Monitor Repair Verification Drive Cycle. RERUN Quick Test.
H88	CHECK FOR OVER VOLTAGE ON THE HO2S CIRCUIT IN THE PCM		
	● Key on. ● HO2S disconnected. ● Measure voltage between SIG RTN circuit at the HO2S harness connector and battery negative post. ● Measure voltage between HO2S SIG circuit at the HO2S harness connector and battery negative post. ● Are either voltage readings greater than 1.5 volts?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPLACE HO2S. RESTORE vehicle. RERUN Quick Test.
H100	KOER DTC P 1127		
	DTC P 1127 indicates the HO2S heater(s) were not on during KOER Self-Test and testing of the HO2S did not occur. The HO2S heaters are turned on and off when certain temperatures are reached. The HO2S heaters are activated based on exhaust temperature modeling, which allows upstream heaters to be energized independently of the downstream heaters. Possible causes: — Engine not operating long enough prior to performing KOER Self-Test. — Exhaust system too cool. ● Scan tool connected. ● Key on, engine on. ● Access all HO2S heaters and HO2S heater monitor PIDs. ● Key off. ● Do all PIDs indicate ON?	Yes No	Engine still operating. PERFORM KOER Self-Test. Operate the engine until all PIDs indicate on. PERFORM KOER Self-Test.

Test Step		Result	Action to Take
H110	DTCS P1128 AND P1129 KOER		
DTCP1128 and P1129 indicate that during KOER testing either the upstream or downstream or both HO2S signal(s) are swapped from bank to bank. — P1128 refer to the upstream HO2S. — P1129 refer to the downstream HO2S. Possible Causes: — Crossed HO2S harness connectors. — Crossed wiring at HO2S harness connectors. — Crossed HO2S wiring at 104-pin PCM harness connector. ● Visually inspect vehicle HO2S harness connector(s) for any indication of being crossed (stretched wires, wire harnesses not mounted properly). ● Are there crossed connections or wires?		Yes No	REPAIR as necessary. RERUN Quick Test. GO to H111 .
H111	VERIFY PROPER HO2S SIGNAL PIN LOCATION		
● Breakout box installed, PCM disconnected. ● Disconnect both of the suspect HO2S sensors from the vehicle harness connector. — P1128 = HO2S 11/21 Upstream — P1129 = HO2S 12/22 Downstream ● Measure resistance between PCM circuit test pin(s) and the HO2S harness connectors: — HO2S 11 = Test Pin 60 — HO2S 21 = Test Pin 87 — HO2S 12 = Test Pin 35 — HO2S 22 = Test Pin 61 ● Is the resistance less than 5.0 ohms?		Yes No	HO2S SIG circuit is OK. RESTORE vehicle. RERUN Quick Test. CONNECT HO2S connector to proper HO2S signal pins in the PCM 104-pin harness connector or HO2S harness connectors. RERUN Quick Test.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Chassis Components
- Fuel Return
- Engine Vacuum
- Fuel Supply
- Fuel Pressure
- Fuel Injector
- Fuel Filter

Engine Application	Part Number -9F593-	Electrical Connector Color	Resistance Ohms	Flow Lb./Hr.	Rotunda Injector Tester Information	
					Flow Tube	Color Scale
Car:						
2.0L 2V	F8CE-AA	Ivory	11-18	17	1A	Yellow
2.0L 4V	968F-AC	Dk. Gray	11-18	21	2A	White
2.5L	F73E-BA	Ivory	11-18	17	1A	Yellow
3.0L	F47E-AE	Gray	11-18	14	1A	Gray
3.0L 4V	F6DE-BA	Lt. Blue	11-18	24	2B	Lt. Blue
3.0L FFV	F6DE-AA	Green	11-18	25	2A	Green
3.4L	F6DE-BA	Gold	11-18	19	1A	Yellow
3.8L	F1ZE-BC	Gray	11-18	14	1A	Gray
4.6L 2V	F6VE-AA	Gold	11-18	19	1A	Yellow
4.6L 2V	F0TE-DA	Gold	11-18	19	1A	Yellow
4.6L NGV	F5TE-BA	Aqua	4-6	160	N/A	N/A
4.6L 4V	F55E-AE	Lt. Blue	11-18	24	2B	Lt. Blue
Truck:						
2.5L	F87E-DA	Gray	11-18	14	1A	Gray
3.0L	F87E-BAN	Lt. Green	11-18	12	N/A	N/A
3.8L	F78E-AA	Gold	11-18	19	1A	Yellow
4.0L OHV	97TF-AA	Red	11-18	19	N/A	N/A
4.0L SOHC	973F-BA	Gray	11-18	24	N/A	N/A
4.2L	F65E-AA	Dk. Gray	11-18	21	1A	Yellow
4.6L 2V	F0TE-DA	Gold	11-18	19	1A	Yellow
5.0L	F6VE-AA	Gold	11-18	19	1A	Yellow
5.4L	F0TE-DA	Gold	11-18	19	1A	Yellow
5.4L NGV	F5TE-BA	Aqua	4-6	160	N/A	N/A
5.8L	F2TE-AA	Gold	11-18	19	1A	Yellow
6.8L	F6VE-AA	Gold	11-18	19	1A	Yellow
7.0L	F0TE-DA	Gold	11-18	19	1A	Yellow
7.5L	F1TE-DA	Blue	11-18	24	2B	Lt. Blue

Fuel System Applications

Vehicle Type	Fuel System Type
Ranger	Mechanical Returnless (2)
Explorer/Mountaineer	Returnable Fuel (1)
E/F-Series	Returnable Fuel (1)
Continental	Electronic Returnless (3)
Mark VIII	Electronic Limited Returnless (4)
Crown Victoria/Grand Marquis	Returnable Fuel (1)
Escort/Tracer	Electronic Returnless (3)
Contour/Mystique, Cougar	Returnable Fuel (1)
Taurus/Sable	Returnable Fuel (1)
Expedition	Returnable Fuel (1)
Town Car	Returnable Fuel (1)
Mustang ^a	Returnable Fuel (1)

^a Two speed pump control (4.6L-4V).

(1) Returnable fuel systems return fuel to the fuel tank by means of a return line from the fuel rail.

(2) Mechanical returnless fuel systems do not return fuel to the fuel tank by means of a fuel return liner. The pressure regulator is mounted on the Fuel Pump Module located in the fuel tank and excess fuel is returned at this point.

(3) Electronic fuel systems do not return fuel to the fuel tank by means of a fuel return line. There is no fuel pressure regulator and pressure is controlled by varying the voltage to the fuel pump through the Fuel Pump Driver Module (FPDM).

(4) Fuel returned to fuel tank from fuel rail and pump speed is variably controlled by the FPDM.

Safe Fuel Handling Practices

WARNING: Fuel in the fuel system remains under high pressure even when the engine is not running. To avoid injury or fire, release the fuel pressure from the fuel system before disconnecting any fuel line. To release the pressure from the system perform the following:

- Connect the Rotunda fuel pressure gauge T80L-9974-B or equivalent at the schrader valve located on the fuel rail. Testing kit valve must be closed.
- Gradually open the testing kit valve to relieve fuel pressure in the vehicle fuel system and drain the fuel into a suitable container or return it to the fuel tank.

WARNING: To avoid unnecessary fuel spillage and fire hazard, any time fuel lines are disconnected, the ignition switch must be in the OFF position unless fuel pump operation is required for test purposes. Use care to prevent combustion from fuel spillage. No smoking, open flames or any kind of arcing.

SAFE FUEL HANDLING PRACTICES - GASOLINE, METHANOL, AND METHANOL BLENDS

- Report all fires to the appropriate authorities.
- Flames from methanol or methanol-gasoline blends can be invisible.
- Know the locations of portable fire extinguishers, fire blankets, fire alarms and eye/wash shower facilities. Learn how to use them.
- Use a B or AFFF (light water) type fire extinguisher to fight flammable liquid fires.
- If gasoline has been swallowed, do not induce vomiting. Seek medical attention immediately!
- If methanol or a methanol/gasoline blend has been swallowed, induce vomiting under the direction of a physician or Poison Control Center. Seek medical attention immediately!
- When overcome by vapors, if safe, move victim to fresh air. If not breathing, give artificial respiration or CPR (Cardiopulmonary Resuscitation) as appropriate. Seek medical attention immediately!
- If splashed in eyes, flush with large amounts of water for 15 minutes. Remove contact lenses, if worn. Seek medical attention.
- If splashed on skin, remove contaminated clothing. Wash skin thoroughly with soap and water.
- All fuels can be harmful or fatal if swallowed.
- Be aware, if swallowed, onset of serious health effects can be delayed 12 to 24 hours.
- Fuels and other products containing methanol (e.g. windshield washer fluid) can cause blindness if swallowed.
- All fuel vapors can be harmful if inhaled.
- All fuels can be harmful if absorbed through the skin.
- All fuels are irritating to the eyes and respiratory system.
- Some fuels contain benzene which is a cancer-causing agent.
- Use flammable liquid handling precautions.
- Wear chemical goggles and nitrile gloves (additional protective clothing and equipment may be necessary in some instances).
- Keep flammable liquids in approved, labeled, closed containers.
- Use in well-ventilated areas and control vapors. Be aware that vapors are not visible, are heavier than air, can travel along the floor, and will settle in lower areas.
- When transferring flammable liquids, bond the receiving container to the source and ground the source to the earth.
- Do not smoke or use heat/spark producing equipment near vapors.
- Do not eat, smoke or drink where these products are handled, processed or stored.
- Never siphon by mouth.
- Wash hands thoroughly after handling any fuel.
- Notify the proper authorities in the event of any spill you have not been trained to clean up.
- Stop, contain, and clean up small spills with an absorbent material.

Inertia Fuel Shutoff Switch Reset Instructions

WARNING: If you see or smell gasoline at any time other than during fueling, do not reset the Inertia Fuel Shutoff (IFS) switch.

- Turn key OFF.
- Check for fuel leaks in the engine compartment.
- If no leak is apparent, reset the IFS switch by pushing the reset button on the top of the switch.

NOTE: In the closed position, the button can be depressed an additional 1.57 mm (1/16 inch) against a spring.

- Turn key to ON or START position for a few seconds, then OFF again.
- Again, check for leaking fuel.

Test Step		Result	Action to Take												
HC1	CHECK SYSTEM INTEGRITY														
- Visually inspect the complete fuel delivery system, including fuel lines, connections, relays, damage to fuel tank, fuel pump, fuel pressure regulator and fuel injector areas for leaks, looseness, cracks, kinks, pinching, or abrasion caused by a collision or mishandling. - Visually inspect electrical harness and connectors for loose pins, corrosion, abrasion, or other damage from collision or mishandling. - Check electrical connectors for proper mating. - Verify vehicle has followed maintenance schedule. - Verify inertia fuel shutoff (IFS) switch is set. - Verify battery is fully charged (12.5 volts or greater). - Verify electrical / fuse integrity. - Verify fuel level in the tank is sufficient. Has any concern been found?		Yes No	REPAIR as necessary. RERUN Quick Test. GO to HC2 .												
HC2	CHECK VOLTAGE AT FUEL PUMP HARNESS CONNECTOR														
- Connect scan tool. - Connect battery charger. - Verify IFS switch state. Follow the IFS switch reset procedure at the beginning of this pinpoint test. - Disconnect the fuel pump harness connector at the fuel pump. - Key on, engine off. - Connect a digital multimeter between the fuel pump power circuit and fuel pump ground circuit at the fuel pump harness connector. - Access Output Test Mode and turn on the fuel pump circuit and monitor the voltage reading. Was the voltage greater than 12.5 volts?		Yes No	EXIT Output Test Mode. RECONNECT fuel pump harness connector. RESTORE vehicle. GO to HC3 . FOR vehicles with electronic returnless fuel systems and Mark VIII: GO to Pinpoint Test Step KB70 . ALL others: CHECK for opens and shorts in the fuel pump power and ground circuits. RESTORE vehicle.												
HC3	CHECK FUEL FILTER FOR PROPER MAINTENANCE														
- Locate and inspect the vehicle maintenance schedule and fuel filter. Check for last repair date. <table border="1"> <thead> <tr> <th></th> <th>3 Inch Dia. Filter</th> <th>2 Inch Dia. Filter</th> </tr> </thead> <tbody> <tr> <td>Car</td> <td>120,700 km / 75,000 miles</td> <td>80,467 km / 50,000 miles</td> </tr> <tr> <td>Truck</td> <td>80,467 km / 50,000 miles</td> <td>48,280 km / 30,000 miles</td> </tr> <tr> <td>Contour / Mystique, Cougar</td> <td colspan="2">160,933 km / 100,000 miles</td> </tr> </tbody> </table> Was the fuel filter repaired within periods called out by the previous chart?			3 Inch Dia. Filter	2 Inch Dia. Filter	Car	120,700 km / 75,000 miles	80,467 km / 50,000 miles	Truck	80,467 km / 50,000 miles	48,280 km / 30,000 miles	Contour / Mystique, Cougar	160,933 km / 100,000 miles		Yes No	GO to HC4 . REPLACE fuel filter. GO to HC4 .
	3 Inch Dia. Filter	2 Inch Dia. Filter													
Car	120,700 km / 75,000 miles	80,467 km / 50,000 miles													
Truck	80,467 km / 50,000 miles	48,280 km / 30,000 miles													
Contour / Mystique, Cougar	160,933 km / 100,000 miles														

Test Step		Result	Action to Take																		
HC4	CHECK FUEL PRESSURE																				
WARNING: BEFORE SERVICING OR REPLACING ANY COMPONENTS IN THE FUEL SYSTEM, REDUCE THE POSSIBILITY OF INJURY OR FIRE BY FOLLOWING DIRECTION IN FUEL SYSTEM CAUTION, HANDLING AND WARNING AT THE BEGINNING OF THIS PINPOINT TEST. ● Install fuel pressure tester. ● Release fuel pressure. ● Key on, engine off. ● Access Output Test Mode on scan tool and run the fuel pump to obtain maximum fuel pressure. NOTE: The fuel pump will only operate for approximately 8 seconds when Output Test Mode is selected and activated. Fuel Pressure Chart <table><tr><th>Vehicle</th><th>kPa</th><th>psi</th></tr><tr><td>Contour, Mystique, Cougar (2.5L)</td><td>310-415</td><td>45-60</td></tr><tr><td>Escort/Tracer, Continental</td><td>517-862</td><td>55-85</td></tr><tr><td>Ranger</td><td>386-496</td><td>56-72</td></tr><tr><td>Ranger (Flex Fuel)</td><td>324-434</td><td>47-63</td></tr><tr><td>All Others</td><td>207-310</td><td>30-45</td></tr></table> ● Is the fuel pressure at the specified pressure (use the fuel pressure chart)?		Vehicle	kPa	psi	Contour, Mystique, Cougar (2.5L)	310-415	45-60	Escort/Tracer, Continental	517-862	55-85	Ranger	386-496	56-72	Ranger (Flex Fuel)	324-434	47-63	All Others	207-310	30-45	Yes	▶ For Electronic/Mechanical Returnless Fuel Systems: GO to HC12 . All others: GO to HC5 .
Vehicle	kPa	psi																			
Contour, Mystique, Cougar (2.5L)	310-415	45-60																			
Escort/Tracer, Continental	517-862	55-85																			
Ranger	386-496	56-72																			
Ranger (Flex Fuel)	324-434	47-63																			
All Others	207-310	30-45																			
		No	▶ For Mechanical Returnless Fuel System with fuel pressure greater than 448 kPa (65 psi). REPLACE fuel pressure regulator in fuel tank. RESTORE vehicle. RECHECK fuel pressure. For Mechanical Returnless Fuel System with fuel pressure less than 310 kPa (45 psi): GO to HC13 . For Electronic Returnless systems with fuel pressure less than 517 kPa (75 psi). GO to HC13 . For Electronic Returnless systems with fuel pressure greater than 862 kPa (125 psi). RESTORE vehicle. Concern is elsewhere. RETURN to Symptom Charts for further direction. All others: Fuel pressure greater than 280 kPa (40 psi) (Contour/Mystique, Cougar 415 kPa (60 psi) on returnable fuel systems, GO to HC10 . Fuel pressure less than 240 kPa (35 psi) (Contour/Mystique, Cougar 310 kPa (45 psi) on returnable fuel systems, GO to HC10 .																		
HC5	CHECK FUEL PRESSURE LEAKDOWN																				
● Observe Warning, Caution and Notes. ● Fuel pressure tester installed. ● Key on, engine off. ● Access Output Test Mode on scan tool and run the fuel pump to obtain maximum fuel pressure. ● Key off. ● Verify fuel pressure remains within 34 kPa (5 psi) of the maximum fuel pressure for 1 minute after the fuel pump is turned off. ● Does the fuel pressure remain within 34 kPa (5 psi)?		Yes	▶ GO to HC7 .																		
		No	▶ GO to HC6 .																		

Test Step		Result	Action to Take
HC6	CHECK PRESSURE REGULATOR DIAPHRAGM		
- Fuel pressure tester installed. - Start engine and run engine for 10 seconds. - Key off, wait 10 seconds. - Start engine and run engine for 10 seconds. - Key off, remove vacuum hose from fuel pressure regulator port. - Inspect for fuel in the vacuum hose or regulator port. - Is the vacuum hose and regulator port free of fuel?		Yes No	GO to HC12 . REPLACE fuel pressure regulator. RESTORE vehicle. RECHECK for fuel in the vacuum hose and regulator port.
HC7	CHECK FUEL PRESSURE, ENGINE RUNNING		
- Fuel pressure tester installed. - Disconnect vacuum hose at the fuel pressure regulator and plug it. - Drive vehicle with heavy accelerations while observing fuel pressure gauge reading. - Does fuel pressure reading hold steady within 21 kPa (3 psi) during test?		Yes No	RESTORE vehicle. GO to HC8 . GO to HC13 .
HC8	CHECK FUEL PRESSURE REGULATOR RESPONSE		
- Fuel pressure tester installed. - Install vacuum gauge to intake manifold. - Start engine and observe both gauges. - Accelerate and decelerate engine speed to vary vacuum gauge reading. - Does the fuel pressure gauge reading increase as vacuum gauge reading decreases or decrease as vacuum gauge reading increase?		Yes No	RESTORE vehicle. Concern is elsewhere. RETURN to Symptom Charts for further direction. GO to HC9 .
HC9	CHECK VACUUM SUPPLY		
- Fuel pressure tester installed. - Vacuum hose disconnected and plugged at the fuel pressure regulator. - Install a hand held vacuum pump to the fuel pressure regulator. - Start engine, remain at idle. - Observe fuel pressure while applying vacuum. - Does the fuel pressure change as the vacuum changes?		Yes No	REPAIR vacuum source. RESTORE vehicle. REPLACE fuel pressure regulator. RESTORE vehicle.

Test Step		Result	Action to Take
HC10	CHECK FOR RESTRICTED FUEL RETURN LINE		
	- Fuel pressure tester installed. - Remove fuel return line at the fuel rail and connect a short hose from the fuel rail to a measure container of at least 1.1 liter (1.0 quart) capacity. - Key on, engine off. - Access Output Test Mode on scan tool and run the fuel pump to obtain maximum fuel flow (one cycle of the fuel pump is all that is required). - Record fuel pressure and observe if fuel is being returned to the measuring container. Is fuel pressure between (Contour/Mystique, Cougar 2.5L 310 and 415 kPa (45 and 60 psi) or 240 and 280 kPa (35 and 40 psi) on all others and is fuel returning to the container?	Yes No	GO to HC11 . Fuel pressure greater than 415 kPa (60 psi) on Contour/Mystique, Cougar 2.5L or all others 290 kPa (45 psi). REPLACE fuel pressure regulator. RESTORE vehicle.
HC11	CHECK FUEL RETURN SYSTEM		
	- Observe Warning, Caution and Handling at the beginning of this pinpoint test. - Disconnect fuel return line at the fuel rail. - Disconnect fuel return line at the fuel pump. - Check the fuel return line for restrictions due to blockage, kinking or pinching. - Apply 21 to 34 kPa (3 to 5 psi) regulated shop air to the return line pressure. Does air flow freely through the line?	Yes No	REPLACE the fuel pump module. RESTORE vehicle. RECHECK fuel pressure. REPAIR the fuel return line. RESTORE vehicle. RECHECK fuel pressure.
HC12	CHECK FUEL INJECTOR FLOW AND LEAKAGE		
	- Observe Warning, Caution and Handling at the beginning of this pinpoint test. - Check injectors for leakage and flow rate: Use SBDS or equivalent. Is the flow rate and leakage rate for the injectors tested within specification? -	Yes No	For symptoms without DTCs and Electronic/Mechanical Returnless Fuel Systems: RETURN to Symptom Charts for further direction. All others: VERIFY no other leak exists. REPLACE fuel pump module. RESTORE vehicle. RECHECK fuel pressure. REPLACE the failed fuel injector(s). RESTORE vehicle. RECHECK fuel pressure.
HC13	CHECK FUEL SUPPLY LINE FOR RESTRICTION		
	- Observe Warning, Cautions and Handling at the beginning of this pinpoint test. - Disconnect fuel supply line at the fuel rail. - Disconnect fuel supply line at the fuel pump. - Check the fuel supply line for restrictions due to blockage, kinking, or pinching. - Apply 21 to 34 kPa (3 to 5 psi) regulated shop air pressure to the supply line. Does air flow freely through the line?	Yes No	Air flows freely. REPLACE fuel pump module. RESTORE vehicle. RECHECK fuel pressure. REPAIR cause of restriction. RESTORE vehicle. RECHECK fuel pressure.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Ignition System
- Fuel Injectors
- Fuel Pressure
- Vacuum System
- Evaporative Emission System
- Fuel Vapor Storage Canister
- EVAP Canister Purge Valve
- Base Engine
- Crankshaft Position (CKP) Sensor
- Powertrain Control Module

Test Step		Result	Action to Take
HD 1	CHECK POSSIBLE CAUSES OF MISFIRE		
	NOTE: Running out of fuel can turn on the MIL and possibly store a Continuous Misfire DTC. Misfire Continuous Memory Diagnostic Trouble Codes (DTCs): P0301 - Cyl No. 1, Fuel Inj. Test Pin 75 P0302 - Cyl No. 2, Fuel Inj. Test Pin 101 P0303 - Cyl No. 3, Fuel Inj. Test Pin 74 P0304 - Cyl No. 4, Fuel Inj. Test Pin 100 P0305 - Cyl No. 5, Fuel Inj. Test Pin 73 P0306 - Cyl No. 6, Fuel Inj. Test Pin 99 P0307 - Cyl No. 7, Fuel Inj. Test Pin 72 P0308 - Cyl No. 8, Fuel Inj. Test Pin 98 P0309 - Cyl No. 9, Fuel Inj. Test Pin 68 P0310 - Cyl No. 10, Fuel Inj. Test Pin 42 Possible causes: — Ignition system. — Fuel injectors. — Fuel pressure. — Evaporative Emission System. — EVAP canister purge valve. — Base engine. — Running out of fuel. ● Has the vehicle recently run out of fuel?	Yes No	▶ OBD II system OK. COMPLETE PCM Reset to clear DTCs. RETURN vehicle to customer. ▶ GO to HD2.
HD 2	CHECK DAMPER AND PULLEY ASSEMBLY		
	NOTE: This Pinpoint Test Step is for engines that have damper-mounted pulse rings. Remove the front cover if necessary to observe the crank pulley. ● Observe the crank pulley for wobble. ● Examine the EI pulse ring fastened to the harmonic fastener. ● Does the crank pulley wobble or is the pulse ring loose or damaged?	Yes No	▶ DISCONNECT battery for 5 minutes to allow PCM to learn new data, due to the old pulse ring. REPLACE the pulley or damper assembly. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test. ▶ GO to HD3.
HD 3	CHECK FOR OTHER NON-MISFIRE CONTINUOUS MEMORY DTCS		
	NOTE: Check for other non-misfire Continuous Memory DTCs which could cause the misfire DTC. Possible causes: — Camshaft position (CMP) sensor. — Octane adjust (OCT ADJ). — Ignition coil primary circuit. — Knock sensor (KS). ● Are other non-misfire Continuous Memory DTCs present?	Yes No	▶ ADDRESS the next Continuous Memory DTC. DISREGARD Misfire DTC at this time. ▶ GO to HD4.

Test Step		Result	Action to Take
HD4	CHECK FOR KEY ON ENGINE OFF (KOEO) SELF-TEST DTCs		
	- Check for any key on, engine off DTCs which could cause the Misfire DTC. Are any key on, engine off DTCs displayed on the Scan Tool?	Yes No	PROCEED as required to address those DTCs. GO to JB1 to evaluate spark plugs and secondary wires. If OK, GO to HD5
HD5	CHECK FOR OTHER KEY ON ENGINE RUNNING DTCs		
	NOTE: Check for any other key on, engine running DTCs which can cause the Misfire DTC. Are any additional key on, engine running DTCs displayed on the Scan Tool?	Yes No	If DTCs P1131, P1137, P1151 or P1157 are present, GO to HD8 . All others: ADDRESS those DTCs now. Vehicles with D.P.F. EGR Systems: GO to HD6 . All others: GO to HD8 .
HD6	CHECK / COMPARE PID VALUES		
	- Connect scan tool. - Accessories off (A/C, heater, etc.). - Start engine and warm to normal operating temperature. - Access DPFEGR PID with the scan tool. - Key on, engine off. - Record DPFEGR PID value. - Start engine. - Compare key on, engine off and engine running PID values. - Key off. Was engine running PID value within 0.15 volt of key on, engine off value?	Yes No	Disconnect scan tool. GO to HD8 . Go to Pinpoint Test Step HE100 .
HD8	CHECK FUEL INJECTOR(S) AND HARNESS FOR OPEN		
	- Install breakout box, leave PCM disconnected. - Measure resistance between suspect fuel injector and PCM Test Pin 71 or 97. Refer to the list in HD1. Is the resistance between 11.0-18.0 ohms?	Yes No	Fuel injector and harness resistance is OK. GO to HD9 . GO to Pinpoint Test Step H56 to diagnose fuel injectors.

Test Step		Result	Action to Take
HD9	CHECK INJECTOR DRIVER SIGNAL		
NOTE: This step requires a standard 12 volt test lamp. A properly operating system will show a dim glow on the test lamp. ● Connect PCM to breakout box. ● Connect test lamp between PCM Test Pin 71 or 97 and suspect injector test pin. ● Start engine. ● Observe test lamp. ● Key off. ● Did test lamp have a dim glow while running engine?		Yes No	GO to HD10. No light or bright light: REPLACE PCM. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
HD10	CHECK FUEL PRESSURE		
WARNING: THE FUEL SYSTEM WILL REMAIN PRESSURIZED WHEN ENGINE IS NOT RUNNING. TO PREVENT INJURY OR FIRE, USE CAUTION WHILE WORKING ON THE FUEL SYSTEM. ● Install fuel pressure gauge. ● Start and run engine at idle. Record fuel pressure. ● Increase engine speed to 2500 rpm and maintain for one minute. Note and compare fuel pressure. ● Key off. ● Was fuel pressure between 210-310 kPa (30-45 psi)?		Yes No	GO to HD11. Go to Fuel Delivery and Air Induction.
HD11	CHECK ABILITY OF FUEL SYSTEM TO HOLD FUEL PRESSURE		
● Start and run engine at idle. Note fuel pressure. ● Increase engine speed to 2500 rpm and maintain for one minute. ● Look for fuel leaking at the fuel injector O-ring, fuel pressure regulator and the fuel lines to the fuel charging assembly. ● Turn engine off. ● Did fuel pressure remain at specification within 16.5 kPa (5 psi) for 60 seconds?		Yes No	GO to HD12. Go to Fuel Delivery and Air Induction, to determine which area within the Fuel Delivery system is at fault.

Test Step		Result	Action to Take
HD12	CHECK FUEL INJECTOR FOR FLOW AND LEAKAGE		
	- Refer to Warning, Caution and Handling at the beginning of Pinpoint Test HC to avoid fuel spillage and injury. - Verify that the flow rate for each fuel injector is within specification using Injector Flow Tester. Is flow rate for each fuel injector within specification?	Yes No	Fuel delivery system is not likely to have caused the Misfire DTC. GO to HD20 to diagnose the vacuum system. REPLACE or CLEAN the inoperative fuel injector(s) as required. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
HD20	CHECK VACUUM SYSTEM		
	NOTE: Some vacuum leaks can be heard. - Inspect all vacuum lines for damage, such as pinched lines, cracks, proper routing and assembly. Is the vehicle vacuum system OK?	Yes No	GO to HD21 . REPAIR the vacuum system. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
HD21	CHECK EVAPORATIVE EMISSION SYSTEM		
	The Misfire Monitor can be influenced by Evaporative Emission System. The next four Pinpoint Test steps will diagnose the Evaporative Emission System. - Check the EVAP canister for fuel saturation. Is there an excess amount of liquid fuel present in the fuel vapor storage canister?	Yes No	REPLACE EVAP. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test. GO to HD22 . CHECK fuel tank vent system.
HD22	PRESSURE TEST EVAPORATIVE EMISSION SYSTEM		
	- Pressure test EVAP emission system. - Install Rotunda Evaporative Emission System Tester 134-00056 or equivalent first at the EVAP SERVICE port, if equipped, then at the fuel filler cap. - Follow test instructions from the Tester Kit. Is evaporative emission system holding pressure?	Yes No	GO to HD23 . REPAIR as necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.

Test Step		Result	Action to Take
HD23	CHECK VACUUM IN EVAPORATIVE EMISSION SYSTEM		
	- Check for blockage/restrictions or cut hoses between engine vacuum port and EVAP canister. - Check for blockage in fuel tank vent system. Is there a fault indicated?	Yes ► No ►	REPLACE damaged vacuum hoses, or REMOVE blockage/restrictions. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test. For Mustang (Federal): GO to HD24. For all others: GO to HD26.
HD24	CHECK EVAP CANISTER PURGE VALVE		
	This pinpoint test step will verify the mechanical integrity of EVAP canister purge valve. The valve and circuit have been checked electrically and reported during KOEO Self-Test. - Disconnect EVAP canister purge valve. CAUTION: Observe proper pin orientation when connecting a power source. - Connect 12 volt DC power source to valve. - Connect positive power source to VPWR circuit and negative lead to EVAP canister purge circuit at the EVAP canister purge valve harness connector. - Apply 53 kPa (16 in-Hg) of vacuum to the manifold side of the EVAP canister purge valve. Apply power source. Does the valve open and pass air freely?	Yes ► No ►	Evaporative Emission system is functioning properly. GO to HD25 for base engine concerns. REPLACE EVAP canister purge valve. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
HD25	CHECK FOR BASE ENGINE CONCERNS		
	This Pinpoint Test step will determine if there are any base engine concerns that may have caused the Misfire DTC or drive concern. Perform the following tests in order to evaluate base engine integrity: - Perform an Engine Compression test. - Perform Dynamic Valve Train analysis. - Check Positive Crankcase Ventilation System. - Check possible leakage points. Is any service required?	Yes ► No ►	Make repairs. RERUN Quick Test. The cause of the Misfire DTC is intermittent. To diagnose the Ignition System, GO to the Intermittent Ignition procedure in Pinpoint Test Step Z50. FOLLOW Instructions for using the Rotunda Electronic Ignition System, (Distributor/less Ignition System Tester (DIST)) tool.

Test Step		Result	Action to Take
HD26	CHECK OF EVAP CANISTER PURGE VALVE HOUSING LEAKS		
	● EVAP canister purge valve electrically connected. ● Install a hand vacuum pump to the fuel vapor port from EVAP canister on the EVAP canister purge valve vacuum at line. ● Apply 53 kPa (16 in-Hg) of vacuum with the vacuum pump. ● Does the EVAP canister purge valve hold vacuum at room temperature?	Yes No	Go to HD27 . REMOVE vacuum pump. REPLACE damaged EVAP canister purge valve. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HD27	CHECK FOR FILTER CONTAMINATION ON DAMAGE EVAP CANISTER PURGE VALVE		
	● Vacuum line from input vacuum port to intake manifold on the EVAP canister purge valve (control vacuum solenoid part of valve) is removed. ● Install a hand held vacuum pump to the open input vacuum port on the EVAP canister purge valve. ● Apply 48-52 kPa (10-15 in-Hg) of vacuum to the EVAP canister purge valve. ● Does the EVAP canister purge valve hold vacuum or is the valve very slow to release vacuum to atmosphere?	Yes No	REPAIR EVAP canister purge valve filter. If unable to clean filter or REMOVE blockage to filter, REPLACE EVAP canister purge valve. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. REMOVE vacuum pump. RECONNECT all components. GO to HD25 .
HD30	CHECK FOR ADDITIONAL MISFIRE DTCS		
	Diagnostic Trouble Code P0300 indicates multiple cylinders are misfiring or PCM cannot identify which cylinder is misfiring. Possible causes: — Camshaft Position Sensor (CMP) — Low fuel: less than 1/8 tank — Stuck open EGR valve ● Are any other misfire DTCs present?	Yes No	GO to HD1 . GO to HD31 .
HD31	CHECK FOR OTHER CONTINUOUS MEMORY DTCS		
	● Are other Continuous Memory DTCs present?	Yes No	ADDRESS those DTCs. GO to HD32 .

Test Step		Result	Action to Take
HD32	CHECK / COMPARE PID VALUES		
- Connect scan tool. - Accessories off (A/C, heater, radio, etc.). - Start engine and warm to normal operating temperature. - Access DPFEGR PID with the scan tool. - Key on, engine off. - Record PID value. - Start engine, let idle. - Compare key on, engine off and engine running PID values. - Key off. - Was engine running DPFEGR PID value within 0.15 volt of key on, engine off value?		Yes	Disconnect scan tool. Vehicles with VRS type CMP, GO to HD41 .
		No	Vehicles with hall effect type CMP, GO to HD40 . GO to Pinpoint Test Step HE100 .
HD40	CHECK CMP SENSOR OUTPUT		
Diagnostic Trouble Code (DTC) P1309 indicates Misfire Detection Monitor is not enabled. - Breakout box installed, PCM disconnected. - Connect digital multimeter between PCM test pin 85 and test pins 51 or 103. - Bump engine in short burst with the starter without starting engine for at least 10 engine revolutions. - Does digital multimeter reading switch between low (less than 2.0 volts DC) and high (greater than 8.0 volts DC)?		Yes	NOTE: A Hall effect type CMP sensor that is installed out of synchronization will produce a DTC. Verify the correct installation. If the CMP is installed properly, REPLACE PCM. RESTORE vehicle. RERUN Quick Test.
		No	REPLACE CMP sensor. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
HD41	CHECK CMP SENSOR OUTPUT		
- Breakout box installed. PCM connected. - Set digital multimeter on AC scale (monitor less than 5.0 volts). - Start engine and vary engine RPM. - Measure voltage between PCM test pin 85 and test pins 51, 103. - Key off. - Did AC voltage vary greater than 0.1 volt AC?		Yes	Verify the correct installation. If CMP is installed properly, REPLACE PCM. RESTORE vehicle. RERUN Quick Test.
		No	REPLACE CMP sensor. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.

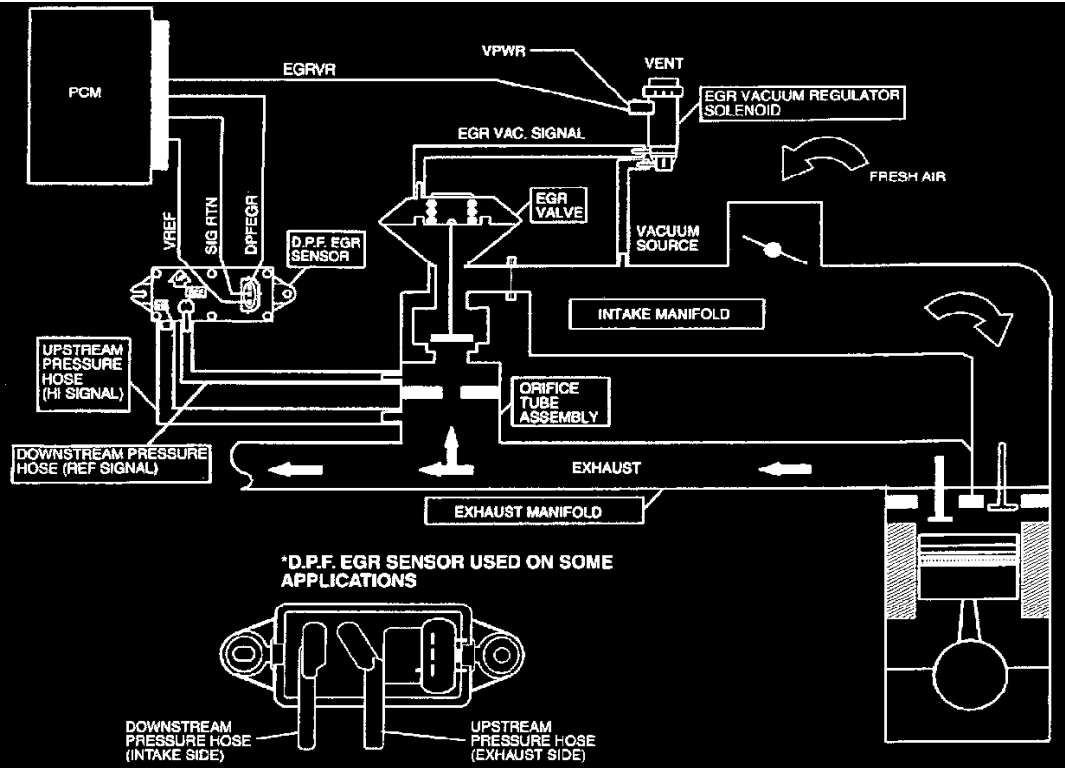
Test Notes

Enter this pinpoint test only when directed here.

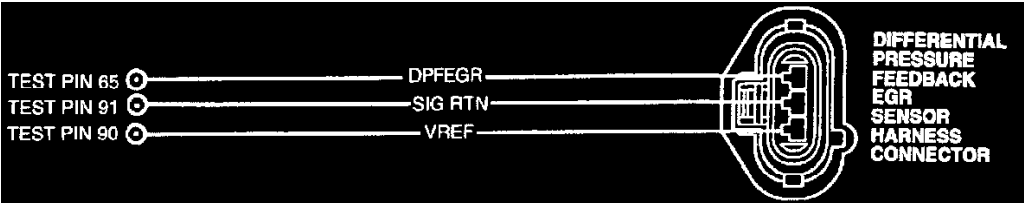
This pinpoint test is intended to diagnose the following:

- Differential Pressure Feedback EGR Sensor
- Exhaust Gas Recirculation (**EGR**) Valve
- EGR Vacuum Regulator Solenoid
- Orifice Tube Assembly
- Differential Pressure Feedback EGR Sensor Pressure Hoses
- Vacuum Lines
- Harness Circuits: VREF, DPFE, SIG, SIG RTN, EVR, EVR PWR
- Powertrain Control Module

Pinpoint Test Schematics



System Schematic



DPFE Sensor Connector



EGR Vacuum Regulator Solenoid Connector

DPFE Sensor Identification

0.55 (+0.25/-0.2) Voltage Offset	1.0 (+0.25/-0.25) Voltage Offset
Aluminum Housing (F48E-9J460-BB)	Aluminum Housing (F7UE-9J460-AA) Black Plastic (F77E-9J460-AB)
Continental 5.0L Explorer/Mountaineer 4.6L F-Series and Expedition 4.6L E-Series	All other applications

The differential pressure feedback EGR sensor will either have an aluminum housing or a black plastic housing depending on the application. Also, sensors will have either a **0.55 voltage** offset or **1.0 voltage** offset (the voltage offset refers to the sensor key ON engine OFF voltage). Refer to the table to identify the sensor for your application when performing Pinpoint Test HE. The part numbers shown in the table are engineering part numbers stamped on the sensor.

Test Step		Result	Action to Take
HE1	DTC P1400: VERIFY DIFFERENTIAL PRESSURE FEEDBACK EGR (D.P.F. EGR) VOLTAGE		
	Diagnostic Trouble Code (DTC) P1400 indicates that Self-Test has detected a DPFEGR circuit input below the minimum. Possible causes: — Leaking upstream pressure hose. — DPFEGR shorted to GND or SIG RTN. — VREF shorted to GND or SIG RTN. — Damaged D.P.F. EGR sensor. — Damaged PCM. ● Key on, engine off. ● Access DPFEGR PID with a scan tool. ● Key off. ● Was DPFEGR PID voltage less than 0.2 volt?	Yes No	The D.P.F. EGR sensor voltage is less than the acceptable minimum. GO to HE2. INSPECT pressure signal hoses for leaks. REPAIR as necessary. If OK, fault that produced DTC P1400 is intermittent. GO to HE6.
HE2	INDUCE OPPOSITE D.P.F. EGR SENSOR VOLTAGE		
	● Disconnect D.P.F. EGR sensor vehicle harness connector. ● Connect a jumper wire between VREF and DPFEGR circuits at the D.P.F. EGR sensor harness connector. ● Key on, engine off. NOTE: If a Scan Tool communication concern exists, remove jumper immediately and go directly to HE3. ● Access DPFEGR PID with a Scan Tool. ● Is DPFEGR PID value between 4.0 and 6.0 volts?	Yes No	REPLACE damaged D.P.F. EGR sensor. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. REMOVE jumper. GO to HE3.
HE3	CHECK VOLTAGE BETWEEN VREF AND SIGRTN CIRCUITS TO D.P.F. EGR SENSOR		
	● Measure voltage between VREF and SIG RTN circuits at the D.P.F. EGR sensor harness connector. ● Key off. ● Was VREF voltage between 4.0 and 6.0 volts?	Yes No	GO to HE4. VREF voltage is out of range. GO to Pinpoint Test Step C1.

Test Step		Result	Action to Take
HE4	CHECK DPFEGR CIRCUIT FOR SHORT TO GROUND AND SIG RTN IN HARNESS		
	- Disconnect Scan Tool from DLC. - Install breakout box, leave PCM disconnected. - Measure resistance between PCM Test Pin 65 and PCM Test Pins 51, 91 and 103. Is each resistance greater than 10,000 ohms?	Yes No	REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
HE6	WIGGLE TEST D.P.F. EGR SENSOR AND HARNESS		
	- Key on, engine off. - Access DPFEGR PID with a Scan Tool. - Observe DPFEGR PID for an indication of a fault while performing the following: - Lightly tap on D.P.F. EGR sensor. Wiggle the D.P.F. EGR sensor connector and harness between sensor and PCM. A fault is indicated by a sudden change in DPFEGR PID voltage. Is a fault indicated?	Yes No	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: DPFEGR and EGRVR PIDs and list of Possible causes.
HE10	DTC P1401: VERIFY DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR VOLTAGE		
	Diagnostic Trouble Code (DTC) P1401 indicates that Self-Test has detected DPFEGR circuit input above the maximum. Possible causes: - DPFEGR open. - DPFEGR shorted to VREF or PWR. - VREF shorted to PWR. - SIG RTN open. - Damaged D.P.F. EGR sensor. - Damaged PCM. - Key on, engine off. - Access DPFEGR PID with a scan tool. - Key off. Was DPFEGR PID voltage greater than 4.0 volts?	Yes No	The D.P.F. EGR sensor voltage is greater than the acceptable maximum. GO to HE11. The fault that produced DTC P1401 is intermittent. GO to HE19.
HE11	CHECK DPFEGR CIRCUIT FOR SHORT TO PWR		
	- Disconnect D.P.F. EGR sensor. - Key on, engine off. - Measure DPFEGR circuit voltage at the D.P.F. EGR sensor harness connector. - Key off. Was voltage greater than 10.5 volts?	Yes No	The D.P.F. EGR sensor voltage input is indicating a short to PWR. GO to HE12. GO to HE13.

Test Step		Result	Action to Take
HE 12	CHECK DPFEGR CIRCUIT FOR SHORT TO PWR IN HARNESS		
	• D.P.F. EGR sensor disconnected. • Install breakout box, leave PCM disconnected. • Key on, engine off. • Measure voltage between PCM Test Pin 65 and PCM Test Pins 51 and 103. • Key off. • Was voltage greater than 10.5 volts?	Yes No	REPAIR short circuit. RESTORE vehicle. RERUN Quick Test. REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test.
HE 13	INDUCE OPPOSITE D.P.F. EGR SENSOR VOLTAGE		
	• Connect a jumper wire between DPFEGR and SIG RTN circuits at the D.P.F. EGR sensor harness connector. • Key on, engine off. NOTE: If a scan tool communication concern exists, remove jumper immediately and go directly to HE 18. • Access DPFEGR PID with a scan tool. • Key off. • Was DPFEGR PID voltage less than 0.05 volt?	Yes No	REMOVE jumper. GO to HE 14 . Unable to induce opposite signal. GO to HE 16 .
HE 14	CHECK VREF VOLTAGE TO D.P.F. EGR SENSOR		
	• Key on, engine off. • Measure voltage between VREF and SIG RTN circuits at the D.P.F. EGR sensor harness connector. • Key off. • Was VREF voltage between 4.0 and 6.0 volts?	Yes No	GO to HE 15 . VREF voltage is out of range. GO to Pinpoint Test Step C1 .
HE 15	CHECK DPFEGR CIRCUIT FOR SHORT TO VREF IN HARNESS		
	• Install breakout box, leave PCM disconnected. • Measure voltage between PCM Test Pins 65 and 90. • Is voltage less than 1.0 volt?	Yes No	REPLACE damaged D.P.F. EGR sensor. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
HE 16	CHECK DPFEGR CIRCUIT FOR OPEN IN HARNESS		
	• Install breakout box, leave PCM disconnected. • Measure resistance of DPFEGR circuit between PCM Test Pin 65 and D.P.F. EGR sensor harness connector. • Is resistance less than 5.0 ohms?	Yes No	GO to HE 17 . REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
HE17	CHECK SIG RTN CIRCUIT FOR OPEN IN HARNESS		
	- Measure resistance of SIG RTN circuit between PCM Test Pin 91 and D.P.F. EGR sensor harness connector. - Is resistance less than 5.0 ohms?	Yes No	REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test. REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
HE18	CHECK DPFEGR CIRCUIT FOR SHORT TO VREF IN HARNESS		
	- Install breakout box, leave PCM disconnected. - Measure voltage between PCM Test Pins 65 and 90. - Is voltage less than 1.0 volt?	Yes No	REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
HE19	WIGGLE TEST D.P.F. EGR SENSOR AND HARNESS		
	- Key on, engine off. - Access DPFEGR PID with a scan tool. - Observe DPFEGR PID for an indication of a fault while performing the following: - Lightly tap on D.P.F. EGR sensor; wiggle the D.P.F. EGR sensor connector and harness between sensor and PCM. A fault is indicated by a sudden change in DPFEGR PID voltage. - Is a fault indicated?	Yes No	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step [Z1] with the following data: DPFEGR and EGRVR PIDS and list of Possible causes.

Test Step		Result	Action to Take
HE20	DTC P0402: CHECK FOR EGR FLOW AT IDLE WITH EGR VACUUM HOSE DISCONNECTED		
	Diagnostic Trouble Code (DTC) P0402 indicates that Self-Test has detected EGR flow at idle. NOTE: If DTC P1405 is in continuous memory, diagnose that first starting with HE50. Possible causes: — EGR valve stuck open. — EGR vacuum regulator solenoid vent plugged or iced. — EGRVR circuit shorted to GND. — EGRVR circuit shorted to VREF. — Improper vacuum hose connection. — Plugged / pinched EGR vacuum regulator Solenoid vacuum hose. — Plugged EGR tube. — Damaged EGR vacuum regulator solenoid. — Pinched / iced pressure hoses. — Damaged differential pressure feedback EGR (D.P.F. EGR) sensor. — Damaged PCM. ● Disconnect vacuum hose at EGR valve and plug hose. ● Run Key On Engine Running (KOER) Self-Test. ● Key off. ● Was KOER DTC P0402 output or unable to run KOER Self-Test due to engine stall or no start?	Yes No	There is possible EGR flow at idle. INSPECT pressure hoses first for pinching and icing. If OK, REMOVE and INSPECT the EGR valve and EGR tube for signs of contamination, unusual wear, carbon deposits, binding and other damage. REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. RECONNECT vacuum hose to EGR valve. GO to HE21.
HE21	CHECK FOR EGR FLOW AT IDLE WITH EGR VACUUM HOSE CONNECTED		
	● EGR vacuum hose connected. ● Run KOER Self-Test. ● Key off. ● Was KOER DTC P0402 output or unable to run KOER Self-Test due to engine stall or no start?	Yes No	There is possible EGR flow at idle. GO to HE22. The fault that produced DTC P0402 is intermittent. INSPECT pressure hoses for pinching and icing. REPAIR as necessary. If OK, GO to HE30.
HE22	CHECK EGR SYSTEM VACUUM HOSES FOR INTEGRITY AND CONNECTION		
	NOTE: A pinched or plugged EGR vacuum hose can trap vacuum between the EGR vacuum regulator solenoid and EGR valve not allowing the EGR valve to close. ● Trace each vacuum hose from EGR vacuum regulator solenoid and verify that each hose is connected correctly. (Refer to vehicle vacuum diagram label.) ● Verify that the EGR valve vacuum hose is not pinched or plugged and routed properly. ● Are vacuum hoses OK?	Yes No	RECONNECT vacuum hoses. GO to HE23. REPAIR vacuum hoses as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.

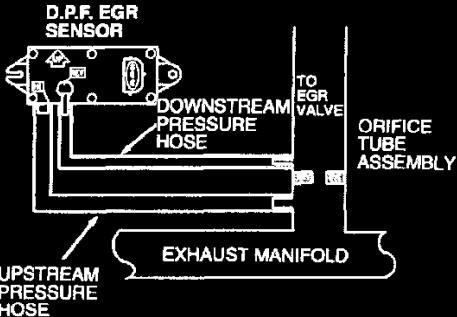
Test Step		Result	Action to Take
HE23	CHECK D.P.F. EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP		
	● Disconnect pressure hoses at D.P.F. EGR sensor. ● Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube). ● Key on, engine off. ● Access DPFEGR PID with a scan tool and note PID value. ● Apply 27 to 30 kPa (8 to 9 in-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds. ● Quickly release vacuum. NOTE: For D.P.F. EGR sensor applications, refer to the Description in the front of this test. ● For applications with 1.0 voltage offset D.P.F. EGR sensor: — The DPFEGR PID voltage must be between 0.75 and 1.25 volt with the key on and no vacuum applied. — The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied. — The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released. ● For applications with 0.55 voltage offset D.P.F. EGR sensor: — The DPFEGR PID voltage must be between 0.35 and 0.8 volt with the key on and no vacuum applied. — The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied. — The DPFEGR PID must drop to less than 1.0 volt in less than 3 seconds when vacuum is released. ● Does the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?	Yes No	▶ REPLACE damaged D.P.F. EGR sensor. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. ▶ RECONNECT D.P.F. EGR sensor. GO to HE24.
HE24	CHECK FOR EGR FLOW AT IDLE WITH EGR VACUUM REGULATOR SOLENOID CONNECTOR OFF		
	● Disconnect vacuum hose at EGR valve and connect hose to vacuum gauge. ● Start engine and bring to an idle. ● While monitoring vacuum gauge, disconnect the EGR vacuum regulator solenoid harness connector. — The EGR valve requires vacuum greater than 5.4 kPa (1.6 in-Hg) to begin to open. If the vacuum reading remains greater than 5.4 kPa (1.6 in-Hg) after the EGR vacuum regulator solenoid is electrically disconnected, this would indicate a mechanical fault in the EGR vacuum regulator solenoid. ● Key off. ● Did the EGR vacuum remain greater than 5.4 kPa (1.6 in-Hg) at idle even after EGR vacuum regulator solenoid is electrically disconnected?	Yes No	▶ This indicates a fault in the EGR vacuum regulator solenoid. GO to HE25. ▶ GO to HE26.

Test Step		Result	Action to Take
HE25	INSPECT EGR VACUUM REGULATOR SOLENOID VENT FOR PLUGGING		
NOTE: A plugged EGR vacuum regulator solenoid vent will not allow EGR vacuum to vent to atmosphere. - Disconnect EGR vacuum regulator solenoid vacuum hoses. - Remove EGR vacuum regulator solenoid vent cap (if removable). - Remove filter and inspect for blockage or icing in some cases. - With the EGR vacuum supply port plugged, apply 34 to 51 kPa (10 to 15 in-Hg) of vacuum directly to EGR vacuum regulator solenoid vacuum source port with a hand vacuum pump. If the vacuum holds or is slow to release to atmosphere, the EGR vacuum regulator solenoid vent could be plugged or restricted. EGR VACUUM REGULATOR SOLENOID VENT VACUUM SUPPLY PORT PLUGGED APPLY VACUUM TO SOURCE PORT AA0897-A - Is the EGR vacuum regulator solenoid vent or vent filter plugged or restricted?		Yes No	▶ REPAIR EGR vacuum regulator solenoid as necessary. If unable to repair, REPLACE EGR vacuum regulator solenoid. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. ▶ REPLACE damaged EGR vacuum regulator solenoid. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HE26	MEASURE EGR VACUUM REGULATOR SOLENOID COIL RESISTANCE		
- Measure resistance across EGR vacuum regulator solenoid. - Is resistance between 26 and 40 ohms?		Yes No	▶ GO to HE27. ▶ REPLACE damaged EGR vacuum regulator solenoid. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HE27	CHECK EGRVR CIRCUIT FOR SHORT TO GROUND IN HARNESS		
- Disconnect scan tool from DLC. - Install breakout box, leave PCM disconnected. - Measure resistance between PCM Test Pin 47 and PCM Test Pins 51 and 103. - Is resistance greater than 10,000 ohms?		Yes No	▶ GO to HE28. ▶ REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.

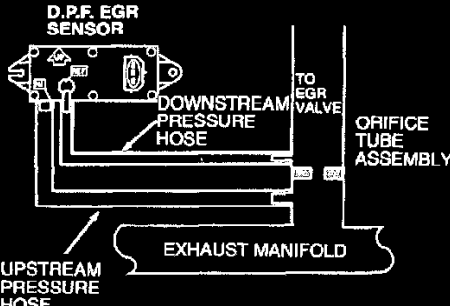
Test Step		Result	Action to Take
HE28	CHECK EGRVR CIRCUIT FOR SHORT TO VREF		
	- Measure resistance between PCM Test Pin 47 (EGRVR) and Test Pin 90 (VREF) at the breakout box. - Is resistance greater than 10,000 ohms?	Yes No	REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
HE30	CHECK D.P.F. EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP		
	- Disconnect pressure hoses at D.P.F. EGR sensor. - Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube). - Key on, engine off. - Access DPFEGR PID with a scan tool and note PID value. - Apply 27 to 30 kPa (8 to 9 in-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds - Quickly release vacuum. NOTE: For D.P.F. EGR sensor applications, refer to the Description in the front of this test. For applications with 1.0 voltage offset D.P.F. EGR sensor: - The DPFEGR PID voltage must be between 0.75 and 1.25 volt with the key on and no vacuum applied. - The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied. - The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released. For applications with 0.55 voltage offset D.P.F. EGR sensor: - The DPFEGR PID voltage must be between 0.35 and 0.8 volt with the key on and no vacuum applied. - The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied. - The DPFEGR PID must drop to less than 1.0 volt in less than 3 seconds when vacuum is released. - Key off. - Did the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?	Yes No	REPLACE damaged D.P.F. EGR sensor. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. RECONNECT D.P.F. EGR sensor. GO to HE31.

Test Step		Result	Action to Take
HE31	CHECK D.P.F. EGR SENSOR VOLTAGE WHILE EXERCISING EGR VALVE		
	● Key on, engine off. ● View DPFEGR PID with a scan tool and make note of voltage. ● For applications with 1.0 voltage offset D.P.F. EGR sensor: — Typical D.P.F. EGR sensor voltage with no EGR flow is between 0.75 and 1.25 volt. ● For applications with 0.55 voltage offset D.P.F. EGR sensor: — Typical D.P.F. EGR sensor voltage with no EGR flow is between 0.35 and 0.8 volt. ● Disconnect vacuum hose at EGR valve and plug hose. ● Connect a hand vacuum pump to EGR valve. ● Start engine and bring to idle. ● Observe DPFEGR PID at idle and compare to the key on engine off voltage. (A higher voltage at idle could be due to a non-seating EGR valve.) ● Apply just enough vacuum to EGR valve to open it 7-10 kPa (2-3 in-Hg) without stalling engine and release vacuum. Repeat several times while observing DPFEGR PID on scan tool. (DPFEGR PID voltage must increase as valve begins to open and return to initial value as vacuum is released. A slow to return voltage could be an indication of a binding or a slow-closing EGR valve.) ● Key off. ● Did the DPFEGR PID voltage indicate an open, binding or slow-closing EGR valve?	Yes ▶ No ▶	REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding and other damage. REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. GO to HE32.

Test Step		Result	Action to Take
HE32	MONITOR EGR VALVE VACUUM WHILE WIGGLING EGRVR CIRCUIT		
	NOTE: An intermittent short to GND in the EGRVR circuit will cause the vacuum applied to the EGR valve to be higher than normal while the short is present. The vacuum available at the EGR valve at idle is normally below 3.4 kPa (1.0 in-Hg) and it takes about 5.4 kPa (1.6 in-Hg) for the valve to begin to open. ● Disconnect vacuum hose at EGR valve from hand vacuum pump and connect hose to a vacuum gauge. ● Key on, engine running. ● Observe vacuum gauge for an indication of a fault while performing the following: — Lightly tap on the EGR vacuum regulator solenoid; wiggle the EGR vacuum regulator solenoid connector and vehicle harness between solenoid and PCM. A fault is indicated by a sudden jump in vacuum reading. ● Key off. ● Was a fault indicated?	Yes ▶ No ▶	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. RECONNECT vacuum hose. GO to HE33.
HE33	INSPECT EGR VACUUM REGULATOR SOLENOID AND VACUUM HOSES FOR POTENTIAL PLUGGING		
	● Remove EGR vacuum regulator solenoid vent filter and inspect for contamination and excessive water absorption. (In cold climate, excessive water in filter could freeze and plug the EGR vacuum regulator solenoid vent.) ● Inspect EGR vacuum hose for possible blockage or pinching. ● Key off. ● Was EGR vacuum regulator solenoid vent or filter contaminated or vacuum hose plugged?	Yes ▶ No ▶	REPAIR EGR vacuum regulator solenoid or EGR vacuum hose as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: DPFEGR and EGRVR PIDs and list of Possible causes.

Test Step		Result	Action to Take
HE50	DTC P1405: INSPECT UPSTREAM PRESSURE HOSE CONNECTIONS Diagnostic Trouble Code (DTC) P1405 indicates that Continuous Memory Self-Test has detected the exhaust manifold side (upstream) differential pressure feedback D.P.F. EGR sensor pressure hose is off or plugged. Possible causes: — Improper upstream pressure hose connection. — Upstream pressure hose plugged. — Plugged or damaged pressure pickup tubes. ● Inspect upstream hose at D.P.F. EGR sensor and orifice tube assembly for disconnect or poor connection. ● Is hose off or poorly connected?  A21168-B	Yes <	

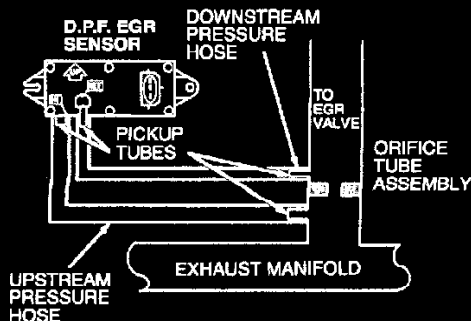
Test Step		Result	Action to Take
HES3	CHECK D.P.F. EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP		
- Disconnect pressure hoses at D.P.F. EGR sensor. - Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube). - Key on, engine off. - Access DPFEGR PID with a scan tool and note PID value. - Apply 27 to 30 kPa (8 to 9 in-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds. - Quickly release vacuum. NOTE: For D.P.F. EGR sensor applications, refer to the Description in the front of this test. For applications with 1.0 voltage offset D.P.F. EGR sensor: - The DPFEGR PID voltage must be between 0.75 and 1.25 volt with the key on and no vacuum applied. - The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied. - The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released. For applications with 0.55 voltage offset D.P.F. EGR sensor: - The DPFEGR PID voltage must be between 0.35 and 0.8 volt with the key on and no vacuum applied. - The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied. - The DPFEGR PID must drop to less than 1.0 volt in less than 3 seconds when vacuum is released. - Key off. Did the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?		Yes	REPLACE damaged D.P.F. EGR sensor. RESTORE vehicle. COMPLETE an EGR Monitor Repair Verification Drive Cycle. RERUN Quick Test.
		No	Fault not found. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.

Test Step		Result	Action to Take
HE60	DTC P1406: INSPECT DOWNSTREAM PRESSURE HOSE CONNECTIONS		
	Diagnostic Trouble Code (DTC) P1406 indicates that Continuous Memory Self-Test has detected the intake manifold side (downstream) differential pressure feedback EGR (D.P.F. EGR) sensor pressure hose is off or plugged. NOTE: If the fault is currently present, DTC P1406 will be output in Key On Engine Running (KOER) Self-Test. Possible causes: — Improper downstream pressure hose connection. — Downstream pressure hose plugged. — Orifice tube assembly loose. — Orifice tube assembly broken. — Plugged or damaged pressure pickup tubes. — Slow responding D.P.F. EGR sensor. ● Inspect downstream hose at D.P.F. EGR sensor and orifice tube assembly for disconnect or poor connection. ● Is hose OFF or poorly connected?	Yes No	▶ REPAIR downstream hose as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. ▶ GO to HE61.
	 A21168-B		
HE61	INSPECT DOWNSTREAM PRESSURE HOSE FOR PLUGGING		
	NOTE: It is essential that the D.P.F. EGR sensor pressure hose is the correct repair part and not a substitute. ● Visually inspect downstream pressure hose routing. Hose must not be pinched or have dips in it where water can settle or freeze. ● Remove downstream pressure hose and carefully inspect for plugging, water or leaks. ● Is there a fault detected in the hose?	Yes No	▶ REPAIR or REPLACE downstream pressure hose as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. ▶ GO to HE62.
HE62	CHECK ORIFICE TUBE ASSEMBLY AND D.P.F. EGR SENSOR		
	● Inspect the connections at the D.P.F. EGR sensor for plugging or damage. ● Inspect the intake manifold side pressure pickup tube and orifice tube assembly for plugging, loose connection or damage. ● Is the D.P.F. EGR sensor or orifice tube assembly plugged, loose or damaged?	Yes No	▶ REPAIR or REPLACE D.P.F. EGR sensor or orifice tube assembly as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. ▶ RESTORE vehicle. GO to HE63.

Test Step		Result	Action to Take
HE63	CHECK EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP		
• Disconnect pressure hoses at D.P.F. EGR sensor. • Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube). • Key on, engine off. • Access DPFEGR PID with a scan tool and note PID value. • Apply 27 to 30 kPa (8 to 9 in.-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds. • Quickly release vacuum. NOTE: For D.P.F. EGR sensor applications, refer to the Description in the front of this test. • For applications with 1.0 voltage offset D.P.F. EGR sensor: — The DPFEGR PID voltage must be between 0.75 and 1.25 volt with the key on and no vacuum applied. — The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied. — The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released. • For applications with 0.55 voltage offset D.P.F. EGR sensor: — The DPFEGR PID voltage must be between 0.35 and 0.8 volt with the key on and no vacuum applied. — The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied. — The DPFEGR PID must drop to less than 1.0 volt in less than 3 seconds when vacuum is released. • Key off. • Did the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?		Yes	▶ REPLACE damaged D.P.F. EGR sensor. RECONNECT all components. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
		No	▶ Fault not found. RECONNECT all components. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.

Test Step		Result	Action to Take
HE70	DTC P0401: RUN KOER SELF-TEST		
Diagnostic Trouble Code (DTC) P0401 indicates that Continuous Memory Self-Test has detected insufficient EGR flow. Possible causes: — Fault in vacuum supply to EGR vacuum regulator solenoid. — EGR valve stuck closed or iced. — EGR valve diaphragm leaks. — EGR valve or flow path restricted. — EGR vacuum hose off, plugged or leaks. — VPWR circuit open to EGR vacuum regulator solenoid. — EGRVR circuit to PCM open. — EGRVR circuit to PCM shorted to PWR. — Differential pressure feedback EGR (D.P.F. EGR) sensor pressure hoses both connected improperly. — D.P.F. EGR sensor pressure hoses reversed. — D.P.F. EGR sensor VREF circuit open. — Downstream pressure hose off. — Downstream pressure hose plugged. — Damaged orifice tube assembly. — Damaged EGR vacuum regulator solenoid. — Damaged D.P.F. EGR sensor. — Damaged PCM. ● Run KOER Self-Test. ● Key off. ● Was KOER DTC P1408 output?		Yes No	 ▶ The KOER Self-Test has detected an EGR fault that is currently present. GO to HE71 . ▶ REMOVE and INSPECT the EGR valve and intake manifold EGR port for restriction. If OK, the fault that produced DTC P0401 is intermittent. GO to HE90 .
HE71	DTC P1408: RETRIEVE CONTINUOUS MEMORY DTCS		
Diagnostic Trouble Code (DTC) P1408 indicates that Key On Engine Running (KOER) Self-Test has detected EGR flow out of range. Possible causes: — Fault in vacuum supply to EGR vacuum regulator solenoid. — EGR valve stuck closed or iced. — EGR valve diaphragm leaks. — EGR valve or flow path restricted. — EGR vacuum hose off, plugged or leaks. — VPWR circuit open to EGR vacuum regulator solenoid. — EGRVR circuit to PCM open. — EGRVR circuit to PCM shorted to PWR. — Differential Pressure Feedback EGR (D.P.F. EGR) sensor pressure hoses both improperly connected. — D.P.F. EGR sensor pressure hoses reversed. — D.P.F. EGR sensor VREF circuit open. — Improper downstream pressure hose connection. — Downstream pressure hose plugged. — Damaged orifice tube assembly. — Damaged EGR vacuum regulator solenoid. — Damaged D.P.F. EGR sensor. — Damaged PCM. NOTE: If any DTC other than DTC P1408 is output, record DTC and refer to Diagnostic Trouble Code Charts after completing this Pinpoint Test. ● Retrieve all Continuous Memory DTCS. ● Is DTC P1408 output?		Yes No	 ▶ GO to HE60 . ▶ GO to HE72 .

Test Step		Result	Action to Take
HE72	RUN KOER SELF-TEST WHILE MONITORING EGR VACUUM		
- Disconnect vacuum hose at EGR valve and connect hose to a vacuum gauge. - NOTE: Since the EGR vacuum hose is disconnected, ignore DTCs during this KOER Self-Test. Run Key On Engine Running (KOER) Self-Test while monitoring gauge. Approximately 30 seconds into test, EGR flow will be requested for a few seconds. The vacuum at this time should increase above 5.4 kPa (1.6 in-Hg) to open the valve. - Key off. - Did the vacuum increase to 10 kPa (3.0 in-Hg) or greater at any time during KOER Self-Test?		Yes	▶ The vacuum indicated is sufficient to open the EGR valve. Fault is unlikely to be in EGR vacuum control system. GO to HE73 .
		No	▶ The vacuum indicated is insufficient to open the EGR valve. GO to HE80 .
HE73	INSPECT D.P.F. EGR SENSOR PRESSURE HOSES		
- Visually inspect both pressure hoses for reversed connection at D.P.F. EGR sensor or at orifice tube assembly. - Inspect both hoses for improper routing. Hoses should not be pinched or have dips where water could settle or freeze. - Inspect both hoses for leaks and blockage. - Inspect D.P.F. EGR sensor and orifice tube assembly for blockage or damage at the pickup tubes. - Is a fault detected?		Yes	▶ REPAIR pressure hoses as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
		No	▶ GO to HE74 .



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Test Step		Result	Action to Take
HE74	CHECK D.P.F. EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP		
● Disconnect pressure hoses at D.P.F. EGR sensor. ● Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube.) ● Key on, engine off. ● Access DPFEGR PID with a scan tool and note PID value. ● Apply 27-30 kPa (8-9 in-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds. ● Quickly release vacuum. NOTE: For D.P.F. EGR sensor applications, refer to the Description in the front of this test. ● For applications with 1.0 voltage offset D.P.F. EGR sensor: — The DPFEGR PID voltage must be between 0.75 and 1.25 volt with the key on and no vacuum applied. — The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied. — The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released. ● For applications with 0.55 voltage offset D.P.F. EGR sensor: — The DPFEGR PID voltage must be between 0.35 and 0.8 volt with the key on and no vacuum applied. — The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied. — The DPFEGR PID must drop to less than 1.0 volt in less than 3 seconds when vacuum is released. ● Key off. ● Did the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?		Yes No	GO to HE75 . RECONNECT pressure hoses. GO to HE76 .

Test Step		Result	Action to Take
HE75	MEASURE VREF VOLTAGE AT D.P.F. EGR SENSOR HARNESS CONNECTOR		
	● Disconnect D.P.F. EGR sensor. ● Key on, engine off. ● Measure voltage between the sensor VREF circuit and SIG RTN circuit at the D.P.F. EGR sensor harness connector. ● Key off. ● Was VREF voltage between 4.0 and 6.0 volts?	Yes No	REPLACE damaged D.P.F. EGR sensor. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. VREF voltage is out of range. GO to Pinpoint Test Step C1.
HE76	CHECK EGR VALVE FUNCTION BY APPLYING VACUUM WITH HAND PUMP		
	● Disconnect vacuum hose at EGR valve and plug hose. ● Connect a hand vacuum pump to EGR valve. ● Start engine and bring to idle. ● Access DPFEGR and RPM PIDs with a scan tool. ● Slowly apply 27 to 34 kPa (8 to 10 in-Hg) of vacuum to the EGR valve and hold it for 10 seconds. If engine wants to stall, increase rpm with throttle to maintain a minimum of 1000 rpm. ● Look for the following: — EGR valve starts opening at about 5.4 kPa (1.6 in-Hg) vacuum indicated by increasing DPFEGR PID voltage. — DPFEGR PID voltage increasing until EGR valve is fully open. DPFEGR PID must read 2.5 volts minimum with full vacuum applied. — DPFEGR PID voltage steady when vacuum is held. If voltage drops within a few seconds, the EGR valve or vacuum source can be leaking. ● Key off. ● Did the DPFEGR PID voltage indicate that the EGR valve is operating as described in this test?	Yes No	RESTORE vehicle. GO to HE85. REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding, leaking diaphragm and other damage. If EGR valve is OK, look for an obstructed EGR port in the intake manifold or plugged orifice tube assembly. REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.

Test Step		Result	Action to Take
HE80	CHECK VACUUM SOURCE AND VACUUM HOSES TO AND FROM EGR VACUUM REGULATOR SOLENOID		
	- Inspect vacuum lines between vacuum source and EGR vacuum regulator solenoid and between EGR vacuum regulator solenoid and EGR valve for leaks, kinks, disconnects, blockage, routing or any damage. - Disconnect vacuum hoses at EGR vacuum regulator solenoid. - Connect EGR vacuum regulator solenoid vacuum source hose to a vacuum gauge. - With engine warm and at idle, take vacuum gauge reading. - Key off. - Was the vacuum gauge reading a minimum of 51 kPa (15 in-Hg) at idle and vacuum lines OK?	Yes No	► RESTORE vehicle. GO to HE81 . ► ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HE81	CHECK VPWR VOLTAGE TO EGR VACUUM REGULATOR SOLENOID		
	- Disconnect EGR vacuum regulator solenoid. - Key on, engine off. - Measure VPWR circuit voltage at EGR vacuum regulator solenoid harness connector. - Key off. - Was EGR vacuum regulator solenoid VPWR voltage greater than 10.5 volts?	Yes No	► GO to HE82 . ► REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HE82	CHECK EGR VACUUM REGULATOR SOLENOID RESISTANCE		
	- EGR vacuum regulator solenoid disconnected. - Measure EGR vacuum regulator solenoid resistance. - Is solenoid resistance between 26 and 40 ohms?	Yes No	► GO to HE83 . ► REPLACE damaged EGR vacuum regulator solenoid. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HE83	CHECK EGRVR CIRCUIT FOR SHORT TO PWR IN HARNESS		
	- Install breakout box, leave PCM disconnected. - Key on, engine off. - Measure voltage between PCM Test Pin 47 and ground. - Key off. - Was voltage greater than 1.0 volt?	Yes No	► REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. ► GO to HE84 .

Test Step		Result	Action to Take
HE84	CHECK EGRVR CIRCUIT FOR OPEN IN HARNESS		
	- Measure resistance of EGRVR circuit between PCM Test Pin 47 and EVR vacuum regulator solenoid harness connector. - Is resistance less than 5.0 ohms?	Yes No	RECONNECT EGR vacuum regulator solenoid. GO to HE85. REPAIR open in EVR circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HE85	CHECK EGR VACUUM REGULATOR SOLENOID VACUUM OUTPUT CAPABILITY BY GROUNDING EVR CIRCUIT		
	- Reconnect PCM and EGR vacuum regulator solenoid. - Disconnect vacuum hose at the EGR valve and connect to a vacuum gauge. - Key on, engine running. - With engine at idle, jumper PCM Test Pin 47 (EGRVR) to chassis ground. - Is vacuum gauge reading 13.5 kPa (4.0 in-Hg) or greater?	Yes No	REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test. REPLACE damaged EGR vacuum regulator solenoid. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HE90	INSPECT EGR SYSTEM FOR AN INTERMITTENT FAILURE		
	- Visually inspect the EGR system for signs of intermittent failure. - Is a fault found?	Yes No	REPAIR fault as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. GO to HE91.

Test Step		Result	Action to Take
HE91	CHECK EGR VALVE FUNCTION BY APPLYING VACUUM WITH HAND PUMP		
	● Disconnect vacuum hose at EGR valve and plug hose. ● Connect a hand vacuum pump to EGR valve. ● Start engine and bring to idle. ● Access DPFEGR and RPM PIDs with a scan tool. ● Slowly apply 17 to 34 kPa (5 to 10 in-Hg) of vacuum to the EGR valve and hold it for 10 seconds. If engine wants to stall, increase rpm with throttle to maintain a minimum of 800 rpm. ● Look for the following: — EGR valve starts opening at about 5.4 kPa (1.6 in-Hg) vacuum indicated by increasing DPFEGR PID voltage. — DPFEGR PID voltage increasing until EGR valve is fully open. DPFEGR PID should read 2.5 volts minimum with full vacuum applied. — DPFEGR PID voltage steady when vacuum is held. If voltage drops within a few seconds, the EGR valve or vacuum source could be leaking. ● Key off. ● Did the DPFEGR PID voltage indicate that the EGR valve is operating as described in this test?	Yes No	▶ GO to HE92. ▶ REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding, leaking diaphragm and other damage. If EGR valve is OK, look for an obstructed EGR port in the intake manifold. REPAIR as necessary RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HE92	INSPECT EGR VACUUM SIGNAL SUPPLY FOR INTERMITTENT FAILURE		
	● Install breakout box and connect PCM to breakout box. ● Disconnect plugged hose at EGR valve and connect to a vacuum gauge. ● Key on, engine running. ● Connect a jumper wire between PCM Test Pin 47 and ground to activate the solenoid to full on. At idle, the vacuum gauge should read above 13.5 kPa (4.0 in-Hg). ● Observe vacuum gauge for an indication of a fault while performing the following: — Lightly tap on the EGR vacuum regulator solenoid and wiggle the EGR vacuum regulator solenoid connector, vacuum lines and vehicle harness between the solenoid and PCM. A fault is indicated by a sudden drop in vacuum reading. ● Key off. ● Was a fault indicated?	Yes No	▶ ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. ▶ Unable to duplicate or identify fault at this time. (In cold climates, the EGR valve may temporarily freeze shut and thaw when the engine warms up causing the intermittent DTC.) GO to Pinpoint Test Step Z1 with the following data: DPFEGR and EGRVR PIDs and list of Possible causes.

Test Step		Result	Action to Take
HE100	EGR DIAGNOSIS BY SYMPTOM: CHECK FOR EGR FLOW WITH EGR VACUUM HOSE DISCONNECTED AND PLUGGED		
	NOTE: Perform KOER Self-Test and repair any DTCs before proceeding with this test. The symptom charts have indicated possible EGR flow at idle with no EGR diagnostic trouble codes output. Possible causes: — EGR valve not fully seating. — EGR vacuum regulator solenoid vent restricted. — Damaged EGR vacuum regulator solenoid. • Disconnect vacuum hose at EGR valve and plug hose. • Key on, engine off. • Access DPFEGR PID with a scan tool and note voltage. • Start engine and bring to idle. • With engine at idle, look at the DPFEGR PID voltage and compare to the engine off reading. An increase in the voltage at idle indicates that the differential pressure feedback EGR sensor is sensing EGR flow. • Key off. • Was the DPFEGR PID voltage greater at idle by a minimum of 0.15 volt than with the engine off?	Yes No	▶ The DPFEGR PID voltage is indicating EGR flow at idle. Since the EGR vacuum hose is disconnected and plugged, the fault is most likely in the EGR valve. REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding and other damage. REPAIR as necessary RESTORE vehicle. VERIFY a symptom no longer exists. ▶ This indicates a fault in the EGR valve vacuum supply. INSPECT the EGR vacuum regulator solenoid vent and vent filter for restrictions. REPAIR as necessary. If OK, REPLACE EGR vacuum regulator solenoid. RESTORE vehicle. VERIFY a symptom no longer exists.
HE110	DTC P1409: CHECK EGR VACUUM REGULATOR SOLENOID RESISTANCE		
	Diagnostic Trouble Code (DTC) P1409 indicates that Self-Test has detected an electrical fault in the EGRVR circuit. Possible causes: — Open EGRVR circuit. — Open VPWR circuit to EGR vacuum regulator solenoid. — EGRVR circuit shorted to VPWR. — EGRVR circuit shorted to GND. — Damaged EGR vacuum regulator solenoid. — Damaged PCM. • Disconnect EGR vacuum regulator solenoid. • Measure EGR vacuum regulator solenoid resistance. • Is solenoid resistance between 26 and 40 ohms?	Yes No	▶ The EGR vacuum regulator solenoid resistance is within specification. GO to HE111. ▶ REPLACE EGR vacuum regulator solenoid. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.

Test Step		Result	Action to Take
HE111	CHECK VPWR VOLTAGE TO EGR VACUUM REGULATOR SOLENOID	Yes No	GO to HE112 . REPAIR open in VPWR circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
● Key on, engine off. ● Measure VPWR circuit voltage at EGR vacuum regulator solenoid harness connector. ● Key off. ● Was voltage greater than 10.5 volts?			
HE112	CHECK EGRVR CIRCUIT FOR OPEN IN HARNESS	Yes No	GO to HE113 . REPAIR open in EVR circuit. RESTORE vehicle. RERUN Quick Test.
● Install breakout box and leave PCM disconnected. ● Measure resistance of EGRVR circuit between PCM Test Pin 47 and EGR vacuum regulator solenoid harness connector. ● Is resistance less than 5.0 ohms?			
HE113	CHECK EGRVR CIRCUIT FOR SHORT TO POWER IN HARNESS	Yes No	GO to HE114 . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
● Breakout box installed, leave PCM disconnected. ● Key on, engine off. ● Measure voltage between PCM Test Pin 47 and ground. ● Key off. ● Was voltage less than 1.0 volt?			
HE114	CHECK EGRVR CIRCUIT FOR SHORT TO GROUND IN HARNESS	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
● Measure resistance between PCM Test Pin 47 and PCM Test Pins 24 and 103. ● Is each resistance greater than 10,000 ohms?			

Test Step		Result	Action to Take
HE120	CONTINUOUS MEMORY DTC P1409: WIGGLE EGR VACUUM REGULATOR SOLENOID WHILE MONITORING VPWR		
Continuous Memory DTC P1409 indicates that Continuous Memory Self-Test has detected an electrical malfunction in the EGR vacuum regulator solenoid sometime during vehicle operation. NOTE: If DTC P1409 was output in Key On Engine Off (KOEO) or Key On Engine Running (KOER) Self-Test, go to HE110 to diagnose present fault. Possible causes: — Open EGRVR circuit. — Open VPWR circuit to EGR vacuum regulator solenoid. — EGRVR circuit shorted to VPWR. — EGRVR circuit shorted to GND. — Damaged EGR vacuum regulator solenoid. — Damaged PCM. ● Install breakout box, leave PCM disconnected. ● Key on. ● Measure voltage between PCM Test Pins 47 and 24. ● Voltage must read greater than 10.5 volts. For an indication of a fault, look for this voltage to drop while performing the following: — Lightly tap on the EGR vacuum regulator solenoid. — Wiggle the EGR vacuum regulator solenoid connector. — Grasp the EGR vacuum regulator solenoid harness connector and wiggle wires between solenoid and PCM. ● Key off. ● Was a fault indicated?		Yes No	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. RERUN Quick Test. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: DPFEGR and EGRVR PIDs and list of Possible Causes.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Exhaust system pipes (front and rear)
- Exhaust system muffler and tailpipe assembly
- Catalytic converter
- Exhaust manifold
- Harness circuits: Downstream Heated Oxygen Sensors (HO2S)

Test Step		Result	Action to Take
HF1	DTCs P0420 OR P0430: CHECK FOR MISFIRE DETECTION MONITOR DTCS		
	Diagnostic Trouble Code (DTC) P0420 indicates that bank 1 catalyst system efficiency is below the acceptable threshold.	Yes	ADDRESS the Misfire Detection Monitor DTCs.
	Diagnostic Trouble Code (DTC) P0430 indicates that bank 2 catalyst system efficiency is below the acceptable threshold.	No	
	NOTE 1: Complete the spark timing check in Quick Test before proceeding with this test step. Spark timing retarded below specification can increase exhaust gas temperature and decrease catalyst efficiency over time.		
	NOTE 2: Be sure customer has not:		
	(1) Refueled vehicle with leaded gasoline.		
	(2) Noticed high vehicle oil consumption.		
	NOTE 3: If entering this Pinpoint Test for symptoms only, go immediately to HF5 .		
	NOTE 4: Internal deterioration of a catalytic converter is usually caused by abnormal engine operation upstream of the catalyst. Events that can produce higher than normal temperatures in the catalyst are particularly suspect. For example, misfiring can cause higher than normal catalyst operating temperatures.		
	Possible causes:		
	— Use of leaded fuel.		
	— Oil contamination.		
	— Cylinder misfiring.		
	— Damaged HO2S.		
	— Damaged ECT sensor.		
	— Downstream HO2S wires improperly connected.		
	— Fuel pressure too high.		
	— Damaged exhaust system pipe.		
	— Damaged exhaust manifold.		
	— Damaged muffler / tailpipe assembly.		
	— Damaged catalytic converter.		
	● Retrieve and record all Continuous Memory DTCs (MIL and non-MIL).		
	● Were any of the following Misfire Detection Monitor DTCs recorded: P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0309 and P0310?		

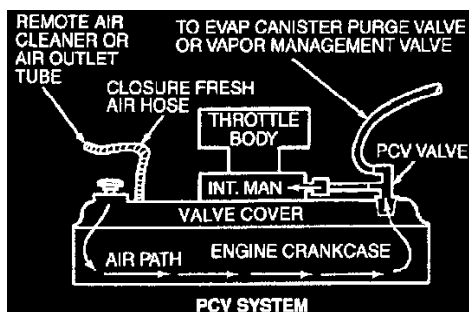
Test Step		Result	Action to Take
HF2	CHECK FOR HO2S MONITOR DTCs		
NOTE 1: Incorrect HO2S signal input (such as rich / lean input signal when the engine is operating under lean / rich conditions) can cause an abnormal temperature increase in the catalyst. NOTE 2: Non-California applications will not have an active HO2S monitor. As a result, a Catalyst Efficiency Monitor DTC can be generated for a rear HO2S concern. To check for a rear HO2S concern on these applications, go to the HO2S monitor Pinpoint Test Step H81. If any repair actions are necessary in Pinpoint Test H, run KOER Self-Test to verify the repair. If repair actions are not necessary, go to HF3. Were any of the following HO2S monitor DTCs recorded in HF1: P0136, P0138 and P0141 (Bank 1, rear HO2S) or P0156, P0158 and P0161 (Bank 2, rear HO2S)?		Yes	► ADDRESS the HO2S Monitor DTCs.
		No	► GO to HF3 .
HF3	CHECK FOR ECT SENSOR DTCs		
NOTE: ECT sensor DTCs can indicate that the thermostat is not operating correctly or that the engine coolant level is not filled to specification, producing above normal operating temperatures. Were any of the following ECT sensor DTCs recorded in HF1: P0117, P0118, P0125 and P1117?		Yes	► ADDRESS the ECT Sensor DTCs.
		No	► GO to HF4 .
HF4	CHECK FOR ANY OTHER DTCs		
Were any other DTCs recorded in HF1 (not including the initial P0420 or P0430 DTCs)?		Yes	► ADDRESS the DTCs.
		No	► GO to HF5 .
HF5	CHECK REAR HO2S WIRING AND PCM CONNECTIONS		
NOTE: If the electrical connections of the rear HO2S are interchanged / crossed, the Catalyst Efficiency Monitor Test will fail. - Inspect the wiring of each rear HO2S for proper routing and connection. - Disconnect the PCM, inspect for damaged or pushed out pins, corrosion and loose wires. - Are there any concerns with the HO2S wiring or the PCM connection?		Yes	► REPAIR any wiring or connection concerns. For PCM pin concerns, REPLACE PCM. RESTORE vehicle. RERUN Quick Test.
		No	► No Electronic EC root causes related to the DTCs or symptoms. GO to HF6 .

Test Step		Result	Action to Take																		
HF6	CHECK FUEL PRESSURE																				
WARNING: THE FUEL SYSTEM WILL REMAIN PRESSURIZED WHEN THE ENGINE IS NOT RUNNING. TO PREVENT INJURY OR FIRE, USE CAUTION WHEN WORKING ON THE FUEL SYSTEM. NOTE: Fuel pressures above specification can produce an abnormally rich air / fuel mixture. The rich air / fuel mixture can cause higher than normal catalyst operating temperatures. - Inspect the vacuum hose going to the fuel pressure regulator for proper installation and cracks. Repair as necessary. - Install fuel pressure gauge. - Verify vacuum source to fuel pressure regulator. - Start and run the engine at idle. Record the fuel pressure. - Increase engine speed to 2500 rpm and maintain for one minute. Record the fuel pressure. - Key off. FUEL PRESSURE CHART <table><tr><th>Vehicle</th><th>kPa</th><th>Psi</th></tr><tr><td>Contour / Mystique (2.5L)</td><td>310-415</td><td>45-60</td></tr><tr><td>Escort / Tracer</td><td>517-862</td><td>55-85</td></tr><tr><td>Ranger</td><td>386-496</td><td>56-72</td></tr><tr><td>Ranger (Flex Fuel)</td><td>324-434</td><td>47-63</td></tr><tr><td>All Others</td><td>207-310</td><td>30-45</td></tr></table> - Was the fuel pressure within specifications listed in the chart above?		Vehicle	kPa	Psi	Contour / Mystique (2.5L)	310-415	45-60	Escort / Tracer	517-862	55-85	Ranger	386-496	56-72	Ranger (Flex Fuel)	324-434	47-63	All Others	207-310	30-45	Yes	Fuel pressure is OK. REMOVE the fuel pressure gauge. GO to HF7 .
Vehicle	kPa	Psi																			
Contour / Mystique (2.5L)	310-415	45-60																			
Escort / Tracer	517-862	55-85																			
Ranger	386-496	56-72																			
Ranger (Flex Fuel)	324-434	47-63																			
All Others	207-310	30-45																			
	No	Fuel pressure is out of specification. GO to Pinpoint Test HC1 Fuel Delivery Systems, for diagnosis. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.																			
HF7	CHECK FOR OBVIOUS LEAK SOURCES IN THE EXHAUST SYSTEM																				
NOTE: If a catalyst is in series with a leaking exhaust system, it can fail the Catalyst Efficiency Monitor test. - Inspect the following for leaks, cracks, loose connections or punctures: - Exhaust manifold. - Front exhaust pipe. - Rear exhaust pipe. - Muffler / tailpipe assembly. - Are the above components free of cracks and punctures, etc.?		Yes	GO to HF8 .																		
	No	REPAIR the leak source(s). COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.																			

Test Step		Result	Action to Take
HF8	CHECK FOR OBVIOUS RESTRICTIONS IN THE EXHAUST SYSTEM		
	- Inspect the following for dents, areas of collapsed material and unusual bending: - Front exhaust pipe. - Rear exhaust pipe. - Muffler / tailpipe assembly. - Are the components free of dents and areas of collapsed material or unusual bending, etc.?	Yes No	GO to HF9 . REPAIR the restricted component(s) as necessary. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HF9	CHECK MANIFOLD VACUUM FOR INDICATION OF EXCESSIVE EXHAUST SYSTEM RESTRICTION		
	- Attach a vacuum gauge to the intake manifold vacuum source. - Install a tachometer. - Observe the vacuum gauge needle while performing the following: NOTE: The vacuum gauge reading may be normal when the engine is first started and idled. However, excessive restriction in the exhaust system will cause the vacuum gauge needle to drop to a low point even while the engine is idled. - Start the engine and gradually increase the engine speed to 2000 rpm with the transmission in NEUTRAL. - Decrease engine speed to base idle rpm. - Key off. - Did manifold vacuum rise above 54 kPa (16 inches-Hg) with the engine speed at 2000 rpm?	Yes No	GO to HF10 . Manifold vacuum did not reach an acceptable level. GO to HF11 to check for excessive restriction in the exhaust system.
HF10	CHECK MANIFOLD VACUUM FOR INDICATION OF MODERATE EXHAUST SYSTEM RESTRICTION		
	- Key on, engine idling. - Increase the engine speed gradually from base idle rpm to 2000 rpm with the transmission in NEUTRAL. - Observe the speed the vacuum gauge needle rises, while maintaining the increased engine rpm. NOTE 1: On a non-restricted exhaust system, the vacuum gauge needle will rise quickly to the normal range as the increased rpm is maintained. NOTE 2: On a restricted exhaust system, the vacuum gauge needle will rise slowly to the normal range as the increased rpm is maintained. NOTE 3: The rate of speed the vacuum gauge needle rises to the normal range is slower on a restricted system than on a non-restricted system as the increased rpm is maintained. - Decrease engine speed to base idle rpm. - Key off. - Is the rate of speed that the vacuum gauge needle rises back to the normal range (above 54 kPa (16 inches-Hg)) much slower than that of a non-restricted system?	Yes No	A moderate restriction may be present. GO to HF11 . No indications of restrictions or leaks have been detected in the exhaust system. If here because of DTCs P0420 or P0430, the catalytic converter is chemically inactive. REPLACE the catalytic converter. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. RESTORE vehicle. For further diagnosis of symptom (e.g. Lack of Power, Loss of Power, or No Start) REFER to Symptom Charts.

Test Step		Result	Action to Take
HF 11	CHECK MANIFOLD VACUUM WITH EXHAUST MANIFOLD DISCONNECTED FOR INDICATION OF A RESTRICTION		
	NOTE: An intake manifold gasket leak can also cause the vacuum gauge needle to remain well below the normal range. - Disconnect exhaust system immediately after the exhaust manifold. - Repeat the vacuum measurement found in test step HF 10. - Did the vacuum needle QUICKLY rise above 54 kPa (16 inches-Hg) with the engine speed at 2000 rpm?	Yes No	The exhaust system restriction is downstream of the exhaust manifold. RECONNECT exhaust system at exhaust manifold. GO to HF 12. A restriction is present in the exhaust manifold. INSPECT each exhaust port for casting flash / restrictions by dropping a length of chain into it (NOTE: Do not use a wire or lamp to check the ports. The restriction can be small enough for both to pass through, but large enough to cause excessive back-pressure at high engine rpm.). REPLACE the exhaust manifold if unable to remove the casting flash / restriction. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HF 12	CHECK MANIFOLD VACUUM WITH MUFFLER / TAILPIPE ASSEMBLY DISCONNECTED FOR INDICATION OF A RESTRICTION		
	- Disconnect muffler / tailpipe assembly from the catalytic converter. - Repeat the vacuum measurement found in test step HF 10. - Did the vacuum needle QUICKLY rise above 54 kPa (16 inches-Hg) with the engine speed at 2000 rpm?	Yes No	There is a restriction in the muffler / tailpipe assembly. REPLACE the muffler / tailpipe assembly. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. There is a restriction in the catalytic converter. REPLACE the catalytic converter. INSPECT the muffler to be certain converter debris has not entered. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.

Test Notes



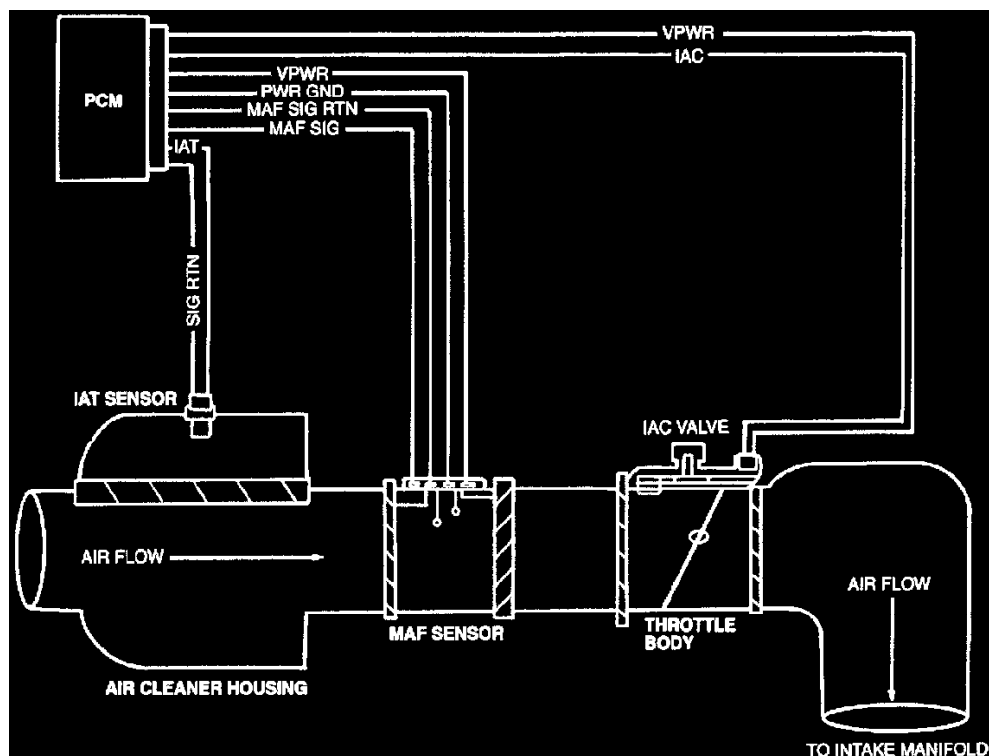
Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Positive Crankcase Ventilation (PCV) valve and related vacuum lines.

Test Step		Result	Action to Take
HG1	STUCK PCV VALVE CHECK		
- Verify PCV valve maintenance schedule has been followed. - Verify proper PCV valve part number. - Verify clean PCV valve. - Shake the PCV valve. Does PCV valve rattle when shaken?		Yes	REINSTALL PCV valve. GO to HG2 .
		No	PCV valve is sticking. REPLACE PCV valve. VERIFY a symptom no longer exists.
HG2	PCV SYSTEM CHECK		
- Start engine and bring to normal operating temperature. - Disconnect closure (fresh air) hose from remote air cleaner or air outlet tube (tube connecting mass air flow sensor and throttle body). - Place a stiff piece of paper over the hose end. Wait one minute. Does vacuum hold the paper in place?		Yes	PCV System is OK. RESTORE vehicle. RETURN to Symptom Charts.
		No	System is leaking / plugged or Evaporative Emission System is leaking. GO to HG3 .
HG3	EVAPORATIVE EMISSION SYSTEM CHECK		
NOTE: If the evaporative emission hose is not connected to the PCV hose, follow the No Action to Take (refer to VECI decal). - Disconnect evaporative emission hose at connection to PCV hose (if equipped). Cap the connector. - Again place a stiff piece of paper over the closure (fresh air) hose end, as in HG2. Wait one minute. Does vacuum now hold the paper in place?		Yes	PCV system is OK. GO to Evaporative Emission System Testing.
		No	For applications with Fuel Tank Pressure (FTP) sensor: GO to Pinpoint Test Step HX47. All others: GO to Pinpoint Test Step HW9. CHECK for vacuum leaks / obstruction in the PCV system (such as oil cap, PCV valve, hoses, cut grommets, valve cover bolt torque / gasket leak). REPAIR as necessary.

Test Notes



Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Throttle body assembly
- Speed control cable

- Accelerator cable linkage to throttle body
- Air cleaner assembly (including air cleaner element)
- Air inlet tube
- Clean air tube (hose) and resonator
- Intake Manifold Runner Control (**IMRC**) housing assembly
- IMRC actuator assembly
- Harness circuits: IMRC, IMRC Monitor, SIG RTN, PWR GND, VPWR
- Intake Manifold tuning valve (**IMT**) electric
- IMT valve vacuum
- IMT valve vacuum control solenoid
- Powertrain control module



Parameter (PID) Values

Vehicle	Engine	Trans	RPM	IACDC %	ECT
Escort/Tracer	2.0L 2V	IF4E	780±25	21-45	80°C (180°F)
Escort/Tracer	2.0L 2V	MT	725±25	20-44	80°C (180°F)
Escort/Tracer	2.0L 4V	IF4E	780±25	21-45	80°C (180°F)
Escort/Tracer	2.0L 4V	MT	725±25	21-45	80°C (180°F)
Contour/Mystique	2.0L	CD4E	800±25	19-43	80°C (180°F)
Contour/Mystique	2.0L	MTX	880±25	21-45	80°C (180°F)
Contour/Mystique	2.5L	CD4E	744±25	20-44	80°C (180°F)
Contour/Mystique	2.5L	MTX	725±25	19-43	80°C (180°F)
Taurus/Sable	3.0L 2V	AX4N/AX4S	900±25	19-43	80°C (180°F)
Taurus/Sable	3.0L FF	AX4N/AX4S	900±25	19-43	80°C (180°F)
Taurus/Sable	3.0L 4V	AX4N	900±26	19-43	80°C (180°F)
Taurus SHO	3.4L	AX4N	900±27	19-43	80°C (180°F)
Mustang	3.8L	4R70W	700±25	21-45	80°C (180°F)
Mustang	3.8L	T50D	720±25	20-44	80°C (180°F)
Mustang	4.6L 2V	4R70W	656±25	21-45	80°C (180°F)
Mustang	4.6L 2V	T45	656±25	20-44	80°C (180°F)
Mustang	4.6L 4V	T45	656±25	20-44	80°C (180°F)
Crown Victoria/Grand Marquis	4.6L	4R70W	800±25	19-43	80°C (180°F)
Crown Victoria	4.6L NG	4R70W	800±25	19-43	80°C (180°F)
Continental	4.6L	AX4N	800±25	19-43	80°C (180°F)
Town Car	4.6L	4R70W	800±25	20-44	80°C (180°F)
Mark VIII	4.6L	4R70W	900±28	20-45	80°C (180°F)
Ranger	2.5L	4R44E	768±25	20-44	80°C (180°F)
Ranger	2.5L	M50D	720±25	20-45	80°C (180°F)
Ranger	3.0L	4R44E	900±25	20-44	80°C (180°F)
Ranger	3.0L	M50D	860±25	20-44	80°C (180°F)

Vehicle	Engine	Trans	RPM	IACDC %	ECT
Ranger	4.0L	5R55E	824±25	20-44	80°C (180°F)
Ranger	4.0L	M5OD	750±25	20-45	80°C (180°F)
Windstar	3.0L	AX4S	700±25	20-45	80°C (180°F)
Windstar	3.8L	AX4S	700±25	20-45	80°C (180°F)
Explorer	4.0L	5R55E	750±26	20-46	80°C (180°F)
Explorer	4.0L	M5OD	750±27	20-47	80°C (180°F)
Explorer	4.0L SOHC	5R55E	750±26	20-46	80°C (180°F)
Explorer/Mountaineer	5.0L	4R70W	750±27	20-47	80°C (180°F)
E/F-Series	4.2L	4R70W	824±25	20-44	80°C (180°F)
F-Series	4.2L	M5OD	750±25	20-44	80°C (180°F)
E/F/Expedition	4.6L	4R70W	824±25	20-44	80°C (180°F)
F-Series	4.6L	M5OD	750±25	20-44	80°C (180°F)
E/F/Expedition/Navigator	5.4L	E4OD	824±25	20-44	80°C (180°F)
E/F-Series	5.4L NG	E4OD	750±25	20-45	80°C (180°F)
E/F-Series	6.8L	E4OD	776±24	25-37	80°C (180°F)
E/F-Series	6.8L	E4OD	780-810	20-44	180°F

RPM	IMRCM VDC (electric)	*IMRCM VDC (vacuum)	IMRC ON/OFF
KOEO	5.0 ± 0.2	3.5 ± 0.5	OFF
Idle to 3000	5.0 ± 0.2	3.5 ± 0.5	OFF
Above 3500	0.6 ± 0.3	0.6 ± 0.3	ON
3000 to Idle	5.0 ± 0.2	3.5 ± 0.5	OFF

* Voltage valves in this column will display approximately twice this value at the breakout box with digital multimeter.

NOTE: During some Intake Manifold Runner Control (IMRC) service procedures, it will be necessary to perform a drive cycle for verification of the IMRC and PCM operation. The table lists RPM PID, IMRCM PID and IMRC PID values during acceleration and deceleration.

Test Step		Result	Action to Take
HU1	CONFIRM DRIVE SYMPTOM		
	This Pinpoint Test addresses these drive symptoms: ● Stick, bind, grab feeling in accelerator pedal. ● Hard start/long crank. ● Hesitation or stalls at idle. ● Idle quality symptoms. ● Lack of power. ● Is the drive symptom listed above?	Yes No	GO to HU2 . RETURN to Symptom Charts, to address other drive Symptoms.
HU2	SELECT DIAGNOSTIC TEST STEP		
	● Does the intake air system symptom relate to stick, bind, grab conditions on the throttle body?	Yes No	GO to HU3 . GO to HU6 .
HU3	CHECK ACCELERATOR AND SPEED CONTROL CABLES FOR FREEDOM OF TRAVEL		
	● Disconnect accelerator cable and speed control cable from throttle body linkage. ● Inspect cables for freedom of travel from accelerator pedal / speed control device to throttle body linkage cable connector. ● Do cables travel freely?	Yes No	GO to HU4 . REPAIR cable as necessary. VERIFY a symptom no longer exists.
HU4	CHECK THROTTLE RETURN STOP		
	● Cables removed from throttle body linkage. ● Remove the clean air tube from the throttle body and verify that there is no foreign material or debris preventing the throttle plate from rotating to the fully closed position. ● Verify that the throttle return stop is in contact with the throttle linkage lever arm when the throttle is in the closed plate (idle) position. ● Does the throttle return stop contact lever arm?	Yes No	GO to HU5 . NOTE: Do not adjust throttle return stop to try to correct idle quality concerns. REPLACE throttle body assembly. RESTORE vehicle. VERIFY a symptom no longer exists.
HU5	CHECK FOR THROTTLE BODY STICKING, BINDING, GRABBING		
	● Gently cycle throttle from open to closed position several times. ● Gently cycle throttle by hand from closed to WOT position. Inspect for freedom of travel particularly during the initial throttle opening. ● NOTE: Throttle bodies use a special coating / sealant on the throttle bore and plate area to make them tolerant to engine sludge accumulation. CAUTION: Do not clean the throttle bore and plate area. Cleaning will damage the throttle body assembly. ● Does the throttle rotate freely without sticking, binding or grabbing condition?	Yes No	RECONNECT accelerator cable and clean air tube to the throttle body assembly. RETURN to Symptom Charts, if the drive Symptom persists. REPLACE throttle body assembly. RESTORE vehicle. GO to HU . Start the engine. Gently cycle throttle by hand from closed to partially open position. Inspect for freedom of travel particularly during the initial throttle opening.
HU6	CHECK AIR CLEANER ELEMENT		
	● Inspect air cleaner element. ● Is the air cleaner element excessively dirty?	Yes No	REPLACE air cleaner element. RETURN Symptom Charts, if the drive Symptom persists. GO to HU8 .

Test Step		Result	Action to Take
HU8	CHECK FOR PROPER OPERATION OF RELATED ENGINE SYSTEMS		
NOTE: If here from Pinpoint Test QA, go directly to HU9. • Verify that the following engine systems have been properly diagnosed and corrected before proceeding with the Intake Air system diagnostics: — Positive Crankcase Ventilation (PCV) System. — Ignition System. — Exhaust System. — Engine Cooling System (engine coolant temperature is above 80°C (180°F)). — Incorrect fuel pressure, plugged fuel filter, fuel quality (contamination). • Have the systems been properly checked and are they operating properly?		Yes	▶ GO to HU9 .
		No	▶ GO to Symptom Charts with the symptom for direction.
HU9	CHECK FOR VACUUM LEAKS		
• Key on, engine running. • With engine at idle, listen for vacuum leaks. • Inspect the entire Intake Air System from the mass air flow (MAF) sensor to the intake manifold for leaks such as: — Cracked or punctured inlet air tube. — Loose connections on the inlet air tube at the air cleaner housing or throttle body. — Idle air control (IAC) valve assembly or gasket seal. — EGR valve gasket seal leak to intake manifold. — Intake manifold assembly or gasket seal. — EGR valve diaphragm or control solenoid. — Vacuum supply connectors and hose. — PCV connectors and hose. • Are any leaks detected in the areas listed above?		Yes	▶ REPAIR as necessary. VERIFY a symptom no longer exists.
		No	▶ GO to HU10 .

Test Step		Result	Action to Take
HU10	CHECK IDLE		
• Transmission in PARK (wheels blocked and parking brake engaged). • A/C, heater and all accessories are off. • Engine at normal operating temperature and fan control off. CAUTION: Do not disconnect fan control harness. It may cause engine overheating. • Connect Scan Tool. • Access engine RPM PID. NOTE: Engine idle rpm is controlled by the PCM and cannot be adjusted. The PCM is calibrated to control idle at the speeds listed in the Hot Idle PID Value Table at the beginning of this Pinpoint Test. When performing this test, verify the rpm is within specification. If the engine is allowed to idle for an extended period of time, or if the engine temperature is hot enough to require fan control operation, it may be necessary to turn the engine off and repeat this test procedure. Vehicle must idle for at least one minute after startup before reading PID. • Access IAC PID, idle air percent duty cycle. • Do the RPM and IAC PID readings match the values in the Hot Idle PID Value Table at the beginning of the pinpoint test?		Yes No	▶ GO to HU11 . ▶ GO to HU12 .
HU11	CHECK IDLE CONTROL RESPONSE		
• Transmission still in PARK. • A/C, heater and all accessories off. • Engine at normal operating temperature and fan control off, but not disconnected. CAUTION: Do not disconnect fan control harness. It may cause engine overheating. • Briefly perform wide open throttle and let it return to the idle position. • Does the engine stall or does the rpm fluctuate excessively before returning to the idle speed specified in HU10?		Yes No	▶ GO to HU12 . ▶ Intake Air system is OK. RESTORE vehicle. RETURN to Symptom Charts to check other possible causes of the drive symptoms.

Test Step		Result	Action to Take
HU12	CHECK IAC VALVE FOR PROPER FUNCTION		
• Transmission still in PARK. • A/C, heater and all accessories off. • Engine at normal operating temperature and fan control off, but not disconnected. CAUTION: Do not disconnect fan control harness. It may cause engine overheating. • Disconnect IAC valve harness connector. • Listen to engine rpm. • Key off. • Did the rpm drop or engine stall?		Yes	Fast Idle Symptom: GO to HU14 .
		No	Other Symptoms: GO to HU13 . NOTE: Do not attempt to clean the IAC valve. IAC valve is inoperative, REPLACE IAC valve only. RESET Keep Alive Random Access Memory (RAM). VERIFY symptom no longer exists.
HU13	THROTTLE BODY VISUAL / FUNCTIONAL CHECK		
• Remove throttle body assembly (refer to Workshop Manual). • Hold throttle body up to a light source. The hole in the throttle plate (in some applications only) must be visible and unobstructed. • Rotate the throttle lever and allow it to return. It must not stick or bind and must return to the closed plate position (throttle return stop contacting lever) freely when released. • Does the throttle body pass these visual / functional checks?		Yes	Throttle body is operating properly. REINSTALL throttle body assembly. RETURN to Symptom Charts to check other possible causes of symptom.
		No	Throttle body is inoperative. REPLACE entire throttle body assembly. RESET Keep Alive Random Access Memory (RAM). VERIFY a symptom no longer exists.
HU14	CHECK IAC CIRCUIT FOR SHORT TO GROUND		
• Install breakout box, leave PCM disconnected. • Measure resistance between PCM test pin 83 (IAC) and PCM test pins 51 or 103 (PWR GND). • Is each resistance greater than 10,000 ohms?		Yes	REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test.
		No	REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
HU15	PERFORM VISUAL INSPECTION		
DTCs P1518, P1537 and P1538 indicate IMRC is stuck open. DTCs P1512, P1513 and P1519 can indicate IMRC may be stuck closed. DTCs P1516 and P1517 indicate IMRC input error. Possible causes: — Damaged vacuum lines. — Damaged vacuum solenoid. — Damaged vacuum actuator. — IMRC actuator cable / gears seized. — Cables improperly routed (binding) or seized. — Damaged / disconnected IMRC housing return springs. — Lever / shaft return stop obstructed / bent. — Lever / shaft wide open stop obstructed / bent. — IMRC lever / shaft stick / bind or disconnected. ● For electric IMRC, view cable routing. Make sure cables are not binding or improperly routed. Cable core wire at IMRC housing attachment must have slack and lever must contact closed plate stop screw. For Escort / Tracer, view IMRC actuator lever. Make sure lever is visible. For vacuum operated IMRC systems, make sure sensor linkage is attached and secure. Lever must contact closed plate stop screw with key on engine running. ● NOTE: IMRC return spring is strong. Make sure return springs operate properly and plates open and close fully. Manually open and close IMRC plates at intake manifold (press IMRC lever down for Escort / Tracer) and feel for sticking / binding. ● Is fault indicated?		Yes	▶ REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. RESTORE vehicle. VERIFY service.
		No	▶ Passed visual inspection. GO to HU16 .

Test Step		Result	Action to Take
HU16	PERFORM IMRC FUNCTIONAL TEST		
- Connect scan tool to data link connector (DLC). - Key on, engine off. - Access Output Test Mode (OTM). WARNING: KEEP FINGERS CLEAR OF IMRC LEVER/CABLE MECHANISM. - Turn all outputs on (IMRC included). - When IMRC is commanded on, lever(s) should rotate to full open position. At least one of the levers should contact the wide open stop, the other may be slightly off the wide open stop. This is normal. For Escort/Tracer, IMRC actuator lever will rotate to full open position at approximately 90 degrees. Did the IMRC lever(s) cycle from fully closed and remain fully open while all outputs were on?		Yes	Passed operational test. For DTC P1516 and P1517: GO to HU64. For DTC P1518: GO to HU26. For DTC P1519: GO to HU29.
		No	Exit OTM. GO to HU17.
HU17	PERFORM IMRC OPERATIONAL TEST		
- Key on, engine running - Increase engine speed to above 3500 rpm. CAUTION: Keep fingers clear of IMRC lever/cable mechanism. - When engine speed is above approximately 3500 rpm, lever(s) must rotate to full open position. At least one lever should contact the wide open stop (for Escort/Tracer, lever will not be visible), the other (if applicable) may be slightly off the wide open stop. This is normal. When engine returns to idle (or below 3000 rpm), lever(s) must return to original closed position. - Key off. Did the IMRC lever(s) cycle from fully closed and remain fully open while the rpm was above 3500?		Yes	Passed operational test. For DTC P1516 and P1517: GO to HU64. For DTC P1518: GO to HU26. For DTC P1519: GO to HU29.
		No	Failed operational test. GO to HU18 (except Escort/Tracer). For Escort/Tracer: GO to HU20.

Test Step		Result	Action to Take
HU18	PERFORM IMRC PHYSICAL TEST		
- Disconnect IMRC cables from both LH and RH intake runners. - NOTE: IMRC return springs are strong. Rotate by hand both the LH and RH bank IMRC housing lever assembly fully open and then closed. - Feel for sticking or binding plate rotation. - Feel for return spring tension. 34 to 45 N-m (3 to 4 lb-in). - Do the IMRC plates open and close completely (lever contacting closed plate stop screw) without obstruction?		Yes	Passed physical check, RECONNECT IMRC cables or IMRC monitor assembly: For DTC P1516 and P1517: GO to HU64. For DTC P1518: GO to HU26. For DTC P1519: GO to HU29.
		No	Failed physical test. INSPECT IMRC runner plates for sludge contaminants, warping, misalignment, etc. CLEAN as necessary. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HU19	VERIFY IMRC CIRCUIT FAULT		
Intake Manifold Runner Control circuit malfunction: Possible causes: - IMRC control circuit open. - IMRC VPWR circuit open. - IMRC control circuit shorted to PWR GND or SIG RTN. - IMRC control circuit shorted to VPWR. - Damaged IMRC actuator. - Damaged PCM. - Connect scan tool to DLC. - Key on, engine off. - Access IMRCF PID. - Does PID display On?		Yes	Fault is present. GO to HU20 .
		No	Fault is intermittent. GO to HU36 .
HU20	CHECK IMRC ACTUATOR VPWR CIRCUIT FOR OPEN IN HARNESS		
- Disconnect IMRC actuator harness connector. - Key on, engine off. - Measure voltage between VPWR circuit at the IMRC actuator harness connector and B-. - Key off. - Is IMRC VPWR voltage greater than 10.5 volts?		Yes	VPWR OK. GO to HU21 .
		No	REPAIR open in IMRC VPWR circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.

Test Step		Result	Action to Take
HU21	CHECK PWR GND CIRCUIT FOR OPEN IN HARNESS		
	- IMRC actuator harness connector disconnected. - Key on, engine off. - Measure voltage between PWR GND circuit and VPWR circuit at the IMRC actuator. - Key off. - Is voltage greater than 10.5 volts?	Yes No	Passed PWR GND check. GO to HU22 . REPAIR open in IMRC PWR GND circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HU22	CHECK IMRC DRIVER CIRCUIT FOR SHORT TO GROUND		
	- Disconnect scan tool from DLC. - IMRC actuator harness connector disconnected. - Measure resistance from IMRC signal circuit at the harness connector to B-. - Is resistance greater than 10,000 ohms?	Yes No	Passed check. GO to HU23 . GO to HU39 .
HU23	CHECK IMRC DRIVER CIRCUIT FOR SHORT TO VPWR / VREF		
	- Install breakout box, leave PCM disconnected. - Measure voltage between PCM test pin 42 and PCM test pins 51 or 103 at the breakout box. - Is voltage less than 1.0 volt?	Yes No	GO to HU24 . REPAIR IMRC control circuit short to VPWR / VREF. RESTORE vehicle. RERUN Quick Test.
HU24	CHECK IMRC DRIVER CIRCUIT FOR OPEN IN HARNESS		
	- IMRC actuator harness connector disconnected. - Install breakout box, leave PCM disconnected. - Disconnect scan tool from DLC. - Measure resistance from PCM test pin 42 and IMRC signal circuit at IMRC actuator harness connector. - Is resistance less than 5.0 ohms?	Yes No	GO to HU25 . REPAIR open IMRC control circuit. RESTORE vehicle. RERUN Quick Test.
HU25	VERIFY PCM IMRC DRIVER		
	- Reconnect IMRC actuator harness connector. - Key on, engine off. - Jumper PCM test pin 42 to PCM test pins 51 or 103. - Key off. - Did the IMRC plates open after the jumper was inserted?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPLACE IMRC actuator. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
HU26	DTC P1518: VERIFY IMRC MONITOR CIRCUIT VOLTAGE		
Diagnostic Trouble Code (DTC) P1518 indicates the IMRC monitor circuit voltage is less than expected. Possible causes: — IMRC monitor signal circuit shorted to PWR GND or SIG RTN. — Damaged IMRC actuator. — Damaged PCM. ● Connect scan tool to data link connector (DLC). ● Key on, engine off. NOTE: If the IMRC plates are physically open, go to HU20 except Escort / Tracer. Escort / Tracer go to HU22. ● Access IMRCM PID. ● Is IMRCM PID reading with the plates closed greater than 1.6 volts?		Yes No	Fault is intermittent. GO to HU34. Failed IMRC monitor circuit check. GO to HU27.
HU27	CHECK IMRC MONITOR CIRCUIT		
● Key off. ● Disconnect IMRC harness connector from IMRC actuator. ● Key on, engine off. ● Access IMRCM PID. ● Did PID reading increase to more than 1.6 volts when the IMRC actuator harness connector was disconnected?		Yes No	Make sure IMRC plates are closed. For Escort / Tracer, be sure IMRC actuator lever is visible and plates closed. Then REPLACE IMRC actuator. COMPLETE PCM Reset to clear DTCs. RESTORE vehicle. RERUN Quick Test. GO to HU28.
HU28	CHECK IMRC MONITOR CIRCUIT FOR SHORT TO GROUND		
● Key off. ● IMRC actuator harness connector disconnected. ● Disconnect PCM. ● Disconnect scan tool from DLC. ● At the harness connector measure resistance from IMRC monitor circuit to B-. ● At the harness connector, measure resistance from IMRC monitor circuit to SIG RTN. ● Is resistance greater than 10,000 ohms for B- and SIG RTN?		Yes No	Monitor circuit OK. REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short in IMRC monitor circuit to B- or SIG RTN. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
HU29	DTC P1519: IMRC MONITOR CIRCUIT INPUT GREATER THAN EXPECTED		
	Diagnostic Trouble Code (DTC) P1519 indicates the IMRC monitor circuit signal voltage is greater than expected. Possible causes: — IMRC monitor circuit open. — IMRC control circuit open. — IMRC monitor circuit short to VREF. — IMRC monitor return circuit open. — Damaged IMRC actuator. — IMRC VPWR circuit open. — Damaged PCM. ● Key off. ● Connect scan tool to data link connector (DLC). ● Disconnect IMRC actuator harness connector. ● Connect a wire jumper from IMRC monitor circuit pin to SIG RTN at the IMRC harness connector. NOTE: If any scan tool communication concern exists, remove jumper and go to HU38. ● Key on, engine off. ● Access IMRCM PID. ● Key off. ● Was IMRCM PID reading less than 0.2 volt?	Yes No	Expected reading. REMOVE jumper wire. GO to HU40. REMOVE jumper wire. GO to HU30.
HU30	CHECK SIG RTN CIRCUIT FOR OPEN IN HARNESS		
	● Disconnect scan tool from DLC. ● Measure resistance between B- and SIG RTN circuit at the IMRC harness connector. ● Is reading less than 5.0 ohms?	Yes No	Expected reading. GO to HU31. REPAIR open SIG RTN circuit. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33.
HU31	CHECK IMRC MONITOR CIRCUIT FOR OPEN IN HARNESS		
	● Install breakout box, leave PCM disconnected. ● Measure resistance between PCM test pin 8 and IMRC monitor circuit at the IMRC actuator harness connector. ● Is resistance less than 5.0 ohms?	Yes No	REPLACE damaged PCM. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33. REPAIR open in IMRC monitor circuit. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33.

Test Step		Result	Action to Take
HU32	ACCESS OTM TO CHECK CIRCUIT OPERATION		
- Connect scan tool to DLC. - Key on, engine off. - Access Output Test Mode (OTM).		Yes	Fault is intermittent. GO to HU34
- While in Output Test Mode, access the IMRC and IMRCM PIDs. If the scan tool will not allow access to PIDs while in Output Test Mode, disconnect PCM, install a breakout box, reconnect PCM, connect a digital multimeter between PCM test pin 8 and PCM test pins 51 or 103. - Command the outputs on. The IMRCM PID value should be less than 1.6 volts (the digital multimeter voltage should show the same reading). Also, the IMRC PID should be in the ON state. - Is the PID/digital multimeter reading less than 1.6 volts?		No	REPLACE damaged IMRC actuator. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33 .
HU33	IMRC REPAIR VERIFICATION DRIVE CYCLE		
- Key on, engine off. - Connect scan tool to data link connector (DLC). - Complete PCM Reset. - Access IMRC, IMRCM and RPM PIDs. - Vehicle at operating temperature. - Drive vehicle, obeying all traffic and safety laws. - Transmission in OVERDRIVE range. - SAFELY perform three accelerations from stop to more than 3500 rpm. Watch for IMRC, IMRCM and RPM PIDs to change. Refer to IMRC Drive Cycle PID Table at the beginning of this Pinpoint Test. - Perform Quick Test. - Are any DTCs received?		Yes	GO to Powertrain DTC chart.
		No	PASSED IMRC Drive Cycle. No IMRC fault is present at this time.
HU34	IMRC MONITOR CIRCUIT LOW WIGGLE TEST		
- Key on, engine off. - Connect scan tool to data link connector (DLC). - IMRC actuator disconnected. - Connect a wire jumper from IMRC monitor circuit pin to SIG RTN pin at IMRC connector. - Access IMRCM PID (with jumper connected, reading must be less than 0.2 volt). - While viewing the PID, wiggle wiring from IMRC connector to PCM connector. - Did IMRCM PID reading jump from less than 0.2 volt to greater than 1.6 volts?		Yes	Intermittent fault area has been identified. ISOLATE and REPAIR as necessary. REMOVE jumper wire. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
		No	GO to HU35 .

Test Step		Result	Action to Take
HU35	IMRC MONITOR CIRCUIT HIGH WIGGLE TEST		
● Key off. ● IMRC actuator harness connector disconnected. ● Key on, engine off. ● Access IMRCM PID. ● While viewing the IMRCM PID, wiggle wiring from IMRC connector to PCM connector. ● Did IMRCM PID reading drop to less than 1.6 volts?		Yes	Intermittent fault area has been identified. ISOLATE and REPAIR as necessary. PERFORM this test step again to verify repair.
		No	Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: IMRCM and IMRC PIDs and list of Possible causes.
HU36	INTERMITTENT CIRCUIT HIGH FAULT TEST		
● Key off. ● Reconnect all components. ● Connect scan tool to DLC. ● Key on, engine off. ● Access Output Test Mode. ● While in Output Test Mode, access the IMRC and IMRCM PIDs. If the scan tool will not allow access to PIDs while in Output Test Mode, install a breakout box, reconnect PCM and connect a digital multimeter between PCM test pin 42 and PCM test pins 51 or 103. ● Command the outputs on. The IMRC PID value should be on (the digital multimeter voltage should be less than 1.0 volt) and the IMRCM PID value should be less than 1.6 volts. — Shake, wiggle and bend the IMRC Signal Circuit wiring from the IMRC actuator back to the PCM while viewing the IMRC digital multimeter reading or IMRCM PID reading. — Look for a sudden change in the IMRCM PID reading or in the digital multimeter reading to indicate when a fault is detected. ● Is a fault indicated?		Yes	Possible open in IMRC control circuit or VPWR circuit to the IMRC actuator. ISOLATE fault and REPAIR as necessary. REPEAT this test step to verify repair.
		No	GO to HU37 .

Test Step		Result	Action to Take
HU37	INTERMITTENT CIRCUIT LOW FAULT TEST		
This step determines whether the IMRC Signal Circuit is intermittently shorting to ground and causing the IMRC plates to open. ● Key on, engine off. ● All components connected. ● While viewing IMRC plates or actuator lever on Escort / Tracer, wiggle wiring and connectors from IMRC actuator to PCM. ● Did the IMRC lever move or plates open while wiggling/pulling on the wiring?		Yes	▶ Possible short to ground in the IMRC Control Circuit. ISOLATE fault and REPAIR as necessary. REPEAT this test step to verify service.
		No	▶ Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: IMRCM and IMRC PIDs and list of Possible causes.
HU38	CHECK IMRC MONITOR CIRCUIT FOR SHORT TO VREF IN HARNESS		
● Key off. ● IMRC actuator harness connector disconnected. ● Install breakout box, leave PCM disconnected. ● Disconnect scan tool from DLC. ● Measure resistance between PCM test pin 8 and PCM test pin 90. ● Is resistance greater than 10,000 ohms?		Yes	▶ REPLACE PCM. RESTORE vehicle. RERUN Quick Test.
		No	▶ REPAIR short between IMRC monitor circuit and VREF circuit. RESTORE vehicle. RERUN Quick Test.
HU39	CHECK IMRC CONTROL CIRCUIT FOR SHORT TO GROUND		
● IMRC actuator harness connector disconnected. ● Install breakout box, leave PCM disconnected. ● Disconnect scan tool from DLC. ● Measure resistance between PCM test pin 42 and PCM test pins 51 or 103 and 91. ● Is resistance greater than 10,000 ohms for PWR GND and SIG RTN?		Yes	▶ REPLACE PCM. RESTORE vehicle. RERUN Quick Test.
		No	▶ REPAIR short to GND or SIG RTN in IMRC control circuit. RESTORE vehicle. RERUN Quick Test.
HU40	ENTER OTM TO CHECK IMRC CIRCUIT		
● Reconnect IMRC actuator harness connector. ● Connect scan tool to DLC. ● Key on, engine off. ● Access Output Test Mode (OTM) ● While in OTM, turn all outputs on. Observe the IMRC lever(s). ● Key off. ● Did the IMRC lever(s) cycle open during the OTM command?		Yes	▶ GO to HU32 .
		No	▶ GO to HU20 .

Test Step		Result	Action to Take
HU64	DETERMINE IMRC FAULT PATH		
	Diagnostic Trouble Codes (DTCs) P1516 or P1517 indicate the IMRC plates were open or closed longer than expected. This step determines the diagnostic path for DTCs P1516 or P1517. ● Connect scan tool to DLC. ● Key on, engine off. ● Access IMRCM and IMRC2M (for Escort/Tracer, do not access IMRC2M PID). ● Key off. ● Were the PID values less than 3 volts?	Yes No	GO to HU29. GO to HU26.
HU65	PERFORM VISUAL INSPECTION		
	DTC P1549 indicates IMTV circuit malfunction. Lack or loss of power may be caused by a damaged IMT valve. Vacuum control solenoid may be damaged for SOHC engine. Possible causes: — Open signal circuit. — Open VPWR circuit. — Shorted signal circuit. — Damaged IMT valve. — Damaged PCM. ● Inspect IMT Valve System. Check to be sure the harness is intact and the connector is firmly in place. Check vacuum line for SOHC IMTV system. ● Is fault indicated?	Yes No	REPAIR as necessary. COMPLETE PCM reset. VERIFY a symptom no longer exists. Passed visual inspection. GO to HU66.
HU66	CHECK PCM DRIVER COMMAND		
	● Connect scan tool to data link connector (DLC). ● Key on, engine running. ● Access IMTV PID. ● Increase engine speed to about 3500 rpm while observing IMTV PID. ● Key off. ● Did PID read 100% then drop to 50% while rpm was above 3500 or did SOHC read ON?	Yes No	Passed test. GO to HU67. REPLACE damaged PCM. RERUN Quick Test and VERIFY a symptom no longer exists.
HU67	CHECK IMT VALVE ACTUATOR OR VACUUM CONTROL SOLENOID VPWR CIRCUIT FOR OPEN IN HARNESS		
	● Disconnect harness connector from the actuator (solenoid for SOHC). ● Key on, engine off. ● Measure VPWR circuit voltage at the harness connector. ● Key off. ● Was the voltage greater than 10.5 volts?	Yes No	Passed check. GO to HU69. REPAIR IMT Valve actuator (vacuum solenoid for SOHC) VPWR circuit for open. RESTORE vehicle. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists.

Test Step		Result	Action to Take
HU69	CHECK FOR OPEN SIGNAL CIRCUIT BETWEEN PCM AND IMT VALVE ACTUATOR OR VACUUM CONTROL SOLENOID		
	● Install breakout box, leave PCM disconnected. ● Measure resistance of Circuit between PCM test pin 46 and actuator or solenoid for SOHC harness connector. ● Is the resistance less than 5.0 ohms?	Yes No	Passed test. GO to HU70 . REPAIR IMT Valve Actuator (vacuum solenoid for SOHC) Signal Circuit open. RESTORE vehicle. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists.
HU70	CHECK IMT VALVE ACTUATOR OR VACUUM CONTROL SOLENOID SIGNAL FOR SHORT TO PWR GND		
	● Measure resistance between PCM test pin 46 and test pin 77 or 103. ● Is resistance greater than 10,000 ohms?	Yes No	Passed check. GO to HU71 . REPAIR IMT Valve actuator (solenoid for SOHC) signal circuit for short to PWR GND. RESTORE vehicle. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists.
HU71	CHECK IMT VALVE ACTUATOR OR VACUUM CONTROL SOLENOID SIGNAL CIRCUIT FOR SHORT TO VPWR		
	● Key on, engine off. ● Measure voltage between PCM test pin 46 and 77 or 103. ● Key off. ● Was the voltage less than 1 volt?	Yes No	Passed check. GO to HU72 . REPAIR IMT Valve actuator (vacuum solenoid for SOHC) signal circuit for short to VPWR. RESTORE vehicle. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists.

Test Step		Result	Action to Take
HU72	CHECK PCM DRIVER FOR IMT VALVE ACTUATOR OR VACUUM CONTROL SOLENOID		
	- Reconnect PCM. - Connect DVOM to VPWR and signal at the harness connector. - Connect scan tool to data link connector (DLC). - Key on, engine off. - Access Output Test Mode (OTM). - Take a reading with the digital Multimeter. - Command all outputs on. - Take another reading with the digital Multimeter. - Key off. • Was the voltage less than 1 volt before commanding all outputs on and greater than 10.5 volts with all outputs on?	Yes No	Passed test. GO to HU73. For SOHC GO to HU75. REPLACE PCM. RESTORE vehicle. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists.
HU73	CHECK IMT VALVE SHUTTER FOR DAMAGE		
	- Remove IMT Valve. - Visually inspect IMT valve shutter for damage. - Rotate shutter by hand. • Does the shutter bind or appear damaged?	Yes No	Damaged shutter. REPLACE IMT valve. RESTORE vehicle. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists. Passed test. Leave IMT Valve disassembled. GO to HU74. For SOHC GO to HU77.
HU74	CHECK IMT VALVE ACTUATOR FOR COIL DAMAGE		
	- Reconnect IMT valve harness connector. - Key on, engine off. - Access Output Test Mode (OTM) - Command all outputs on. • Did the IMT valve shutter rotate when commanding all outputs on?	Yes No	Passed check. Fault is intermittent. GO to Pinpoint Test Step Z1 with the IMTV PID and list of possible causes. REPLACE IMT valve actuator. COMPLETE PCM Reset. RESTORE vehicle. RERUN Quick Test and VERIFY a symptom no longer exists.

Test Step		Result	Action to Take
HU75	CHECK MANIFOLD VACUUM TO IMT VALVE SOLENOID		
	- Reconnect solenoid harness connector. - Disconnect vacuum line at the solenoid from the intake manifold. - Install a vacuum gauge to the vacuum line. - Start engine and let idle. - Inspect both vacuum lines to solenoid for leaks, kinks, disconnects, blockage, routing or any damage. - Take a reading from the gauge. Is the gauge reading greater than 33.8 kPa (10 in-Hg) at idle and the vacuum lines ok?	Yes No	Passed check. RECONNECT vacuum line from the manifold to the solenoid. GO to HU76. REPAIR open in vacuum source. COMPLETE PCM Reset. RESTORE vehicle. RERUN Quick Test and VERIFY a symptom no longer exists.
HU76	CHECK VACUUM BETWEEN VACUUM SOLENOID AND IMT VALVE		
	- Disconnect vacuum line at the IMT valve from the solenoid. - Install a vacuum gauge to the vacuum line and take a reading. - Increase engine speed to about 3500 rpm while reading gauge. - Key off. Did the vacuum gauge read 0 kPa (0 in-Hg) at idle and greater than 33.8 kPa (10 in-Hg) at 3500 rpm?	Yes No	Passed check. GO to HU73. REPLACE IMT valve vacuum solenoid. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists. RESTORE vehicle.
HU77	VACUUM CHECK ON IMT VALVE FOR INTERNAL DAMAGE		
	- Apply approximately 33.8 kPa (10 in-Hg) to IMT Valve. - Observe IMT valve shutter. Did IMT valve shutter rotate 90 degrees with vacuum applied and return to original position when vacuum was released?	Yes No	Passed check. Fault is intermittent. GO to Pinpoint Test Step Z1 with the IMTV PID and list of possible causes. REPLACE IMT valve. RESTORE vehicle. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists.
HU80	CHECK VACUUM CONTROL SOLENOID VPWR CIRCUIT FOR OPEN IN HARNESS		
	- Disconnect harness connector from the solenoid. - Key on, engine off. - Measure VPWR circuit voltage at the harness connector. Was the voltage greater than 10.5 volts?	Yes No	Passed check. GO to HU81. REPAIR vacuum solenoid VPWR circuit for open. COMPLETE PCM Reset. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33.

Test Step		Result	Action to Take
HU81	CHECK B+ TO VACUUM ACTUATOR VPWR CIRCUITS FOR OPEN IN HARNESS		
	- NOTE: IMRC vacuum actuator harness connectors are interchangeable. Be sure each connector is attached to the proper bank. Observe IMRCM (bank 1) and IMRCM2 (bank2) PID value change with scan tool while disconnecting each harness connector. Bank 1 on a "V" type engine is on the RH side when sitting in the driver seat or near the dash panel on the transverse mounted engine. - Disconnect harness connectors from each actuator. - Measure VPWR circuit voltage at each harness connector. Was the voltage greater than 10.5 volts.	Yes No	Passed test. GO to HU82 REPAIR the failed vacuum actuator VPWR circuit for open. COMPLETE PCM Reset. RESTORE vehicle. GO to HU33 .
HU82	CHECK PCM DRIVER FOR VACUUM CONTROL SOLENOID		
	- Connect digital Multimeter to VPWR and signal at the harness connector. - Connect scan tool to data link connector (DLC). - Access Output Test Mode (OTM) - Take a reading with the digital multimeter. - Command all outputs on. - Take another reading with the digital multimeter. - Key off. Was the voltage less than 1 volt before commanding all outputs on and greater than 10.5 volts with all outputs on?	Yes No	Passed check. GO to HU86 . GO to HU83 .
HU83	CHECK VACUUM CONTROL SOLENOID SIGNAL FOR SHORT TO PWR GND		
	- Install breakout box, leave PCM connected. - Measure resistance between PCM test pin 42 and 77 or 103. Is the resistance greater than 10,000 ohms?	Yes No	Passed check. GO to HU84 . REPAIR Vacuum Solenoid Signal Circuit. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33 .

Test Step		Result	Action to Take
HU84	CHECK VACUUM CONTROL SOLENOID SIGNAL FOR SHORT TO VPWR		
	● Key on, engine off. ● Measure voltage between PCM test pin 42 and 77 or 103. ● Key off. ● Was the voltage less than 1 volt?	Yes No	Passed check. GO to HU85 . REPAIR Vacuum Solenoid Signal Circuit for short to VPWR. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33 .
HU85	CHECK FOR OPEN SIGNAL CIRCUIT BETWEEN PCM AND VACUUM CONTROL SOLENOID		
	● Measure resistance of circuit between PCM test pin 42 and solenoid harness connector. ● Is the resistance less than 5 ohms?	Yes No	Passed check. REPLACE PCM. RESTORE vehicle. GO to HU33 . REPAIR Vacuum Solenoid Signal Circuit for open. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33 .
HU86	CHECK FOR VACUUM FROM MANIFOLD TO VACUUM CONTROL SOLENOID		
	● Disconnect vacuum line at the solenoid from the intake manifold. ● Install a vacuum gauge to the vacuum line. ● Key on, engine running. ● Inspect both vacuum lines to solenoid for leaks, kinks, disconnects, blockage, routing or any damage. ● Take a reading from the gauge. ● Key off. ● Was the gauge reading greater than 33.8 kPa (10 in-Hg) at idle and were vacuum lines ok?	Yes No	Passed check. RECONNECT vacuum line from the manifold to the solenoid. GO to HU87 . REPAIR open in vacuum source. COMPLETE PCM reset. RESTORE vehicle. COMPLETE IMRC Repair Verification Drive Cycle. GO to HU33 .
HU87	CHECK FOR VACUUM FROM VACUUM CONTROL SOLENOID TO VACUUM ACTUATORS		
	● Disconnect vacuum line at the solenoid to actuators. ● Install vacuum gauge to the solenoid. ● Key on, engine running. ● Take a reading from the gauge. ● Increase engine speed to at least 3500 rpm. ● Take another gauge reading at 3500 rpm. ● Key off. ● Did the vacuum gauge read greater than 33.8 kPa (10 in-Hg) at idle and 0 kPa (0 in-Hg) above 3500 rpm?	Yes No	Passed check. GO to HU88 . REPLACE vacuum solenoid. COMPLETE PCM reset. RESTORE vehicle. COMPLETE IMRC Repair Verification Drive Cycle. GO to HU33 .

Test Step		Result	Action to Take
HU88	CHECK FOR OPEN PWR GND CIRCUIT BETWEEN VACUUM ACTUATORS AND BATTERY NEGATIVE POST		
	● Key on. ● Measure voltage between VPWR and PWR GND at each actuator harness connector. ● Key off. ● Was each voltage greater than 10.5 volts?	Yes No	Passed check. GO to HU89 . REPAIR failed vacuum actuator PWR GND circuit for open. COMPLETE PCM reset. RESTORE vehicle. COMPLETE IMRC Repair Verification Drive Cycle. GO to HU33 .
HU89	CHECK VACUUM ACTUATOR SIGNAL FOR SHORT TO VPWR		
	● Install breakout box, leave PCM disconnected. ● Key on. ● Measure voltage between signal and PWR GND at each actuator harness connector. ● Key off. ● Was each voltage less than 1 volt?	Yes No	Passed check. GO to HU90 . REPAIR Failed Vacuum Actuator Signal Circuit short to VPWR. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33 .
HU90	CHECK VACUUM ACTUATOR SIGNAL FOR SHORT TO PWR GND		
	● Measure resistance between PCM test pin 8 and 77 or 103. ● Measure resistance between PCM test pin 9 and 77 or 103. ● Is each resistance greater than 10,000 ohms?	Yes No	Passed check. GO to HU91 . REPAIR Failed Vacuum Actuator Signal Circuit for short. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33 .
HU91	CHECK FOR OPEN SIGNAL CIRCUIT BETWEEN PCM AND VACUUM ACTUATORS		
	● Measure resistance of circuit between PCM test pin 8 and vacuum actuator harness connector signal bank1. ● Measure resistance of circuit between PCM test pin 9 and vacuum actuator harness connector signal bank2. ● Is each resistance less than 5 ohms?	Yes No	Passed check. GO to HU92 . REPAIR Failed Vacuum Actuator Signal Circuit for open. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33 .

Test Step		Result	Action to Take
HU92	CHECK PCM MONITOR CIRCUIT FOR DAMAGE		
	- Reconnect PCM to breakout box. - Key on. - Connect scan tool to data link connector (DLC). - Access IMRCM and IMRC2M PIDs - Note PID readings for each bank. - Jumper PCM test pin 8 to 77 or 103 then 97 while observing IMRCM PID. - Jumper PCM test pin 9 to 77 or 103 then 97 while observing IMRC2M PID. - Remove both jumper wires. Did each PID read 0 volts then 2.5 volts (0 then 5 volts at the breakout box)?	Yes No	Passed check. GO to HU93 . REPLACE PCM. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33 .
HU93	CHECK VACUUM ACTUATOR SIGNAL VOLTAGE		
	NOTE: Vacuum actuator rod retaining clips MUST be replaced whenever removed. - Reconnect actuator harness connectors for bank 1 and bank 2. - Reconnect vacuum solenoid harness connector. - Key on, engine running. - Note IMRCM and IMRC2M PIDs. - Increase engine speed to at least 3500 rpm. - Note IMRCM and IMRC2M PIDs. - Key off. Did both PIDs read at least 3 volts at idle and less than .5 volt above 3500 rpm (breakout box with DVOM will display at least 6 volts at idle and less than 1 volt above 3500 rpm)?	Yes No	Passed check. Fault is intermittent. GO to Pinpoint Test Step Z1 with the IMRC, IMRCM and IMRC2M PIDs. REPLACE vacuum actuator that failed. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33 .
HU95	PERFORM IMRC WIGGLE TEST		
	- Connect scan tool. - Key on, engine off. - Access IMRCM PID. - While viewing the IMRCM PID, wiggle wiring from the IMRC monitor connector to the PCM connector. Did the PID voltage reading fluctuate?	Yes No	Intermittent fault area has been identified. ISOLATE and REPAIR as necessary. VERIFY repair by performing this test step again. REPLACE PCM. GO to HU33 .

Test Notes

Enter this pinpoint test only when directed here.

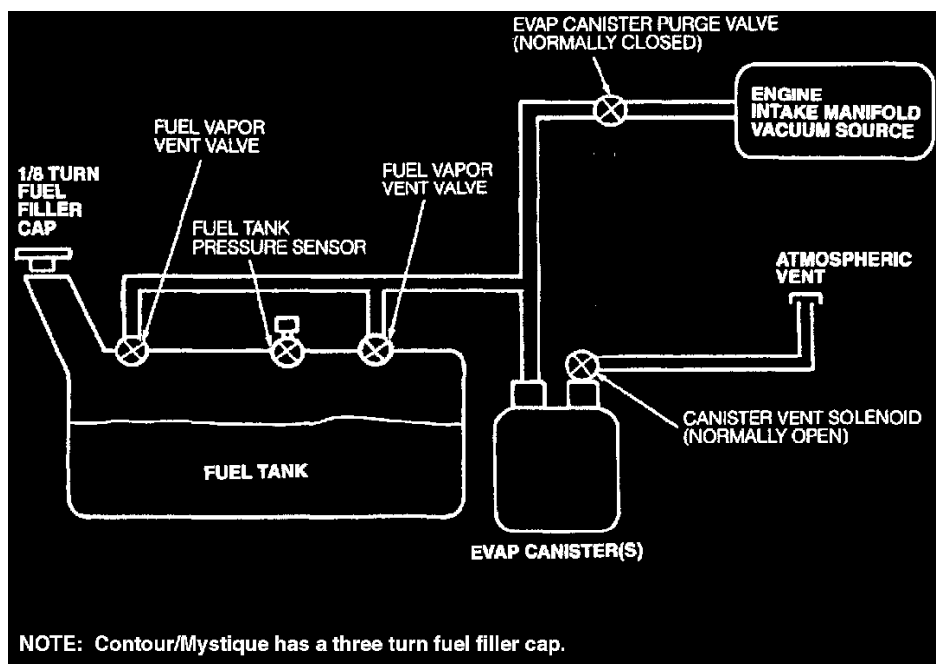
This pinpoint test is intended to diagnose the following:

- Canister Vent (CV) solenoid
- CV solenoid elbow
- CV solenoid - hose assembly
- Fuel filler cap
- Fuel tank pressure sensor
- Evaporative (EVAP) canister tube (fuel tank to canister)
- Fuel canister purge outlet tube (EVAP canister to EVAP canister purge valve)
- EVAP return tube (EVAP canister purge valve to intake manifold)
- EVAP canister purge valve
- Vacuum line (EVAP canister purge valve to intake manifold)
- Harness circuits: CV, FLI, FTP, EVAP Canister Purge Valve, SIG RTN, Vehicle Power (VPWR), Reference Voltage (VREF) and power ground (PWR GND)
- Powertrain control module

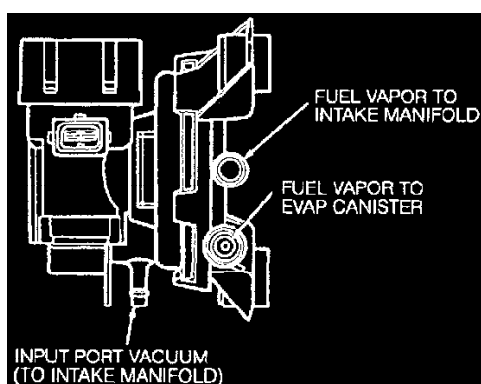
This pinpoint test is used as an assistance in diagnosing the following EVAP components:

- EVAP canister
- Fill limit valve assembly
- Fuel filler pipe flapper valve
- Fuel filler pipe check valve assembly
- Fuel tank filler pipe
- Fuel tank assembly (with fuel vapor vent valve)
- Fuel tank assembly (without fuel vapor vent valve)
- Fuel vapor control valve
- Fuel vapor vent valve
- Liquid/vapor fuel discriminator

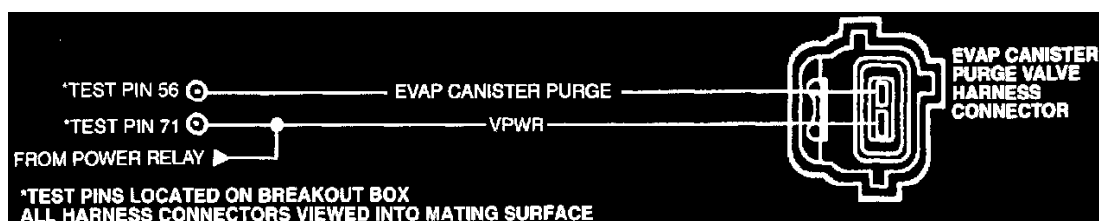
- On-board refueling vapor recovery (ORVR) T - connector assembly



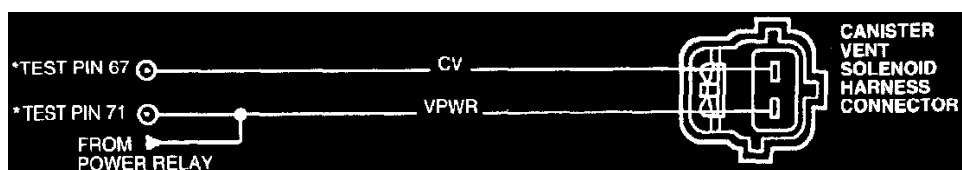
System Schematic



Vapor And Vacuum Ports



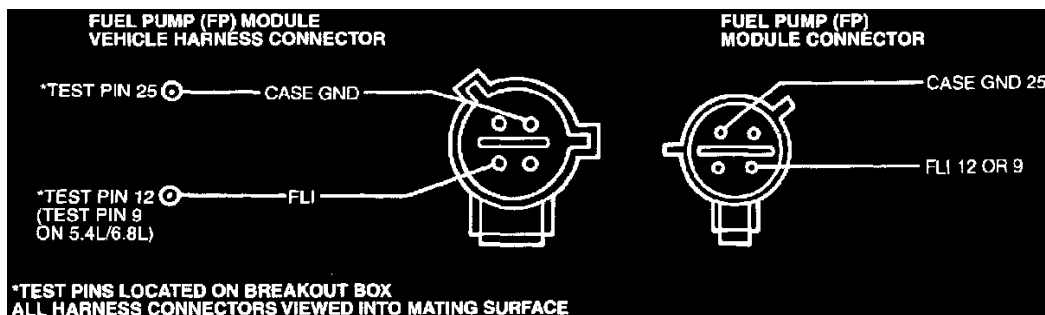
Canister Purge Valve Harness Connector



Canister Vent Solenoid Harness Connector



Fuel Tank Pressure Sensor Harness Connector



Fuel Pump Module Connectors

Test Step		Result	Action to Take
HX1	DTC P0442: VISUAL INSPECTION FOR SMALL EVAPORATIVE EMISSION SYSTEM LEAKS		
	Continuous Memory Diagnostic Trouble Code (DTC) P0442 indicates that a fuel vapor leak has been detected [as small as 0.10 cm (0.04 inch)] in the Evaporative Emission (EVAP) system. Possible causes: — After market parts and accessories nonconforming to the EVAP system specifications. — Damaged, cross threaded or loosely installed fuel filler cap. — Small holes or cuts in fuel vapor hoses / tubes (EVAP canister tube, EVAP canister outlet tube or EVAP return tube) in the EVAP system. — Loose fuel vapor hose / tube connections to EVAP system components. — EVAP system component [EVAP canister purge valve, fuel tank pressure (FTP) sensor, canister vent (CV) solenoid, fuel vapor control valve tube assembly or fuel vapor vent valve assembly] seals leaking. — CV solenoid partially open when commanded closed. — EVAP canister leaking. • Check for presence of fuel filler cap. (Perform Pinpoint Test Step HX2 before tightening a loose cap or checking for a cross threaded cap). • Verify that the CV solenoid is properly seated on the EVAP canister (if possible). • Visually inspect for cut or loose connections to fuel vapor hoses / tubes in following locations: — EVAP canister to EVAP canister purge valve. — EVAP canister to fuel vapor vent valve assembly. — fuel vapor control valve tube assembly to fuel tank (if applicable). • Check for fuel filler pipe damage. • Is a fault indicated?	Yes ▶ No ▶	CONNECT or REPLACE fuel vapor hoses / tubes as required. REPLACE damaged EVAP system components as necessary. REFER to the Emission Control system for the removal and installation of fuel vapor vent valve assembly, fuel vapor control valve tube assembly, EVAP canister purge valve and FTP sensor. GO to HX2. GO to HX2.

Test Step		Result	Action to Take
HX2	CHECK FOR SMALL EVAPORATIVE EMISSION SYSTEM LEAKS FROM THE EVAPORATIVE TEST PORT		
NOTE: When performing a check for leaks or blockages in the EVAP system, energize (close) the canister vent (CV) solenoid through the scan tool for a maximum of nine minutes per pinpoint test step. Then de-energize the CV solenoid prior to performing the subsequent pinpoint test step. This is done to assure proper closing of the solenoid. ● Disconnect and plug the EVAP return tube (EVAP canister purge valve to intake manifold) at the intake manifold vacuum source. ● Connect scan tool. ● Key on, engine off. ● Access VPWR PID. If the voltage is not 12 volts or greater, GO to HX61. ● Locate evaporative test port [marked EVAPORATIVE SERVICE PORT DO NOT USE UNREGULATED PRESSURE ABOVE 6.89 kPa (1 PSI)] near EVAP canister purge valve or EVAP canister. ● If vehicle is not equipped with the evaporative test port, GO to HX3. ● Install the Rotunda Evaporative Emission System Leak Tester 134-00056 or equivalent at the evaporative test port. ● Close CV solenoid by accessing Output Test Mode on the scan tool. ● Select ALL OFF mode and push START button. ● Regulate the nitrogen or argon gas pressure on the tester to 3.48 kPa (14 in-H₂O). ● Follow the instructions that come with the EVAP System Leak Tester and pressurize the EVAP system. ● Perform the EVAP system leak test. ● Does the pressure on the EVAP system stay above 1.49 kPa (6 in-H₂O) and pass the leak test?		Yes	CHECK for visable damage to fuel filler cap. REMOVE the EVAP system Leak Tester from the evaporative test port. GO to HX3 .
		No	REMOVE the EVAP system Leak Tester from the evaporative test port. GO to HX3 .

Test Step		Result	Action to Take
HX3	CHECK FOR SMALL LEAKS AT FUEL FILLER CAP AND EVAPORATIVE TEST PORT		
- Install the EVAP System Leak Tester at the fuel filler pipe. - Follow the instructions that come with the EVAP System Leak Tester kit to perform TESTING AT FILLER NECK. - Access the ultra-sonic detector from the test kit. - Key on, engine off. - Close CV solenoid by accessing Output Test Mode on the scan tool. - Pressurize the EVAP system to 3.48 kPa (14 in-H₂O). - Perform the EVAP system leak test. - Slowly pass the detector probe around the fuel filler cap and the evaporative test port. Is an audible change around the fuel filler cap (or evaporative test port) and an EVAP system leak test failure indicated?		Yes	▶ REMOVE EVAP System Leak Tester from fuel filler cap. REPLACE fuel filler cap or evaporative test. (The test port can be an integral part of the EVAP canister purge valve). REPEAT Pinpoint Test Step HX3. For EVAP system passing the leak test: PERFORM the Vehicle Preparation for Monitor Repair Verification Drive Cycle and RERUN Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. For EVAP system not passing the leak test: GO to HX4.
		No	▶ PERFORM the Vehicle Preparation for Monitor Repair Verification Drive Cycle and RERUN Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle.
HX4	SMALL LEAK CHECK FOR EVAP SYSTEM WITH LEAK TESTER SET AT FILL POSITION		
- Install EVAP System Leak Tester at evaporative test port. - Close canister vent (CV) solenoid by accessing Output Test Mode on the scan tool. - Select ALL OFF mode and push START button. - Regulate the nitrogen or argon gas pressure on the tester to 3.48 kPa (14 in-H₂O). - Follow the instructions that come with the EVAP System Leak Tester. - Turn selector on the Leak Tester to FILL POSITION. - Pressurize the EVAP system to 3.48 kPa (14 in-H₂O). Does the pressure on the EVAP system hold between 3.43 and 3.53 kPa (13.80 and 14.20 in-H₂O)?		Yes	▶ GO to HX5.
		No	▶ DISCONTINUE pressurizing the EVAP system. GO to HX6.

Test Step		Result	Action to Take
HX5	CHECK FOR SMALL LEAK IN THE ENTIRE EVAP SYSTEM WITH ULTRA-SONIC DETECTOR		
	NOTE: If the EVAP canister-CV solenoid and fuel tank assemblies are not accessible to perform the following step, GO to the Engine, Evaporative Emissions for removal procedures. ● Key on, engine off. ● NOTE: To assure that the CV solenoid remains closed do not energize the solenoid with the scan tool for more than nine minutes. If necessary, de-energize the CV solenoid with some time passing between checks. Close the CV solenoid closed by accessing Output Test Mode on the scan tool. ● Pressurize the EVAP system to 3.48 kPa (14 in-H₂O). ● Access the ultra-sonic detector from the EVAP System Leak Tester kit. ● Slowly pass the detector probe over the EVAP system at the following locations: — EVAP return tube to EVAP canister purge valve. — EVAP canister purge valve to EVAP canister-CV solenoid assembly. — EVAP canister-CV solenoid assembly to fuel tank. — Fuel filler cap and fuel filler pipe. ● Is a sudden audible change indicated?	Yes No	▶ RECONNECT loose or REPLACE damaged fuel vapor hoses / tubes (EVAP return tube, EVAP canister purge outlet tube and EVAP canister tube). REFER to the Emission Control system, for removal and installation of EVAP canister purge valve, EVAP canister-CV solenoid, FTP sensor, fuel vapor vent valve assembly, fuel vapor control valve tube assembly and fuel filler pipe. GO to HX6. ▶ DISCONTINUE pressurizing EVAP system. GO to HX6.
HX6	CHECK FOR SMALL EVAPORATIVE LEAK FROM EVAP RETURN TUBE TO THE EVAP CANISTER WITH ULTRA-SONIC DETECTOR		
	● Disconnect the EVAP canister tube (from the fuel tank) at the fuel vapor tee between the EVAP canister purge valve and EVAP canister (or at the F-fitting on the EVAP canister). ● Plug (cap) the fuel vapor tee (or the F-fitting on the canister). ● Close the CV solenoid by accessing Output Test Mode on the scan tool. ● Pressurize the EVAP system to 3.48 kPa (14 in-H₂O) at the evaporative test port. ● Access the ultra-sonic detector from the EVAP System Leak Tester kit. ● Slowly pass the detector probe from the EVAP return tube (intake manifold to EVAP canister purge valve), EVAP canister purge outlet tube (EVAP canister purge valve to EVAP canister-CV solenoid assembly) and canister vent hose assembly. ● Is a sudden audible change indicated?	Yes No	▶ RECONNECT loose or REPLACE damaged EVAP return tube, EVAP canister purge outlet tube or canister vent hose assembly. REFER to the Emission Control system for removal and installation of EVAP canister purge valve and EVAP canister-CV solenoid assembly REPEAT Pinpoint Test Step HX6 to VERIFY fuel vapor leak no longer exists. GO to HX7. ▶ REMOVE plug from fuel vapor tee (or F-fitting) on the EVAP canister. GO to HX7.

Test Step		Result	Action to Take
HX7	CHECK FOR SMALL EVAPORATIVE LEAK BETWEEN EVAP CANISTER TUBE AND THE FUEL TANK AT THE FUEL FILLER PIPE		
NOTE: If the fuel vapor vent valve and fuel vapor control valve tube assemblies are not accessible to perform the following step, GO to the Emission Control system for removal procedures. - Remove the EVAP System Leak Tester equipment from the evaporative test port. - Remove fuel filler cap. - Install EVAP System Leak Tester at the fuel filler pipe. - Plug the open end of the EVAP canister tube (from the fuel tank) at the fuel vapor tee (or at the F-fitting on the EVAP canister). - Key on, engine off. - Pressurize the EVAP system at 6.47 to 6.97 kPa (26 to 28 in-H₂O) with selector on the Leak Tester at FILL POSITION. - Access the ultra-sonic detector from the EVAP System Tester kit. - Slowly pass the detector probe from the EVAP canister tube to the fuel tank, checking the FTP sensor, fuel vapor vent valve(s), fuel vapor control valve and fuel filler pipe. - Is a sudden audible change indicated?		Yes	RECONNECT loose or REPLACE EVAP canister tube. REFER to Emission Control System for removal and installation of FTP sensor, fuel vapor vent valve assembly and fuel vapor control valve tube assembly. REPEAT Pinpoint Test Step HX7 to VERIFY a leak no longer exists. GO to HX8.
		No	GO to HX8 .

Test Step		Result	Action to Take
HX8	VERIFICATION LEAK CHECK ON THE EVAP SYSTEM AT THE FUEL FILLER PIPE		
- Reconnect the EVAP canister tube to the fuel vapor tee (or the F-fitting on the EVAP canister). - Key on, engine off. - Close the CV solenoid by accessing Output Test Mode on the scan tool. - Regulate the nitrogen or argon gas pressure on the tester to 3.48 kPa (14 in-H₂O). - Pressurize the EVAP system to 3.48 kPa (14 in-H₂O) at the fuel filler pipe. - Follow the instructions that come with the EVAP System Leak Tester. - Perform the EVAP system leak Test. - Does the EVAP system pass the leak test?		Yes	REMOVE the EVAP System Leak Tester from the fuel filler pipe. REINSTALL the fuel filler cap. TIGHTEN the cap only one eighth turn so that the cap initially clicks by sound or touch. RECONNECT the EVAP return tube to the intake manifold vacuum. PERFORM the Vehicle Preparation for Monitor Repair Verification Drive Cycle and RERUN Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle.
		No	Begin at Pinpoint Test Step HX4 and locate a small leak that still exists. Proceed to Pinpoint Test Step HX8 afterwards to VERIFY repair. REMOVE the EVAP System Leak Tester. REINSTALL the fuel filler cap. TIGHTEN the cap only one eighth turn so that the cap initially clicks by sound or touch. RECONNECT the EVAP return tube to the intake manifold. PERFORM the Vehicle Preparation for Monitor Repair Verification Drive Cycle and RERUN Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle.

Test Step		Result	Action to Take
HX10	DTC P0443: INSPECT EVAP CANISTER PURGE VALVE CIRCUIT FOR INTERMITTENT FAILURE		
	Continuous Memory Diagnostic Trouble Code (DTC) P0443 may indicate an intermittent EVAP canister purge valve circuit failure. Possible causes: — Intermittent EVAP canister purge valve or VPWR circuit open. — Damaged EVAP canister purge valve. ● Rerun KOEO, KOER Self-Tests and retrieve Continuous Memory DTCs. ● Is DTC P0443 present in Continuous Memory Self-Test only?	Yes No	▶ The fault that produced Continuous Memory DTC P0443 can be intermittent. GO to HX16. ▶ GO to HX11.
HX11	DTC P0443: CHECK VPWR VOLTAGE TO EVAP CANISTER PURGE VALVE		
	Diagnostic Trouble Code (DTC) P0443 indicates a failure in the EVAP canister purge valve circuit. Possible causes: — VPWR circuit open. — EVAP canister purge valve circuit open. — EVAP canister purge valve circuit shorted to PWR GND. — EVAP canister purge valve circuit shorted to VPWR. — Damaged EVAP canister purge valve. — Damaged PCM. ● Key off. ● Disconnect EVAP canister purge valve. ● Key on, engine off. ● Measure voltage between VPWR circuit at the EVAP canister purge valve harness connector and battery negative post. ● Key off. ● Was voltage greater than 10.5 volts?	Yes No	▶ GO to HX12. ▶ REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HX12	CHECK EVAP CANISTER PURGE VALVE RESISTANCE		
	NOTE: EVAP canister purge valve resistance reading must be taken with engine cooled down. ● Disconnect EVAP canister purge valve. ● Measure EVAP canister purge valve (EVAP canister purge valve) resistance. ● Is resistance between 30 and 38 ohms?	Yes No	▶ GO to HX13. ▶ REPLACE damaged EVAP canister purge valve. COMPLETE PCM Reset to clear DTCs. RERUN Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle.

Test Step		Result	Action to Take
HX13	CHECK EVAP CANISTER PURGE VALVE CIRCUIT FOR OPEN IN HARNESS		
	- Install breakout box, leave PCM disconnected. - Measure resistance of EVAP canister purge valve circuit between PCM test pin 56 and EVAP canister purge valve harness connector. - Is resistance less than 5.0 ohms?	Yes No	GO to HX14 . REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HX14	CHECK EVAP CANISTER PURGE VALVE CIRCUIT FOR SHORT TO PWR GND IN HARNESS		
	- Disconnect scan tool from DLC. - Measure resistance between PCM test pin 56 and PCM test pins 24 and 103. - Are both resistances greater than 10,000 ohms?	Yes No	GO to HX15 . REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HX15	CHECK EVAP CANISTER PURGE VALVE CIRCUIT FOR SHORT TO VPWR IN HARNESS		
	- Key on, engine off. - Measure voltage between PCM test pin 56 and PCM test pins 51 and 103. - Key off. - Was voltage greater than 10.5 volts?	Yes No	REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test.
HX16	CHECK EVAP CANISTER PURGE VALVE CIRCUIT FOR INTERMITTENT OPEN		
	- Key off. - Install breakout box, leave PCM disconnected. - Measure the resistance between PCM test pins 56 and 71 while performing the following: - Lightly tap on EVAP canister purge valve and observe a resistance change. - Wiggle EVAP canister purge valve connector and harness between valve and PCM, observe a resistance change. - Does the resistance reading change to below 30 ohms or above 38 ohms?	Yes No	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. UNABLE to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: resistance readings from this test and a list of Possible causes.

Test Step		Result	Action to Take
HX18	DTC P1450: CHECK FOR VISUAL CAUSES OF EXCESSIVE FUEL TANK VACUUM		
	Continuous Memory Diagnostic Trouble Code (DTC) P1450 indicates that Self-Test has detected the Evaporative Emission Control System has excessive fuel tank vacuum. Bleed up fuel tank vacuum. Possible causes: — EVAP canister purge outlet tube (EVAP canister purge valve to EVAP canister) blockages or kinks. — EVAP canister tube (fuel tank to EVAP canister) blockages or kinks. — Fuel vapor elbow on EVAP canister contaminated. — Restricted EVAP canister. — Canister vent (CV) solenoid stuck closed (partially or fully). — Plugged or contaminated CV solenoid filter. — EVAP canister purge valve stuck open. — Fuel filler cap stuck closed (no vacuum relief). — VREF circuit open in fuel tank pressure (FTP) sensor. — Damaged FTP sensor. NOTE: If the EVAP canister-CV solenoid and fuel tank assemblies are not accessible to perform the following step, GO to Emission control system for removal procedures. • Check for kinks or bends in the fuel vapor hoses/tubes (EVAP canister purge outlet tube and EVAP canister tube). • Visually inspect EVAP canister inlet port, CV solenoid filter and canister vent hose assembly for contamination or debris. • Check CV solenoid filter for blockage or contamination. • Is a fault indicated?	Yes No	▶ REMOVE any contamination or debris around fuel vapor hoses/tubes and EVAP canister-CV solenoid assembly. REMOVE kinks or bends in EVAP canister purge outlet tube, EVAP canister tube and canister vent hose assembly. GO to HX19. ▶ GO to HX19.

Test Step		Result	Action to Take
HX19	CHECK FOR BLOCKAGE BETWEEN THE EVAPORATIVE TEST PORT AND EVAP CANISTER-CV SOLENOID ASSEMBLY		
	• Disconnect and plug the EVAP return tube (EVAP canister purge valve to intake manifold) at the intake manifold vacuum source. • Plug (tape) the CV solenoid (or filter) or plug the canister vent hose assembly. • Locate evaporative test port [marked EVAPORATIVE SERVICE PORT DO NOT USE UNREGULATED PRESSURE ABOVE 6.89 kPa (1 PSI)] near EVAP canister purge valve or EVAP canister. • Install Rotunda Evaporative Emission System Leak Tester 134-00056 or equivalent at the test port. • Regulate the nitrogen or argon gas pressure on the tester to 3.48 kPa (14 in-H₂O). • Pressurize the EVAP system to 3.48 kPa (14 in-H₂O). • Remove the plug (tape) from the CV solenoid or the plug from the canister vent hose assembly. • Does the EVAP system pressure drop rapidly (quickly)?	Yes No	▶ REMOVE EVAP System Leak Tester from evaporative test port. REINSTALL evaporative test port cap. GO to HX20. ▶ GO to Evaporative Emissions for diagnostic symptom condition listed as Hiss When Opening Fuel Cap. REPEAT Pinpoint Test Step HX19 to VERIFY blockage no longer exists. GO to HX22.

Test Step		Result	Action to Take
HX20	PRESSURE CHECK THE FUEL FILLER CAP		
NOTE: When performing a check for leaks or blockages in the EVAP system, energize (close) the canister vent (CV) solenoid through the scan tool for a maximum of nine minutes per pinpoint test step. Then de-energize the CV solenoid prior to performing the subsequent pinpoint test step. This is done to assure proper closing of the solenoid. ● Install the EVAP System Leak Tester at the fuel filler pipe. ● Follow the instructions that come with the EVAP System Leak Tester kit to perform TESTING AT FILLER NECK. ● Key on, engine off. ● Close CV solenoid by accessing Output Test Mode on the scan tool. ● Pressurize the EVAP system to 3.48 kPa (14 in-H₂O) at the evaporative test port. ● NOTE: The Rotunda Engine EAR Amplifier (107-R2100) is an optional tool to be used if noise level hinders the effectiveness of the ultra-sonic detector. Access the ultra-sonic detector from the EVAP System Leak Tester kit. ● Slowly pass the detector probe around the fuel filler cap and the evaporative test port. ● Is an audible change around the fuel filler cap indicated?		Yes	▶ REPLACE fuel filler cap. REPEAT HX20 to VERIFY repair. GO to HX21 .
		No	▶ GO to HX21 .
HX21	CHECK FOR BLOCKAGE BETWEEN THE EVAPORATIVE TEST PORT TANK WITH FUEL FILLER CAP REMOVED		
● Key on, engine off. ● Close CV solenoid by accessing Output Test Mode on the scan tool. ● Pressurize the EVAP system to 3.48 kPa (14 in-H₂O). ● REMOVE fuel filler cap. ● Does the pressure drop rapidly (quickly)?		Yes	▶ REMOVE the EVAP System Leak Tester from the fuel filler pipe. GO to HX22 .
		No	▶ GO to Evaporative emission controls and test for symptom listed as "Hiss when opening fuel cap." REPEAT Pinpoint Test Step HX21 to VERIFY a blockage no longer exists. Then, GO to HX22 .

Test Step		Result	Action to Take
HX22	CHECK FUEL TANK PRESSURE SENSOR PIDS WITH FUEL FILLER CAP REMOVED		
	NOTE: FTP sensor input for KOEO, KOER with no pressure or no vacuum on the fuel tank (fuel filler cap on or off) is 2.40 to 2.80 volts. ● Remove fuel filler cap. ● Key on, engine off. ● Access the FTP [FTP V] PIDs on the scan tool. ● Record the reading. ● Is FTP [FTP V] PID reading between -0.37 and 0.37 kPa (-1.50 and 1.50 in-H₂O) [2.40 and 2.80 volts] with the fuel filler cap off?	Yes No	INSTALL the fuel filler cap only one eighth turn so that the cap initially clicks <u>by sound</u> or touch. GO to HX23. GO to HX24.
HX23	CHECK FOR STUCK OPEN EVAP CANISTER PURGE VALVE CONDITION AT IDLE		
	NOTE: When the EVAPPDC PID reads zero the FTP [FTP V] PID must read + / -0.37 kPa (+ / -1.50 in-H₂O) [2.40 to 2.80 volts]. ● Open the CV solenoid to atmosphere by removing the plug from the canister vent hose assembly or the tape from the the CV solenoid filter cap. ● Remove plug and reconnect the EVAP return tube (EVAP canister purge valve to intake manifold) at the intake manifold vacuum source. ● Verify fuel filler cap is installed. ● Key on, engine off. ● Access the FTP, FTP V and EVAPPDC PIDs on the scan tool. ● Start engine. ● When EVAPPDC PID is zero, is the FTP [FTP V] PID reading below -0.37 kPa (-1.50 in-H₂O) 2.40 volts] ?	Yes No	The EVAP canister purge valve is stuck open. REPLACE EVAP canister purge valve. INSTALL the EVAP System Leak Tester or equivalent to the evaporative test port. PERFORM the EVAP system leak test to VERIFY a leak did not occur on the EVAP canister purge valve installation. PERFORM the Vehicle Preparation for Monitor Repair Verification Drive Cycle and RERUN Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. A blockage is still present in the EVAP system between the evaporative test port and the fuel tank (or the EVAP canister-CV solenoid assembly). GO to HX19 to find additional blockages.

Test Step		Result	Action to Take
HX24	CHECK VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS AT FTP SENSOR		
	● Disconnect FTP sensor. ● Key on, engine off. ● Measure voltage between VREF and SIG RTN circuits at the FTP sensor harness connector. ● Key off. ● Was voltage between 4.0 and 6.0 volts?	Yes ► No ►	REPLACE damaged FTP sensor. After replacing FTP sensor, PERFORM an EVAP System leak test at the evaporative test port to repair. Then, GO to HX22 to VERIFY the repair. GO to HX25.
HX25	CHECK FOR OPEN VREF CIRCUIT BETWEEN PCM AND FTP SENSOR		
	● Install breakout box, leave PCM disconnected. ● Measure resistance of VREF circuit between PCM test pin 90 and FTP sensor harness connector. ● Is resistance less than 5.0 ohms?	Yes ► No ►	REPLACE PCM. RESTORE vehicle. Then, GO to HX22 to VERIFY the repair. REPAIR open circuit. RESTORE vehicle. Then, GO to HX22 to VERIFY the repair.
HX26	DTC P0452: CHECK FOR FTP SENSOR CONNECTOR CONTAMINATION		
	Diagnostic Trouble Code (DTC) P0452 indicates that Self-Test has detected an FTP circuit input below minimum. Possible causes: — Fuel tank pressure (FTP) sensor completely submerged in liquid fuel. — Inside contamination of the electrical connector on the FTP sensor. — FTP short to SIG RTN or PWR GND. — Damaged FTP sensor. — Damaged PCM. ● Key off. ● Visually check for liquid fuel contamination of the FTP sensor electrical connector. ● Check for completely submerged FTP sensor in liquid fuel (can affect correct FTP voltage reading). ● Does FTP sensor and its electrical connector show signs of fuel contamination?	Yes ► No ►	REPAIR FTP sensor electrical connector as necessary. ADJUST fuel tank overfill. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. GO to HX27.

Test Step		Result	Action to Take
HX27	CHECK FOR LOW FTP SENSOR VOLTAGE		
	- Key off. - Connect scan tool. - Key on, engine off. - NOTE: FTP sensor input with no pressure / vacuum on the fuel tank (filler cap open or not open to atmosphere) is between 2.37 and 2.97 volts. - Access FTP V PID. - Is FTP V PID voltage less than 0.22 volt?	Yes No	GO to HX28 . The fault that produced the DTC P0452 is intermittent. GO to HX31 .
HX28	CHECK OPPOSITE INDUCED HIGH FTP SIGNAL		
	- Key off. - Disconnect FTP sensor. - Connect a jumper wire between VREF circuit and FTP circuits at the FTP sensor harness connector. - Key on, engine off. - If a scan tool communication concern exists, remove jumper immediately and go directly to HX29. - Access FTP V PID. - Is FTP V PID value between 4.0 and 6.0 volts?	Yes No	REPLACE damaged FTP sensor. REFER to Emission Control System. RESTORE vehicle. PERFORM the Vehicle Preparation for Monitor Repair Verification Drive Cycle and RERUN Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. REMOVE jumper. GO to HX29 .
HX29	CHECK VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS AT FTP SENSOR		
	- Key on, engine off. - Measure voltage between VREF and SIG RTN circuits at the FTP sensor harness connector. - Key off. - Was VREF voltage between 4.0 and 6.0 volts?	Yes No	GO to HX30 . VREF voltage is out of range. GO to Pinpoint Test Step C1 .
HX30	CHECK FTP CIRCUIT FOR SHORT TO SIG RTN OR PWR GND IN HARNESS		
	- Install breakout box, leave PCM disconnected. - Disconnect scan tool from DLC. - Measure resistance between PCM test pins 62 and 91. - Measure resistance between PCM test pin 62 and PCM test pins 51 and 103. - Are both resistances greater than 10,000 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.

Test Step		Result	Action to Take
HX31	CHECK FTP SENSOR CIRCUIT FOR INTERMITTENT SHORT TO GROUND		
	● Key on, engine off. ● Access FTP V PID. ● Observe FTP V PID while performing the following: — Lightly tap on sides of FTP sensor. Do not tap on top of sensor cover because that can result in an incorrect reading or damage to the sensor. This action requires two technicians to lower fuel tank to access the sensor location. — Wiggle FTP sensor connector and harness between sensor and PCM. — A fault is indicated by a sudden change in the FTP V PID voltage. ● Key off. ● Was a fault indicated?	Yes No	ISOLATE fault and REPAIR as necessary. If FTP sensor is removed from fuel tank or replaced, PERFORM the Vehicle Preparation for Monitor Repair Verification Drive Cycle and RERUN Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. UNABLE to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: FTP V PID and a list of Possible causes.
HX33	DTC P0453: CHECK FOR HIGH FTP SENSOR VOLTAGE		
	Diagnostic Trouble Code (DTC) P0453 indicates that Self-Test has detected a FTP circuit input above the maximum. Possible causes: — FTP open. — FTP short to VREF or VPWR. — VREF shorted to VPWR. — SIG RTN open. — Damaged FTP sensor. — Damaged PCM. ● Key off. ● Connect scan tool. ● Key on, engine off. ● NOTE: FTP sensor input with no pressure/vacuum on the fuel tank (fuel filler cap open or not open to atmosphere) is 2.37 to 2.97 volts. Access FTP V PID. ● Is FTP V PID voltage greater than 4.50 volts?	Yes No	GO to HX34. The fault that produced DTC P0453 is intermittent. GO to HX42.
HX34	CHECK FTP CIRCUIT FOR SHORT TO POWER		
	● Key off. ● Disconnect FTP sensor. ● Key on, engine off. ● Measure voltage between FTP circuit at the FTP sensor harness connector and battery negative post. ● Key off. ● Was the voltage greater than 10.5 volts?	Yes No	The FTP is indicating a short to VPWR. GO to HX35. GO to HX36.

Test Step		Result	Action to Take
HX35	CHECK FTP CIRCUIT FOR SHORT TO VPWR IN HARNESS		
	- Install breakout box, leave PCM disconnected. - Key on, engine off. - Measure the voltage between PCM test pin 62 and PCM test pins 51 and 103. Is voltage greater than 10.5 volts?	Yes No	REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test.
HX36	CHECK OPPOSITE INDUCED LOW FTP SIGNAL		
	- Connect a jumper wire between SIG RTN and FTP circuits at the FTP sensor harness connector. - Key on, engine off. - If a scan tool communication concern exists, turn the key off, remove jumper immediately and go directly to HX41. - Access FTP V PID. - Key off. Was FTP V PID voltage less than 0.10 volt?	Yes No	REMOVE jumper. GO to HX37. Unable to induce opposite signal. GO to HX39.
HX37	CHECK FOR IN RANGE VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS AT FTP SENSOR		
	- Key on, engine off. - Measure the voltage between the VREF circuit and the SIG RTN circuit at the FTP sensor vehicle harness connector. - Key off. Was VREF voltage between 4.0 and 6.0 volts?	Yes No	GO to HX38. VREF voltage is out of range. GO to Pinpoint Test Step C1.
HX38	CHECK FTP CIRCUIT FOR SHORT TO VREF IN SENSOR OR HARNESS		
	- Install breakout box, leave PCM disconnected. - Measure resistance between PCM test pins 62 and 90. Is the resistance greater than 10,000 ohms?	Yes No	REPLACE damaged FTP sensor. REFER to Emission Control System. RESTORE vehicle. PERFORM the Vehicle Preparation for Monitor Repair Verification Drive Cycle and RERUN Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.

Test Step		Result	Action to Take
HX39	CHECK FTP CIRCUIT FOR OPEN IN HARNESS		
	- Install breakout box, leave PCM disconnected. - Measure resistance of FTP circuit between PCM test pin 62 and FTP sensor harness connector. - Is resistance less than 5.0 ohms?	Yes No	GO to HX40 . REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HX40	CHECK FOR OPEN SIG RTN CIRCUIT BETWEEN PCM AND FTP SENSOR		
	- Measure resistance of SIG RTN circuit between PCM test pin 91 and FTP sensor harness connector. - Is resistance less than 5.0 ohms?	Yes No	GO to HX41 . REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HX41	CHECK FTP CIRCUIT FOR SHORT TO VREF IN PCM		
	- Install breakout box, leave PCM disconnected. - Measure resistance between PCM test pins 62 and 90. - Is the resistance greater than 10,000?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HX42	CHECK FTP SENSOR CIRCUIT FOR INTERMITTENT OPEN OR SHORT TO POWER		
	- Key on, engine off. - Access FTP V PID. - Observe FTP V PID while performing the following: - Lightly tap on sides of FTP sensor. Do not tap on top of sensor cover to prevent an incorrect reading or damage to the sensor. This action requires two technicians to lower the fuel tank to access the sensor location. - Wiggle FTP sensor connector and harness between sensor and PCM. - A fault is indicated by a sudden change in the FTP V PID voltage. - Key off. - Was a fault indicated?	Yes No	ISOLATE fault and REPAIR as necessary. If FTP sensor is removed from fuel tank or replaced. PERFORM the Vehicle Preparation for Monitor Repair Verification Drive Cycle and RERUN Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. UNABLE to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: FTP V PID and a list of Possible causes.

Test Step		Result	Action to Take
HX44	DTC P0455: VISUAL INSPECTION FOR SUBSTANTIAL EVAPORATIVE EMISSION SYSTEM LEAKS		
Continuous Memory Diagnostic Trouble Code (DTC) P0455 indicates that the target vacuum on the Evaporative Emission (EVAP) control system detected a large leak or not purge flow. Possible causes: — After market parts and accessories nonconforming to the EVAP system specifications. — Damaged, missing or improperly installed fuel filler cap. — Blockage in fuel vapor hoses / tubes (EVAP canister tube, EVAP canister purge outlet tube or EVAP return tube) in EVAP system. — Disconnected or cracked fuel vapor hoses / tubes in EVAP system. — EVAP canister purge valve stuck closed. — Canister vent (CV) solenoid stuck open. — Fuel tank pressure (FTP) sensor malfunction. — EVAP canister leaking. — Fuel vapor control valve tube assembly blocked. — Fuel vapor vent valve assembly blocked. ● Check for missing fuel filler cap. If the cap is loose DO NOT DISTURB EVAP system. ● Verify that both the input port vacuum hose and EVAP return tube are attached to the EVAP canister purge valve. ● NOTE: If the EVAP canister-CV solenoid assembly is not accessible to perform the following step, Go to Emission Control System for removal and installation procedures. Verify that the CV solenoid is properly seated on the EVAP canister (if possible). ● Visually inspect for disconnected or cracked fuel vapor hoses / tubes between the intake manifold, the EVAP canister purge valve, the EVAP canister, the fuel vapor vent valve assembly and if applicable the fuel vapor control valve tube assembly. ● Check for damage to the fuel filler pipe and the fuel tank. ● Is a fault indicated?		Yes	▶ CONNECT or REPLACE fuel vapor hoses / tubes as required. REPLACE damaged EVAP system components as necessary. GO to HX45 .
		No	▶ GO to HX45 .

	Test Step	Result	Action to Take
HX45	CHECK FOR EVAPORATIVE EMISSION SYSTEM LEAKS		
	NOTE: When performing a check for leaks or blockages in the EVAP system, energize (close) the canister vent (CV) solenoid through the scan tool for a maximum of nine minutes per pinpoint test step. Then de-energize the CV solenoid prior to performing the subsequent pinpoint test step. This is done to assure proper closing of the solenoid. ● Disconnect and plug the EVAP return tube (EVAP canister purge valve to intake manifold) at the intake manifold vacuum source. ● Connect scan tool. ● Key on, engine off. ● Access VPWR PID. If the voltage is not 12 volts or greater, GO to HX61. ● Locate evaporative test port [marked EVAPORATIVE SERVICE PORT DO NOT USE UNREGULATED PRESSURE ABOVE 6.89 kPa (1 PSI)] near EVAP canister purge valve or EVAP canister. ● If vehicle is not equipped with the evaporative test port, GO to HX50. ● Install the Rotunda Evaporative Emission System Leak Tester 134-00056 or equivalent at the evaporative test port. ● Close CV solenoid by accessing Output Test Mode on the scan tool. ● Select ALL OFF mode and push START button. ● Regulate the nitrogen or argon gas pressure on the tester to 3.48 kPa (14 in-H₂O). ● Follow the instructions that come with the EVAP System Leak Tester and pressurize the EVAP system. ● Perform the EVAP system leak test. ● Does the pressure on the EVAP system stay above 1.49 kPa (6 in-H₂O) and pass the leak test?	Yes No	GO to HX46. REMOVE the EVAP System Leak Tester from the evaporative test port and REINSTALL the test port cap. GO to HX50.
HX46	BLOCKAGE CHECK FOR EVAP CANISTER-CV SOLENOID ASSEMBLY		
	● Key on, engine off. ● Close CV solenoid by accessing Output Test Mode on the scan tool. ● Pressurize the EVAP system to 3.48 kPa (14 in-H₂O). ● De-energize the CV solenoid with the scan tool. ● Does the pressure on the EVAP system drop rapidly (quickly) to zero?	Yes No	GO to HX48. GO to HX47.

Test Step		Result	Action to Take
HX47	CHECK FOR BLOCKAGE BETWEEN EVAP CANISTER PURGE VALVE AND EVAP CANISTER		
	NOTE: If the EVAP canister-CV solenoid assembly is not accessible to perform the following step, GO to Emission Control System for removal procedures on the EVAP canister and mounting bracket. - Disconnect and plug the EVAP canister purge outlet tube (between EVAP canister purge valve and EVAP canister) at the EVAP canister. - Re-pressurize the EVAP system to 3.48 kPa (14 in-H₂O). - Remove the plug from the EVAP canister purge outlet tube. - Does the pressure on the EVAP system drop rapidly (quickly) to zero?	Yes No	▶ GO to Emission Control System for diagnostic symptom condition listed as Pressure Released When Opening Fuel Cap. Then, REPEAT Pinpoint Test Step HX46 to VERIFY a blockage no longer exists. Afterwards, GO to HX48. ▶ REMOVE blockage or contamination from the EVAP canister purge outlet tube. If necessary, REPLACE the tube. GO to HX46.
HX48	CHECK FOR BLOCKAGE BETWEEN THE EVAP TEST PORT AND THE FUEL TANK		
	- Key on, engine off. - Close canister vent (CV) solenoid by accessing Output Test Mode on the scan tool. - Re-pressurize the EVAP system to 3.48 kPa (14 in-H₂O) at evaporative test port. - Remove the fuel filler cap. - Does the pressure on the EVAP system drop to zero?	Yes No	▶ LEAVE fuel filler cap off. GO to HX56. ▶ REMOVE EVAP System Leak Tester equipment from evaporative test port. REINSTALL test port cap. GO to HX49.
HX49	CHECK FOR BLOCKAGE BETWEEN FUEL TANK AND EVAP CANISTER TUBE		
	NOTE: If the EVAP canister-CV solenoid assembly is not accessible to perform the following step, GO to Emission Control System for removal procedures on the EVAP canister and mounting bracket. - Key on, engine off. - Install the EVAP System Leak Tester at the fuel filler pipe. - Remove and plug the EVAP canister tube (from the fuel tank) at the tee fitting between the EVAP canister purge valve and EVAP canister (or the F-fitting on the EVAP canister). - Re-pressurize the EVAP system to 3.48 kPa (14 in-H₂O) at fuel filler pipe. - Remove the plug from the EVAP canister tube. - Does the pressure on the EVAP system drop?	Yes No	▶ REMOVE fuel filler cap. REINSTALL EVAP canister tube. GO to HX56. ▶ GO to Emission Control System for diagnostic symptom condition listed as Pressure Released When Opening Fuel Cap. Then, REPEAT Pinpoint Test Step HX48 to VERIFY a blockage no longer exists. LEAVE fuel filler cap off. GO to HX56.

Test Step		Result	Action to Take
HX50	CHECK FOR LARGE LEAKS AT FUEL FILLER CAP		
- Install the EVAP System Leak Tester at the fuel filler pipe. - Follow the instructions that come with the EVAP System Leak Tester kit to perform TESTING AT FILLER NECK. - Access the ultra-sonic detector from the test kit. - Key on, engine off. - Close canister vent (CV) solenoid by accessing Output Test Mode on the scan tool. - Pressurize the EVAP system to 3.48 kPa (14 in-H₂O). - Perform the EVAP system leak test. - Slowly pass the detector probe around the fuel filler cap. - Is an audible change around the fuel filler cap indicated?		Yes	REPLACE fuel filler cap REPEAT Pinpoint Test Step HX50 to VERIFY repair. For EVAP system passing the leak test: TIGHTEN the cap only one eighth turn so that the cap initially clicks by sound or touch. PERFORM the Vehicle Preparation for Monitor Repair Verification Drive Cycle and RERUN Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. For EVAP system not passing the leak test: TIGHTEN the cap only one eighth turn so that the cap initially clicks by sound or touch. GO to HX51.
		No	REMOVE EVAP System Leak Tester from the fuel filler pipe. REINSTALL fuel filler cap. TIGHTEN the cap only one eighth turn so that the cap initially clicks by sound or touch. GO to HX51.

Test Step		Result	Action to Take
HX51	CHECK FOR FUEL VAPOR LEAK IN THE EVAP CANISTER-CV SOLENOID ASSEMBLY		
NOTE: If the EVAP canister-CV solenoid assembly is not accessible to perform the following step, GO to Emission Control System for removal procedures on the EVAP canister and mounting bracket. - Plug the canister vent hose assembly or close (tape CV filter shut) the CV solenoid to atmosphere. - Pressurize the EVAP system to 3.48 kPa (14 in-H₂O) at evaporative service port. - Slowly pass the detector probe around the EVAP canister-CV solenoid assembly. - Is an audible change around the EVAP canister-CV solenoid assembly indicated?		Yes	GO to Emission Control System for general produres to leak test the EVAP canister-CV solenoid assembly. REPLACE damaged component. PERFORM leak test on EVAP canister-CV solenoid assembly prior to installation in vehicle. Then, REPEAT Pinpoint Test Step HX45 to VERIFY fuel vapor leak no longer exists, disregarding the Action To Take direction in that step. For EVAP system passing leak the test: PERFORM the Vehicle Preparation for Monitor Repair Verification Drive Cycle and RERUN Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. For EVAP system not passing the leak test: GO to HX52.
		No	GO to HX52 .

Test Step		Result	Action to Take
HX52	CHECK FOR EVAP SYSTEM LEAK FROM EVAP TEST PORT TO EVAP CANISTER ASSEMBLY		
● Disconnect the EVAP canister tube (from the fuel tank) at the fuel vapor tee between the EVAP canister purge valve and EVAP canister (or at the F-fitting on the EVAP canister). ● Plug (cap) the fuel vapor tee (or F-fitting on the EVAP canister). ● Close the CV solenoid closed by accessing Output Test Mode on the scan tool. ● Re-pressurize the EVAP system to 3.48 kPa (14 in-H₂O) at the evaporative service port. ● NOTE: The Rotunda Engine EAR Amplifier (107-R2100) is an optional tool to be used if noise level hinders the effectiveness of the ultra-sonic detector. Access the ultra-sonic detector from the EVAP System Leak Tester kit. ● Slowly pass the detector probe from the EVAP return tube (intake manifold to EVAP canister purge valve) to the EVAP canister assembly. ● Is a sudden audible change indicated?		Yes	▶ REPLACE fuel vapor hoses/tubes or damaged components as necessary. REMOVE plug tee or F-fitting. RECONNECT the EVAP canister tube. GO to HX53 .
		No	▶ GO to HX54 .
HX53	VERIFICATION OF REPAIR BETWEEN EVAP TEST PORT TO EVAP CANISTER ASSEMBLY		
● Perform the leak test outlined in Pinpoint Test Step HX45, disregarding the Action To Take direction in that step. ● Does the pressure on the EVAP system stay above 1.49 kPa (6 in-H₂O) and pass the leak test?		Yes	▶ REMOVE EVAP System Leak Tester equipment from evaporative test port. LEAVE fuel filler cap off. GO to HX56 .
		No	▶ REMOVE EVAP System Leak Tester equipment from evaporative test port. GO to HX54 .

Test Step		Result	Action to Take
HX54	CHECK FOR EVAP SYSTEM LEAK FROM FUEL TANK TO EVAP CANISTER TUBE		
- Disconnect the EVAP canister tube (from the fuel tank at the fuel vapor tee (or at the F-fitting on the EVAP canister) between the EVAP canister purge valve and EVAP canister. - Plug the open end of the EVAP canister tube. - Install the EVAP System Leak Tester at the fuel filler pipe. - Pressurize the EVAP system from 6.47 to 6.97 kPa (26 to 28 in-H₂O). - NOTE: The Rotunda Engine EAR Amplifier (107-R2100) is an optional tool to be used if noise level hinders the effectiveness of the ultra-sonic detector. Access the ultra-sonic detector from the EVAP System Leak Tester kit. - Slowly pass the detector probe over the fuel filler pipe, fuel tank, fuel vapor vent valve assembly, fuel vapor control valve tube assembly, FTP sensor and the EVAP canister tube (fuel vapor tube from fuel vapor control valve to EVAP canister). - Is a sudden audible change indicated?		Yes	LEAVE EVAP System Leak Tester equipment connected at the fuel filler pipe. REPLACE damaged fuel vapor hoses/tubes. After repair, GO to HX55 .
		No	REMOVE plug from EVAP canister tube. RECONNECT the EVAP canister tube and fuel filler cap. TRANSFER EVAP System Leak Tester equipment from the fuel filler pipe to the evaporative test port. RERUN the EVAP system leak test outlined in Pinpoint Test Step HX45 to VERIFY a leak no longer exists. REMOVE fuel filler cap. GO to HX56 .
HX55	VERIFICATION OF REPAIR BETWEEN FUEL TANK AND EVAP CANISTER		
- Pressurize the EVAP system to 3.48 kPa (14 in-H₂O) and perform leak test. - Does the pressure on the EVAP system stay above 1.49 kPa (6 in-H₂O) and pass the leak test?		Yes	REMOVE plug from EVAP canister tube. RECONNECT the EVAP canister tube and fuel filler cap. TRANSFER EVAP System Leak Tester equipment from the fuel filler pipe to the evaporative test port. RERUN the EVAP system leak test outlined in Pinpoint Test Step HX45 to VERIFY a leak no longer exists. REMOVE fuel filler cap. GO to HX56 .
		No	REPEAT Pinpoint Test Step HX54 to isolate the additional source of the fuel vapor leak.

Test Step		Result	Action to Take
HX56	CHECK FOR FUEL TANK PRESSURE SENSOR FUNCTION WITH FUEL FILLER CAP REMOVED		
	● Connect scan tool. ● Key on, engine off. ● Access the VPWR PID. ● If VPWR PID is not greater than 10.5 volts less, refer to Pinpoint Test Step HX61 to charge the system. Then, return to this pinpoint test step. ● Access the FTP V PID. ● Key off. ● Was the FTP V PID voltage between 2.40 to 2.80 volts with the fuel filler cap off?	Yes No	GO to HX57 . REPLACE damaged FTP sensor. REPEAT this Pinpoint Test Step to VERIFY the repair. GO to HX57 .
HX57	FUEL TANK PRESSURE SENSOR FUNCTIONAL CHECK WITH PRESSURE APPLIED TO EVAP SYSTEM		
	● Install the EVAP System Leak Tester equipment at the fuel filler pipe. ● Plug the canister vent hose assembly or close (tape CV filter shut) the CV solenoid to atmosphere. ● Key on, engine off ● Access the FTP (FTP V) PID on the scan tool. ● Pressurize the EVAP system to 3.48 kPa (14 in-H₂O). ● Key off. ● Was the FTP (FTP V) PID reading [3.11 to 3.86 kPa (12.5 to 15.5 in-H₂O)] (4.22 to 4.90 volts) with pressure applied to EVAP system?	Yes No	REMOVE the EVAP System Leak Tester equipment from fuel filler pipe. RECONNECT fuel filler cap. REMOVE the plug from the canister vent hose assembly or tape from the CV solenoid. GO to HX58 . DISCONTINUE pressurizing the EVAP system. REPLACE damaged FTP sensor. REPEAT Pinpoint Test Step HX56 to VERIFY a 2.40 to 2.80 voltage reading with fuel filler cap removed.
HX58	CHECK FOR EVAP CANISTER PURGE VALVE OPERATION WITH ENGINE AT IDLE		
	● Remove plug and connect EVAP return tube at the intake manifold vacuum source. ● Key on, engine off. ● Access EVAPPDC PID and FTP V PID on the scan tool. ● Start engine. Observe the EVAPPDC PID and FTP V PID. ● Idle engine until EVAPPDC PID reaches a minimum of 40% duty cycle. ● Does the FTP V PID read less than 2.60 volts?	Yes No	PERFORM the Vehicle Preparation for Monitor Repair Verification Drive Cycle and RERUN Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. GO to HX59 .

Test Step		Result	Action to Take
HX59	CHECK FOR INTAKE MANIFOLD VACUUM TO EVAP CANISTER PURGE VALVE		
NOTE: At high elevations (altitude) the intake manifold vacuum source readings at both the input port vacuum hose and EVAP return tube must be at least 33.77 kPa (10 in-Hg). ● Disconnect the input port vacuum hose and EVAP return tube at the EVAP canister purge valve. ● Install a vacuum gauge in kPa (in-Hg) to the open end of the input port vacuum hose and plug the open end of the EVAP return tube. ● Start engine. ● Observe vacuum gauge for manifold vacuum and record reading. ● Key on, engine off. ● Install the vacuum gauge to the EVAP return tube and plug the open end of the input port vacuum hose. ● Again, start engine. ● Again, observe the vacuum gauge for manifold vacuum. ● Are both vacuum gauge readings between 47.28 and 67.54 kPa (14 and 20 in-Hg)?		Yes	▶ REMOVE vacuum gauge. REPLACE damaged EVAP canister purge valve. RECONNECT input port vacuum hose and EVAP return tube to the EVAP canister purge valve. PERFORM the Vehicle Preparation for Monitor Repair Verification Drive Cycle and RERUN Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle.
		No	▶ CHECK for blockage in the input port vacuum hose or EVAP return tube. CHECK intake manifold tree or port for debris or obstructions. REPLACE or REPAIR as necessary. If fuel vapor hoses /tube are replaced, RERUN EVAP System leak test at evaporative test port to VERIFY the repair. REPEAT Pinpoint Test Step HX58 to VERIFY blockage repair.
HX61	REGULATE THE VPWR TO THE CANISTER VENT (CV) SOLENOID)		
● Key off. ● Measure the voltage across the battery terminals. ● Is the voltage 12 volts or greater?		Yes	▶ COMPLETE the Evaporative Emission System leak test in the Pinpoint Test Step that directed you here.
		No	▶ RECHARGE the battery until the VPWR PID on the scan tool reads in excess of 11.0 volts in KOEO. An optional procedure is to apply voltage between 12.0 and 13.5 volts from voltage source to the VPWR input at the CV solenoid. RETURN to the Pinpoint Test Step that directed you here to complete the Evaporative Emission System leak test.

Test Step		Result	Action to Take
HX65	DTC P1451: CHECK VPWR VOLTAGE TO CV SOLENOID		
	Diagnostic Trouble Code (DTC) P1451 indicates that Self-Test has detected a canister vent (CV) solenoid circuit failure. Possible causes: — VPRW circuit open. — CV circuit open. — CV circuit shorted to PWR GND. — CV circuit shorted to PWR. — Damaged CV solenoid. — Damaged PCM. ● Key off. ● Disconnect CV solenoid. ● Key on, engine off. ● Measure VPWR circuit voltage at CV solenoid harness connector. ● Key off. ● Was voltage greater than 10.5 volts?	Yes No	GO to HX66. REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HX66	CHECK CV SOLENOID RESISTANCE		
	● Measure CV solenoid resistance. ● Is resistance between 48 and 65 ohms?	Yes No	GO to HX67. REPLACE damaged CV solenoid. RESTORE vehicle. RECORD and GO to HX72. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HX67	CHECK FOR OPEN CV CIRCUIT BETWEEN PCM AND CV SOLENOID		
	● Install breakout box, leave PCM disconnected. ● Measure resistance of CV circuit between PCM test pin 67 and CV solenoid harness connector. ● Is resistance less than 5.0 ohms?	Yes No	GO to HX68. REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HX68	CHECK CV CIRCUIT FOR SHORT TO PWR GND IN HARNESS		
	● Disconnect scan tool from DLC. ● Measure resistance between PCM test pin 67 and PCM test pins 51 and 103. ● Are both resistances greater than 10,000 ohms?	Yes No	RECONNECT scan tool. GO to HX69. REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.

Test Step		Result	Action to Take
HX69	CHECK CV SIG CIRCUIT FOR SHORT TO PWR OR CHASSIS GND IN HARNESS		
	● Key on, engine off. ● Measure voltage between PCM test pin 67 and chassis ground. ● Key off. ● Was voltage less than 1.0 volt?	Yes No	GO to HX70 . REPAIR short circuit to VPWR, VREF or chassis ground. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HX70	CHECK CV VOLTAGE SIGNAL FROM PCM		
	● Key off. ● Connect PCM to breakout box. ● Connect CV solenoid. ● Connect digital multimeter between PCM test pin 67 and PCM test pin 51 or 103. ● Start engine. ● Observe voltage on digital multimeter. ● Is voltage between 10.0 and 14.0 volts?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPLACE damaged CV solenoid. REMOVE breakout box. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HX76	DTC P0460: CHECK FUEL TANK LEVEL INDICATORS		
	Diagnostic Trouble Code (DTC) P0460 indicates a fuel level input (FLI) circuit malfunction due to a low or high FLI circuit input to the PCM, or a mechanically stuck fuel pump (FP) module. Possible causes: — Empty fuel tank. — Overfilled fuel tank. — Mechanically stuck open or closed FP module. — Incorrect fuel gauge. — Damaged fuel gauge or instrument cluster. — FLI circuit open. — CASE GND circuit open. — FLI circuit shorted to CASE GND or PWR GND. — FLI shorted to VPWR. — CASE GND shorted to VPWR. — Damaged PCM. ● Connect scan tool. ● Key on, engine off. ● Observe and record fuel gauge reading. ● Access FLI PID. ● Are both the fuel gauge and the FLI PID indicating between one quarter (25% on FLI PID) and three quarters (75% on FLI PID) filled?	Yes No	GO to HX78 . INSPECT fuel tank for leaks with the key off. REPAIR fuel tank if necessary. For DTC P0460: GO to HX77 . For fuel gauge inoperative without a DTC P0460: GO to Symptom Chart.

Test Step		Result	Action to Take
HX77	CHECK FOR LOW FUEL LEVEL		
● Key on, engine off. ● While observing both the fuel gauge and FLI PID, add fuel [7.57 to 11.36 liters (2 to 3 gallons)] to the fuel tank. ● Key off. ● Did either the fuel gauge or FLI PID indicate a movement upward as the fuel is added?		Yes	The fuel level in the tank ranges from low to empty. DRAIN or FILL the fuel tank from 25 to 75% level. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. If DTC P0460 is still present, GO to HX79 .
		No	
HX78	CHECK FLI VOLTAGE ON THE SCAN TOOL		
● Key on, engine running. ● Access the FLI V PID. ● Key off. ● Was the FLI V PID voltage between 0.90 and 2.45 volts (6.35 and 4.55 volts on Contour/Mystique)?		Yes	CHECK for a mechanically stuck fuel pump (FP) Module. REPAIR or REPLACE fuel pump assembly as necessary. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
		No	
HX79	FLI CIRCUIT VOLTAGE COMPARISON CHECK AT BREAKOUT BOX AND SCAN TOOL		
● Install breakout box, connect PCM to breakout box. ● Key on, engine running. ● Access FLI V PID. ● Measure voltage between PCM test pins 12 (or 9) and 91. ● Key off. ● Were both voltage readings at breakout box and scan tool between 0.90 and 2.45 volts (6.35 and 4.55 volts on Contour/Mystique)?		Yes	GO to HX80 .
		No	
			CHECK for installation of proper fuel gauge. REFER to Instrument Panel, Gauges and Warning Indicators. If fuel gauge is replaced, RERUN Pinpoint Test Step HX79 . Otherwise, continue diagnosis below. For only one of the voltage readings not within the specified range: REPLACE PCM. RESTORE vehicle. RERUN Quick Test. For both voltage readings not within the specified range: GO to HX81 .

Test Step		Result	Action to Take
HX80	CASE GND CIRCUIT VOLTAGE COMPARISON CHECK AT BREAKOUT BOX AND SCAN TOOL		
	- Key on, engine running. - Access CAS GND PID. - Measure voltage between PCM test pins 25 and 91. - Key off. Were both voltage readings at breakout box and scan tool less than or equal to 0.30 volt?	Yes No	RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. If DTC P0460 is still present, GO to Instrument Panel, Gauges and Warning Indicators or Diagram. For only one of the voltage readings greater than 0.30 volt: REPLACE PCM. RESTORE vehicle. RERUN Quick Test. For both voltage readings greater than 0.30 volt: GO to HX81.
HX81	CHECK FUEL PUMP MODULE RESISTANCE		
	- Disconnect fuel pump (FP) module (refer to FP module pigtail schematic at beginning of this Pinpoint Test). - Measure resistance between FLI and CASE GND pins at FP module pigtail. Is resistance between 15 and 160 ohms?	Yes No	RECONNECT FP module. GO to HX82. REPLACE fuel pump assembly. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HX82	CHECK FLI AND CASE GND CIRCUITS FOR SHORT TO VPWR		
	- Install breakout box, connect PCM to breakout box. - Key on, engine off. - Measure voltage between PCM test pin 12 (or 9) and PCM test pins 51 or 103. - Measure voltage between PCM test pin 25 and PCM test pins 51 or 103. - Key off. Were any voltage readings greater than 10.5 volts?	Yes No	GO to HX83. GO to HX84.
HX83	CHECK FLI AND CASE GND CIRCUITS FOR SHORT TO VPWR IN HARNESS		
	- Key on, engine off. - Disconnect PCM. - Measure voltage between PCM test pin 12 (or 9) and PCM test pin 51 or 103. - Measure voltage between PCM test pin 25 and PCM test pin 51 or 103. Were any voltage readings greater than 10.5 volts?	Yes No	REPAIR short to VPWR in FLI or CASE GND circuits. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. REPLACE PCM. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
HX84	CHECK FLI CIRCUIT FOR OPEN OR SHORT TO GND IN HARNESS		
● Disconnect PCM and battery. ● Measure resistance between PCM test pins 12 (or 9) and 25. ● Is the resistance within ± 27 ohms of the reading recorded in HX85?		Yes	▶ RESTORE vehicle. COMPLETE PCM. Reset to clear DTCs. RERUN Quick Test. If DTC P0460 is still present, REPLACE PCM. VERIFY a symptom no longer exists.
		No	▶ REFER to Instrument Panel, Gauges and Warning Indicators or Diagram. For resistances greater than 10,000 ohms: REPAIR FLI or CASE GND open circuit between FP module, instrument cluster and PCM. RERUN Quick Test. For all other resistances: REPAIR FLI short circuit to PWR GND or CASE GND. RERUN Quick Test.

Test Notes

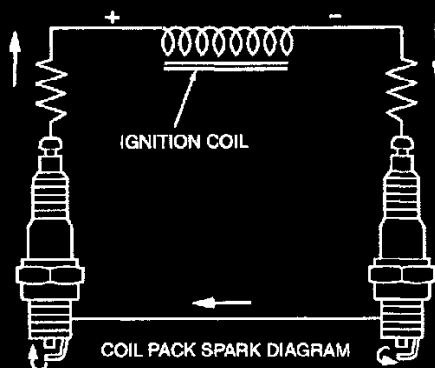
Enter this pinpoint test only when directed here.

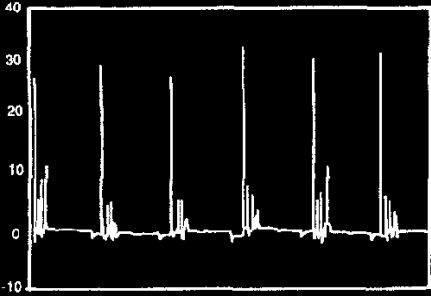
This pinpoint test is intended to diagnose the following:

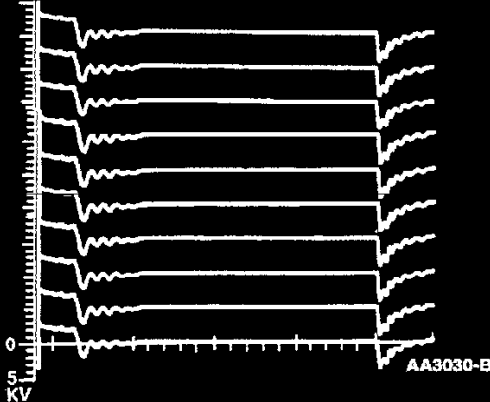
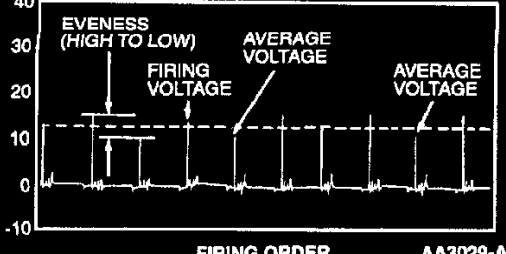
- Spark plugs
- Spark plug wires

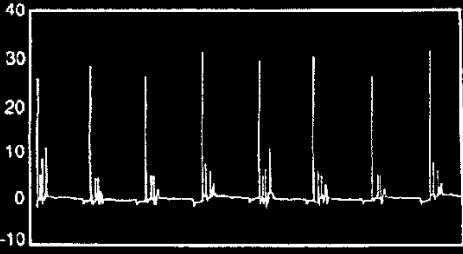
CAUTION: Fouled plugs or a damaged ignition may cause high catalyst temperatures. Check components next to the catalyst and muffler for heat damage.

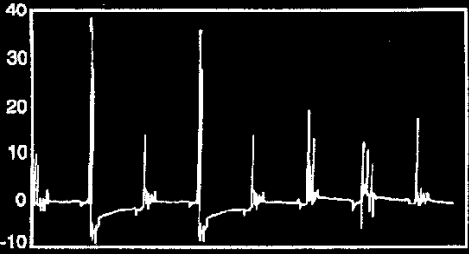
Firing Order	Ignition Coil
4 Cylinder Applications — Except 2.5L Ranger	
1	1
3	2
4	1
2	2
4 Cylinder Applications — 2.5L Ranger	
1	1, 3
3	2, 4
4	1, 3
2	2, 4
6 Cylinder Applications	
1	1
4	2
2	3
5	1
3	2
6	3
8 Cylinder Applications	
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3	2
7	3
2	4
6	1
5	2
4	3
8	4

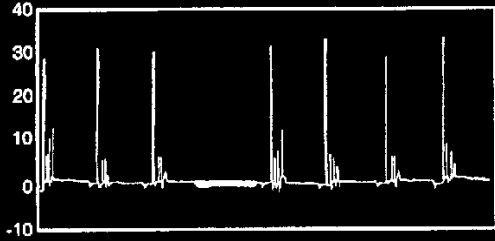
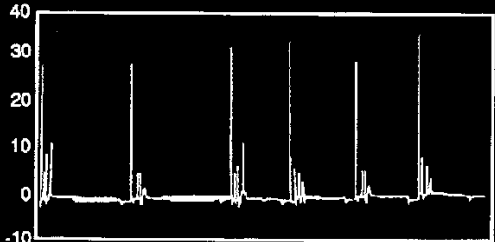


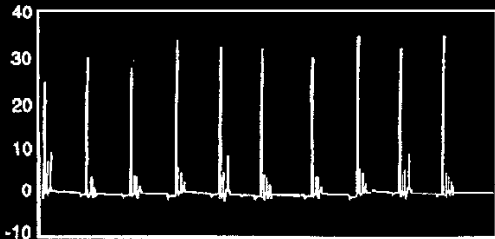
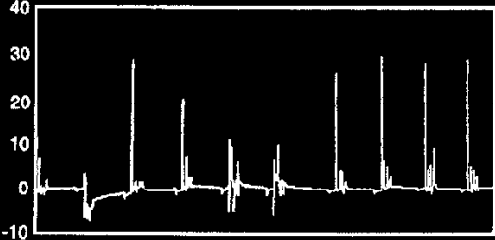
Test Step		Result	Action to Take
JB1	PRELIMINARY TEST		
	Continuous Memory Diagnostic Trouble Codes (DTCs) P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0309 or P0310 indicate a cylinder has misfired in cylinders one through ten. Continuous Memory DTC P0300 indicates a random misfire has been detected. - Visually inspect the engine compartment to make sure all vacuum hoses and coils are properly routed and securely connected. - Examine all wiring harnesses and connectors for damaged, burned or overheated insulation and loose or broken conditions. - Be certain the battery is fully charged. - All accessories must be off during diagnosis. Has a problem been found?	Yes No	REPAIR as required. COMPLETE misfire repair verification drive cycle. For coil pack application: GO to JB2. Coil on Plug using engine analyzer: GO to JB2. Otherwise: GO to JB20.
JB2	CONNECT ENGINE ANALYZER		
	Continuous Memory DTC P0350 indicates an ignition coil primary circuit malfunction. Obtain Rotunda Engine Analyzer 010-00869 or equivalent to diagnose concerns in the secondary side of the ignition system. NOTE: In order for the diagnostic procedures to provide accurate results, it is essential that the calibration of the engine analyzer be maintained. Refer to the equipment manual for the procedure to calibrate the engine analyzer. If the equipment manual is not available, an estimate of the calibration can be made by connecting the Spark Tester DB1P-6666-A or equivalent to a properly operating ignition system and measuring the firing voltage of the spark tester only. The spark tester firing voltage should be approximately 28 KV. Is the engine analyzer connected?	Yes No	For No Start: GO to JB3. All others: GO to JB4. CONNECT engine analyzer and continue with pinpoint test.
JB3	CHECK FOR NORMAL IGNITION PATTERN		
	- Crank engine and observe pattern on scope.  AA1390-A Is the pattern normal?	Yes No	GO to Pinpoint Test A7. For no start: REPAIR IGN/START run circuit. All others: GO to JB4.

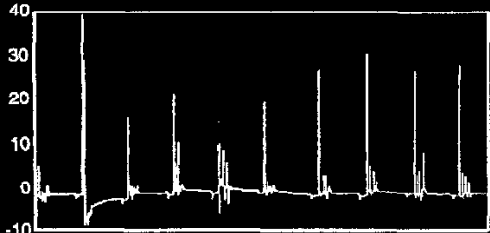
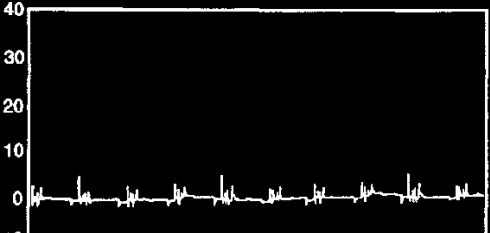
Test Step		Result	Action to Take
JB4	CHECK FOR NORMAL IGNITION OPERATION		
- NOTE: Electronic ignition engine timing is entirely controlled by the PCM. Electronic ignition engine timing is NOT adjustable. Do not attempt to check base timing. You will receive false readings. Multi-strike operating mode. Spark plugs are fired up to four strikes per firing. Multi-strike operating mode is dependent on the PCM calibration and is limited to less than 2000 rpm. Above 2000 rpm, spark plugs are fired once per firing. - Check the spark plug firing voltage average and evenness of patterns.  AA3030-B  AA3029-A - Are the patterns even and is the average value of spark plug firing voltage 20 KV or less with evenness of spark plug firing voltage 8 KV or less?		Yes	These are normal values for a properly operating ignition system. Test complete. If DTCs P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0309 or P0310 are present: GO to Pinpoint Test Step HD5 for fuel injector and pressure test. If you were directed here from Symptom Charts, return to Symptom Charts, otherwise: All other DTCs or no DTC: GO to Pinpoint Test Step Z1.
		No	For Coil Pack: GO to JB5. For Coil on Plug: GO to JB12.

	Test Step	Result	Action to Take
JB5	CHECK FOR EVEN SPARK PLUG VOLTAGE - Check the spark plug firing voltage average and evenness (all cylinders).  FIRING ORDER AA3031-B - Is the average value of spark plug firing voltage greater than 20 KV with evenness of spark plug voltage 8 KV or less?	Yes	Conditions affect all cylinders. Wide spark plug gaps - all cylinders (usually from worn electrodes due to high mileage). CHECK ignition coil wires for proper installation in coil. MEASURE resistance of ignition wires. REPLACE if greater than 7000 ohms per 30.5 cm (1 foot). COMPLETE Misfire Monitor Repair Verification Drive Cycle.
		No	GO to JB6 .
JB6	CHECK FOR EVENNESS BETWEEN CYLINDERS - Check the spark plug firing voltage average and evenness.  FIRING ORDER AA3032-A - Is the evenness of spark plug firing voltage greater than 8 KV?	Yes	Conditions affect some cylinders. Wide spark plug gap(s) or worn electrodes. CHECK spark plugs. COMPLETE Misfire Monitor Repair Verification Drive Cycle.
		No	GO to JB7 .

Test Step		Result	Action to Take
JB7	CHECK FOR SPARK PLUG VOLTAGE		
- Check for high spark plug firing voltage (one or more cylinders).  FIRING ORDER AA3033-B - Is there consistently high spark plug firing voltage in one or more cylinders?		Yes	▶ Spark plug wire(s) are not firmly connected. Disconnected spark plug wire(s). Wide spark plug gap(s). Open plug wire(s). CHECK spark plug wire(s) connection. COMPLETE Misfire Monitor Repair Verification Drive Cycle.
		No	▶ GO to JB8 .
JB8	CHECK FOR LOW SPARK PLUG FIRING VOLTAGE		
- Check for low or missing spark plug firing voltage or sloping or spark line (one or more cylinders).  FIRING ORDER AA3034-A - Is there consistently low or missing spark plug firing voltage or sloping spark line in one or more cylinders?		Yes	▶ GO to JB9 .
		No	▶ For Misfire DTCs: P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307 or P0308: GO to Pinpoint Test Step HD5 for fuel injector and pressure test. All others: REFER to Symptom Charts.

Test Step		Result	Action to Take
JB9	CHECK FOR MISSING SPARK PATTERNS		
●  FIRING ORDER AA3035-A		Yes	CHECK spark plugs and wires. MEASURE resistance of spark plug wires. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). If OK, GO to Pinpoint Test JE1 .
●  FIRING ORDER AA3036-A		No	
● Is spark missing from 2 cylinders on the same coil?			
JB10	CHECK INDUCTIVE VOLTAGE		
● Check inductive voltage on each cylinder individually. ● Is there voltage on a pair of coils that are on the same circuit?		Yes	CHECK spark plugs and wires. MEASURE resistance of spark plug wires. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). If OK, GO to Pinpoint Test JE1 .
		No	

Test Step		Result	Action to Take
JB12	CHECK FOR HIGH SPARK PLUG VOLTAGE		
- Check the spark plug firing voltage average and evenness (all cylinders).  FIRING ORDER AA3037-A - Is the average value of spark plug firing voltage greater than 20 KV with evenness of spark plug voltage 8 KV or less?		Yes	Conditions affect all cylinders. Wide spark plug gaps - all cylinders (usually from worn electrodes due to high mileage). CHECK ignition coil for proper installation. CHECK spark plugs. ADJUST gap or REPLACE as required. COMPLETE Misfire Monitor Repair Verification Drive Cycle.
		No	GO to JB13 .
JB13	CHECK FOR EVENNESS BETWEEN CYLINDERS		
- Check the spark plug firing voltage average and evenness.  FIRING ORDER AA3038-A - Is the evenness of spark plug firing voltage greater than 8 KV?		Yes	Conditions affect some cylinders. Wide spark plug gap(s) or worn electrodes. CHECK spark plugs. ADJUST gap or REPLACE as required. COMPLETE Misfire Monitor Repair Verification Drive Cycle.
		No	GO to JB14 .

Test Step		Result	Action to Take
JB14	CHECK FOR HIGH SPARK PLUG VOLTAGE - Check for high spark plug firing voltage (one or more cylinders).  FIRING ORDER AA3039-A - Is there consistently high spark plug firing voltage in one or more cylinders?	Yes No	- Ignition coils are not firmly connected. Wide spark plug gap(s). CHECK ignition coil connection. COMPLETE Misfire Monitor Repair Verification Drive Cycle. - GO to JB15.
JB15	CHECK FOR LOW SPARK PLUG FIRING VOLTAGE - Check for low or missing spark plug firing voltage or sloping spark line (one or more cylinders).  FIRING ORDER AA3040-A - Is there consistently low or missing spark plug firing voltage or sloping in one or more cylinders?	Yes No	- GO to JB16. - For misfire DTCs: P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0309 or P0310: GO to Pinpoint Test Step HD5 for fuel injector and pressure test. - All others: REFER to Symptom Charts.

Test Step		Result	Action to Take
JB16	CHECK FOR MISSING SPARK PATTERN		
● Is spark missing from any cylinder?		Yes	CHECK spark plugs for wear, carbon deposits and other damage. REPLACE as required. If OK, GO to Pinpoint Test JF1 .
		No	GO to JB17 .
JB17	CHECK INDUCTIVE VOLTAGE		
- Check inductive voltage on each cylinder individually. - Is inductive voltage present on each cylinder/coil?		Yes	CHECK spark plugs and wires. MEASURE resistance of spark plug wires. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). If OK, GO to Pinpoint Test JF1 .
		No	GO to Pinpoint Test JF1 .
JB20	CHECK FOR SPARK AT SPARK PLUG		
- Disable inertia switch. - Disconnect ignition coil or coil wire from spark plug. - Connect an Air Gap Spark Tester 303-D037 (D81P-6666-A) or equivalent, check for spark during crank. - Was spark present during crank?		Yes	GO to JB21 .
		No	GO to Pinpoint Test JF1 .
JB21	CHECK FOR SPARK AT ALL PLUGS		
- Using an Air Gap Spark Tester 303-D037 (D81P-6666-A) or equivalent, check for spark at all wires. - Was spark present at all plugs during crank?		Yes	GO to JB22 .
		No	GO to Pinpoint Test JF1 .
JB22	CHECK SPARK QUALITY		
- Air Gap Spark Tester installed. - Crank engine and observe color of spark for each cylinder. - Is color of spark bluish-white?		Yes	GO to JB23 .
		No	REPLACE ignition coil. COMPLETE Misfire Monitor Repair Verification Drive Cycle.
JB23	CHECK PLUGS		
- Remove and check plugs for damage, wear, carbon deposits and proper plug gap. - Are plugs OK?		Yes	If you were sent here from Pinpoint Test Step HD4 : GO to HD5 . If you were sent here from Symptom Charts, return to Symptom Charts. All others: GO to Pinpoint Test Z1 .
		No	REPAIR plugs. ADJUST gap or REPLACE as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Crankshaft Position (CKP) sensor
- Harness Circuits: CKP + and CKP -
- Powertrain control module

*TEST PIN 21  CKP+
 TEST PIN 22  CKP-



CRANKSHAFT POSITION
(CKP) SENSOR
VEHICLE HARNESS
CONNECTOR

*TEST PINS LOCATED ON BREAKOUT BOX
HARNESS CONNECTOR VIEWED INTO MATING SURFACE

Test Step		Result	Action to Take
JD1	CHECK CKP+ BIAS VOLTAGE AT PCM		
	- Disconnect scan tool from DLC. - Install breakout box, connect PCM to breakout box. - Key on, engine off. - Measure voltage between PCM test pin 21 and ground. - Key off. Was voltage between 1.0 and 2.0 volts?	Yes No	GO to JD10 . Bias fault. GO to JD2 .
JD2	CHECK FOR CKP+ BIAS VOLTAGE FAULT		
	- Disconnect CKP sensor. - Key on, engine off. - Measure voltage between PCM test pin 21 and ground. - Key off. Was voltage greater than 1.0 volt but less than 2.0 volts?	Yes No	GO to JD3 . Bias fault. GO to JD18 .
JD3	CHECK FOR CKP- BIAS VOLTAGE FAULT		
	- Key on, engine off. - Measure voltage between PCM test pin 22 and ground. - Key off. Was voltage between 1.0 and 2.0 volts?	Yes No	REPLACE CKP sensor. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. Bias fault. GO to JD4 .
JD4	DETERMINE IF BIAS HIGH OR BIAS LOW FAULT		
	Was bias voltage reading in JD3 less than 1.0 volt?	Yes No	Bias low fault. GO to JD5 . Bias high fault. GO to JD6 .
JD5	CHECK CKP- CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect PCM. - Measure resistance between PCM test pin 22 and PCM test pins 51 and 103. Is each resistance greater than 10K ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
JD6	CHECK CKP- CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Disconnect PCM. - Key on, engine off. - Measure voltage between PCM test pin 22 and ground. Is voltage less than 0.5 volt?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
JD10	CHECK CKP SENSOR AMPLITUDE AT PCM		
	- Crank engine and measure voltage between PCM test pins 21 and 22. - Key off. Was settled ac voltage reading greater than 0.4 volt?	Yes No	CKP circuit is OK. GO to JB1 . Amplitude fault. GO to JD11 .

Test Step		Result	Action to Take
JD11	CHECK CKP AMPLITUDE AT PCM FOR AMPLITUDE FAULT		
	- Disconnect PCM. - Crank engine and measure voltage between PCM test pins 21 and 22. - Key off. - Was settled ac voltage reading greater than 0.4 volt?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. GO to JD12 .
JD12	CHECK CKP CIRCUIT RESISTANCE FOR AMPLITUDE FAULT		
	- Measure resistance between PCM test pins 22 and 21. - Is resistance between 300 and 800 ohms?	Yes No	GO to JD16 . GO to JD13 .
JD13	DETERMINE IF RESISTANCE HIGH OR RESISTANCE LOW FAULT		
	Was the resistance from JD12 less than 300 ohms?	Yes No	Low resistance fault. GO to JD17 . High resistance fault. GO to JD14 .
JD14	CHECK FOR CKP+ CIRCUIT FOR OPEN IN HARNESS		
	- Disconnect CKP sensor. - Measure resistance of CKP+ circuit between PCM test pin 21 and CKP sensor harness connector. - Is resistance less than 5 ohms?	Yes No	GO to JD15 . REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
JD15	CHECK CKP- CIRCUIT FOR OPEN IN HARNESS		
	- Measure resistance of CKP- circuit between PCM test pin 22 and CKP sensor harness connector. - Is resistance less than 5 ohms?	Yes No	REPLACE CKP sensor. RESTORE vehicle. RERUN Quick Test. REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
JD16	CHECK CKP SENSOR AND PULSE WHEEL		
	- Check pulse wheel and CKP sensor visually for damage. - Is CKP sensor and pulse wheel OK?	Yes No	REPLACE CKP sensor. RESTORE vehicle. RERUN Quick Test. REPAIR or REPLACE damaged parts. RESTORE vehicle. RERUN Quick Test.
JD17	CHECK CKP+ CIRCUIT FOR SHORT TO CKP- CIRCUIT IN HARNESS		
	- Disconnect CKP sensor. - Measure resistance between PCM test pins 21 and 22. - Is resistance greater than 1000 ohms?	Yes No	REPLACE CKP sensor. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
JD18	DETERMINE IF BIAS VOLTAGE HIGH OR BIAS VOLTAGE LOW FAULT		
	Was bias voltage reading in JD2 less than 1.0 volt?	Yes No	Low bias voltage fault. GO to JD19 . High bias voltage fault. GO to JD20 .
JD19	CHECK CKP+ CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect PCM. - Measure resistance between PCM test pin 21 and PCM test pins 51 and 103. - Is each resistance greater than 10K ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
JD20	CHECK CKP+ CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Disconnect PCM. - Key on, engine off. - Measure voltage between PCM test pin 21 and ground. - Is voltage less than 0.5 volt?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.

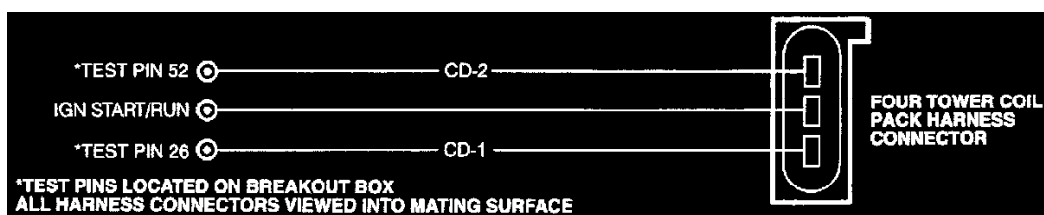
Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

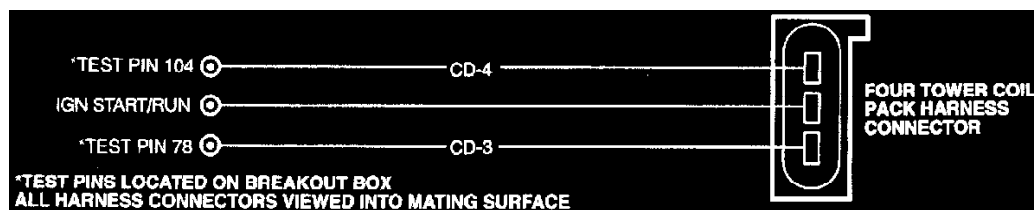
- Ignition coil packs
- Ignition coil harness
- Vehicle power circuit to coil packs
- Powertrain control module

CAUTION: Fouled spark plugs or a damaged ignition system may cause high catalyst temperatures. Check components next to the catalyst and muffler for heat damage.

Cylinder Number	Coil Driver	PCM Pin	Related DTC
4 Cylinder Applications Except 2.5L Ranger			
1	1	26	P0351
3	2	52	P0352
4	1	26	P0351
2	2	52	P0352
4 Cylinder Applications 2.5L Ranger			
1	1, 3	26, 78	P0351, P0353
3	2, 4	52, 104	P0352, P0354
4	1, 3	26, 78	P0351, P0353
2	2, 4	52, 104	P0352, P0354
6 Cylinder Applications			
1	1	26	P0351
4	2	52	P0352
2	3	78	P0353
5	1	26	P0351
3	2	52	P0352
6	3	78	P0353
8 Cylinder Applications			
1	1	26	P0351
3	2	52	P0352
7	3	78	P0353
2	4	104	P0354
6	1	26	P0351
5	2	52	P0352
4	3	78	P0353
8	4	104	P0354



Coil Pack Harness Connector



Coil Pack Harness Connector

Test Step		Result	Action to Take
JE1	DETERMINE WHICH COIL IS NOT FIRING		
	NOTE: Electronic Ignition engine timing is entirely controlled by the PCM. Electronic Ignition timing is NOT adjustable. Do not attempt to check base timing. You will receive false readings. - Determine which coil is not firing using information from Pinpoint Test JB and the chart at the beginning of this Pinpoint Test. - Is this a 2.5L Ranger or an 8 cylinder engine.	Yes No	For engines with damaged CD-1 or CD-2 circuits: GO to JE2. For engines with damaged CD-3 or CD-4 circuits: GO to JE3. For 4 and 6 cylinder engines: GO to JE4.
JE2	CHECK FOR POWER AT COIL PACK CONTAINING COIL 1 AND COIL 2		
	Diagnostic Trouble Codes (DTCs) P0351 and P0352 are ignition Coil 1 and 2 primary circuit faults. Possible causes: - Open or short in Ign Start/Run circuit. - Open CD-1 or CD-2 circuit in harness. - CD-1 or CD-2 shorted to ground in harness. - Damaged coil pack (coil) - Damaged PCM. - Disconnect coil. - Key on, engine off. - Measure voltage between IGN Start/Run circuit at coil harness connector and ground. - Key off. - Was voltage greater than 10.0 volts?	Yes No	IGN Start/Run circuit is OK. For DTC P0351 or damaged CD1 circuit: GO to JE5. For DTC P0352 or damaged CD2 circuit: GO to JE15. IGN Start/Run fault. CHECK condition of related fuses/fuse links. If ok REPAIR open circuit. If fuse/fuse link is damaged CHECK IGN Start/Run circuit for short to ground. REPAIR as necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
JE3	CHECK FOR POWER AT COIL PACK CONTAINING COIL 3 AND COIL 4		
	Diagnostic Trouble Codes (DTCs) P0353 and P0354 are ignition Coil 3 and 4 primary circuit faults. Possible causes: - Open or short in Ign Start/Run circuit. - Open CD-3 or CD-4 circuit in harness. - CD-3 or CD-4 shorted to ground in harness. - Damaged coil pack (coil) - Damaged PCM. - Disconnect coil. - Key on, engine off. - Measure voltage between IGN Start/Run circuit at coil harness connector and ground. - Key off. - Was voltage greater than 10.0 volts?	Yes No	IGN Start/Run circuit is OK. For DTC P0353 or damaged CD3 circuit: GO to JE25. For DTC P0354 or damaged CD4 circuit: GO to JE35. IGN Start/Run fault. CHECK condition of related fuses/fuse links. If ok REPAIR open circuit. If fuse/fuse link is damaged CHECK IGN Start/Run circuit for short to ground. REPAIR as necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.

Test Step		Result	Action to Take
JE4	CHECK FOR PWR AT COIL PACK		
	Diagnostic Trouble Codes (DTC) P0351, P0352 and P0353 are ignition Coil 1, 2 and 3 primary circuit faults. Possible causes: — Open or short in Ign Start / Run circuit. — Open CD-1, CD-2 or CD-3 circuit in harness. — CD-1, CD-2 or CD-3 shorted to ground in harness. — Damaged coil pack (Coil) — Damaged PCM. ● Disconnect coil. ● Key on, engine off. ● Measure voltage between IGN Start / Run circuit at coil harness connector and ground. ● Key off. ● Was voltage greater than 10.0 volts?	Yes No	IGN Start / Run circuit is OK. For DTC P0351 or damaged CD1 circuit: GO to JE5. For DTC P0352 or damaged CD2 circuit: GO to JE15. For DTC P0353 or damaged CD3 circuit: GO to JE25. IGN Start / Run fault. CHECK condition of related fuses / fuse links. If ok REPAIR open circuit. If fuse / fuse link is damaged CHECK IGN Start / Run circuit for short to ground. REPAIR as necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
JE5	CHECK COIL DRIVER 1 (CD-1) CIRCUIT FOR OPEN IN HARNESS		
	● Install breakout box, leave PCM disconnected. ● Measure resistance of CD-1 circuit between PCM test pin 26 and coil harness connector. ● Is resistance less than 5.0 ohms?	Yes No	CD-1 circuit is not open. GO to JE6. REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
JE6	CHECK CD-1 CIRCUIT FOR SHORT TO POWER IN HARNESS		
	● Key on. ● Measure voltage between PCM test pin 26 and ground. ● Key off. ● Was voltage less than 1.0 volt?	Yes No	CD-1 is not shorted to power. GO to JE7. REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.

Test Step		Result	Action to Take
JE7	CHECK CD-1 CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool. - Measure resistance between PCM test pins 26 and 77. Is resistance greater than 10,000 ohms?	Yes No	CD-1 is not shorted to GND. GO to JE8 . REPAIR short in harness. After repair GO to JE10 to check coil for open.
JE8	CHECK OPERATION OF CD-1 WITH KEY OFF AND KEY ON ENGINE OFF		
	- Connect PCM. - Connect an incandescent test lamp between PCM test pins 26 and 71. - Key on, engine off. - Observe lamp state (On or Off). - Key off. Was the lamp continuously off?	Yes No	PCM functions properly during key on engine off. GO to JE9 . CD-1 is shorted in PCM. REPLACE PCM. After repair, GO to JE10 to check coil for open.
JE9	CHECK OPERATION OF CD-1 WHILE CRANKING ENGINE		
	- Disable fuel pump by disconnecting inertia fuel shutoff switch. - Observe incandescent lamp while cranking engine. - Key off. Did lamp blink consistently?	Yes No	PCM is functioning properly. GO to JE11 . PCM is damaged. REPLACE PCM. After repair, GO to JE10 to check coil for open.
JE10	CONFIRM COIL 1 IS NOT OPEN		
	- Measure resistance of Coil 1 between CD-1 and IGN Start/Run circuit at coil pack harness connector. Is resistance less than 5 ohms?	Yes No	Coil is not damaged. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test. Coil is damaged. REPLACE coil pack. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
JE11	CHECK COIL 1 FOR OPEN		
	- Measure resistance of Coil 1 between CD-1 and IGN Start/Run circuit at coil pack harness connector. Is resistance less than 5 ohms?	Yes No	Coil 1 primary is not damaged. GO to JE12 . Coil 1 is damaged. REPLACE coil pack. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.

Test Step		Result	Action to Take
JE 12	CHECK FOR OPEN IN IGNITION COIL SECONDARY		
	- Remove both plug wires from secondary of Coil 1. - Measure resistance of Coil 1 secondary between coil pack towers. - Is resistance between 12K and 14.5K ohms?	Yes No	Coil 1 is not damaged. RESTORE vehicle. If DTC P0350 is present: GO to JE15. If no additional ignition DTCs are present: GO to Z1 with data and list of possible causes. Coil 1 is damaged. REPLACE coil pack. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
JE 15	CHECK COIL DRIVER 2 (CD-2) CIRCUIT FOR OPEN IN HARNESS		
	- Install breakout box, leave PCM disconnected. - Measure resistance of CD-2 circuit between PCM test pin 52 and coil harness connector. - Is resistance less than 5.0 ohms?	Yes No	CD-2 circuit is not open, GO to JE16. REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
JE 16	CHECK CD-2 CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Key on. - Measure voltage between PCM test pin 52 and ground. - Key off. - Was voltage less than 1.0 volt?	Yes No	CD-2 is not shorted to power. GO to JE17. REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
JE 17	CHECK CD-2 CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool. - Measure resistance between PCM test pins 52 and 77. - Is the resistance greater than 10,000 ohms?	Yes No	CD-2 is not shorted to GND. GO to JE18. REPAIR short in harness. After repair, GO to JE20 to check coil for open.

Test Step		Result	Action to Take
JE 18	CHECK OPERATION OF CD-2 WITH KEY OFF AND KEY ON ENGINE OFF		
	● Connect PCM. ● Connect an incandescent test lamp between PCM test pins 52 and 71. ● Key on, engine off. ● Observe lamp state (on or off). ● Key off. ● Was the lamp continuously off?	Yes No	► PCM functions properly during key on engine off. GO to JE 19. ► CD-2 is shorted in PCM. REPLACE PCM. After repair, GO to JE 20 to check coil for open.
JE 19	CHECK OPERATION OF CD-2 WHILE CRANKING ENGINE		
	● Disable fuel pump by disconnecting inertia fuel shutoff switch. ● Observe incandescent lamp while cranking engine. ● Key off. ● Did lamp blink consistently?	Yes No	► PCM is functioning properly. GO to JE 21. ► PCM is damaged. REPLACE PCM. After repair, GO to JE 20 to check coil for open.
JE 20	CONFIRM COIL 2 IS NOT OPEN		
	● Measure resistance of Coil 2 between CD-2 and IGN Start/Run circuit at coil harness connector. ● Is resistance less than 5 ohms?	Yes No	► Coil is not damaged. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test. ► Coil is damaged. REPLACE coil pack. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
JE 21	CHECK COIL 2 FOR OPEN		
	● Measure resistance of Coil 2 between CD-2 and IGN Start/Run circuit at Coil harness connector. ● Is resistance less than 5 ohms?	Yes No	► Coil 2 primary is not damaged. GO to JE 22. ► Coil 2 is damaged. REPLACE Coil pack. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.

Test Step		Result	Action to Take
JE22	CHECK FOR OPEN IN IGNITION COIL SECONDARY		
	- Remove both plug wires from secondary of Coil 2. - Measure resistance of Coil 2 secondary between coil pack towers. - Is resistance between 12K and 14.5K ohms?	Yes No	Coil 2 is not damaged. RESTORE vehicle. If DTC P0350 is present, for four cylinder engines (except 2.5L Ranger): GO to Z1. All others: GO to JE25. If no additional ignition DTCS are present: GO to Z1 with data and list of possible causes. Coil 2 is damaged. REPLACE coil pack. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
JE25	CHECK COIL DRIVER 3 (CD-3) CIRCUIT FOR OPEN IN HARNESS		
	- Install breakout box, leave PCM disconnected. - Measure resistance of CD-3 circuit between PCM test pin 78 and coil harness connector. - Is resistance less than 5.0 ohms?	Yes No	CD-3 circuit is not open. GO to JE26. REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
JE26	CHECK CD-3 CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Key on. - Measure voltage between PCM test pin 78 and ground. - Key off. - Was voltage less than 1.0 volt?	Yes No	CD-3 is not shorted to power. GO to JE27. REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.

Test Step		Result	Action to Take
JE27	CHECK CD-3 CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool. - Measure resistance between PCM test pins 78 and 77. Is resistance greater than 10,000 ohms?	Yes No	CD-3 is not shorted to GND. GO to JE28 . REPAIR short in harness. After repair, GO to JE30 to check coil for open.
JE28	CHECK OPERATION OF CD-3 WITH KEY OFF AND KEY ON ENGINE OFF		
	- Connect PCM. - Connect an incandescent test lamp between PCM test pins 78 and 71. - Key on, engine off. - Observe lamp state (on or off). - Key off. Was the lamp continuously off?	Yes No	PCM functions properly during key on engine off. GO to JE29 . CD-3 is shorted in PCM. REPLACE PCM. After repair, GO to JE30 to check coil for open.
JE29	CHECK OPERATION OF CD-3 WHILE CRANKING ENGINE		
	- Disable fuel pump by disconnecting inertia fuel shutoff switch. - Observe incandescent lamp while cranking engine. - Key off. Did lamp blink consistently?	Yes No	PCM is functioning properly. GO to JE31 . PCM is damaged. REPLACE PCM. After repair, GO to JE30 to check coil for open.
JE30	CONFIRM COIL 3 IS NOT OPEN		
	- Measure resistance of Coil 3 between CD-3 and IGN Start /Run circuit at coil pack harness connector. Is resistance less than 5 ohms?	Yes No	Coil 3 is not damaged. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test. Coil 3 is damage. REPLACE coil pack. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
JE31	CHECK COIL 3 FOR OPEN		
	- Measure resistance of Coil 3 between CD-3 and IGN Start /Run circuit at coil pack harness connector. Is resistance less than 5 ohms?	Yes No	Coil 3 primary is not damaged. GO to JE32 . Coil 3 is damaged. REPLACE coil pack. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.

Test Step		Result	Action to Take
JE32	CHECK FOR OPEN IN IGNITION COIL SECONDARY		
	- Remove plug wires from secondary of Coil 3. - Measure resistance of Coil 3 secondary between coil pack towers. - Is resistance between 12K and 14.5K ohms?	Yes ▶ No ▶	Coil 3 is not damaged. RESTORE vehicle. If DTC P0350 is present for six cylinder engines: GO to Z1. All others: GO to JE35. If no additional ignition DTCs are present: GO to Z1 with data and list of possible causes. Coil 3 is damaged. REPLACE coil pack. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
JE35	CHECK COIL DRIVER 4 (CD-4) CIRCUIT FOR OPEN IN HARNESS		
	- Install breakout box, leave PCM disconnected. - Measure resistance of CD-4 circuit between PCM test pin 104 and coil harness connector. - Is resistance less than 5.0 ohms?	Yes ▶ No ▶	CD-4 circuit is not open. GO to JE36. REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
JE36	CHECK CD-4 CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Key on. - Measure voltage between PCM test pin 104 and ground. - Key off. - Was voltage less than 1.0 volt?	Yes ▶ No ▶	CD-4 is not shorted to power. GO to JE37. REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.

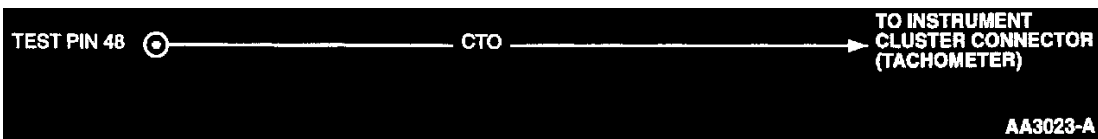
Test Step		Result	Action to Take
JE37	CHECK CD-4 CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool. - Measure resistance between PCM test pin 104 and 77. - Are both resistances greater than 10,000 ohms?	Yes No	CD-4 is not shorted to GND. GO to JE38 . REPAIR short in harness. After repair, GO to JE40 to check coil for open.
JE38	CHECK OPERATION OF CD-4 WITH KEY OFF AND KEY ON ENGINE OFF		
	- Connect PCM. - Connect an incandescent test lamp between PCM test pins 104 and 71. - Key on, engine off. - Observe lamp state (on or off). - Key off. - Was the lamp continuously off?	Yes No	PCM functions properly during key on engine off. GO to JE39 . CD-4 is shorted in PCM. REPLACE PCM. After repair, GO to JE40 to check coil for open.
JE39	CHECK OPERATION OF CD-4 WHILE CRANKING ENGINE		
	- Disable fuel pump by disconnecting inertia fuel shutoff switch. - Observe incandescent lamp while cranking engine. - Key off. - Did lamp blink consistently?	Yes No	PCM is functioning properly. GO to JE41 . PCM is damaged. REPLACE PCM. After repair, GO to JE40 to check coil for open.
JE40	CONFIRM COIL 4 IS NOT OPEN		
	- Measure resistance of Coil 4 between CD-4 and IGN Start / Run circuit at coil pack harness connector. - Is resistance less than 5 ohms?	Yes No	Coil 4 is not damaged. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test. Coil 4 is damaged. REPLACE coil pack. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
JE41	CHECK COIL 4 FOR OPEN		
	- Measure resistance of Coil 4 between CD-4 and IGN Start / Run circuit at coil pack harness connector. - Is resistance less than 5 ohms?	Yes No	Coil 4 primary is not damaged. GO to JE42 . Coil 4 is damaged. REPLACE coil pack. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.
JE42	CHECK FOR OPEN IN IGNITION COIL SECONDARY		
	- Remove both plug wires from secondary of Coil 4. - Measure resistance of Coil 4 secondary between coil pack towers. - Is resistance between 12K and 14.5K ohms?	Yes No	Coil 4 is not damaged. RESTORE vehicle. If DTC P0350 is present or if no additional ignition DTCs are present: GO to Z1 with data and list of Possible causes. Coil 4 is damaged. REPLACE coil pack. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test.

Test Notes

NOTE: Enter this pinpoint test only when directed here from the Symptom Charts, after thoroughly diagnosing the tachometer and tachometer wiring harness.

This pinpoint test is intended to diagnose the following:

- Powertrain control module



Test Step		Result	Action to Take
JH1	CHECK CTO CIRCUIT FOR SHORT TO POWER IN HARNESS		
● Install breakout box, leave PCM disconnected. ● Key on. ● Measure voltage of CTO circuit at PCM Test Pin 48. ● Key off. ● Is voltage less than 0.5 volt?		Yes No	GO to JH2 . REPAIR short circuit. RESTORE vehicle. VERIFY a symptom no longer exists.

Test Step		Result	Action to Take
JH2	CHECK CTO SIGNAL FROM PCM		
● Connect PCM. ● Key on, engine running. ● Measure CTO circuit DC voltage at PCM Test Pin 48. ● Key off. ● Is dc voltage reading between 3.0 and 9.0 volts?		Yes No	GO to JH3 . CTO open or short in PCM. REPLACE PCM. RESTORE vehicle. VERIFY a symptom no longer exists.
JH3	CHECK CTO CIRCUIT FOR SHORT TO GROUND IN HARNESS		
● Disconnect PCM. ● Disconnect instrument cluster connector. ● Measure resistance between PCM Test Pin 48 and 51 or 103. ● Measure resistance between PCM Test Pin 48 and chassis ground. ● Are resistances greater than 10,000 ohms?		Yes No	DIAGNOSE circuit. REPAIR short in harness. RESTORE vehicle. VERIFY a symptom no longer exists.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Fuel Pump Relay
- Inertia fuel shutoff switch
- Harness Circuits: B+, VPWR, FP PWR
- Powertrain Control Module



Test Step		Result	Action to Take
KA1	DTC P0230: CHECK VPWR VOLTAGE TO FUEL PUMP RELAY		
	Diagnostic Trouble Code (DTC) P0230 indicates a fuel pump primary circuit failure. Possible causes: — Open or shorted circuit. — Damaged fuel pump relay. — Damaged PCM. ● Disconnect fuel pump relay. ● Key on, engine off. ● Measure VPWR circuit voltage at the fuel pump relay harness connector. ● Key off. ● Was voltage greater than 10.5 volts?	Yes No	GO to KA2. REPAIR open in VPWR circuit between the Electronic Engine Control power relay and the fuel pump relay. RESTORE vehicle. RERUN Quick Test.
KA2	CHECK FUEL PUMP RELAY		
	● Refer to the pin numbers moulded on the Fuel Pump Relay. There will be either a Pin 1 or Pin 85. ● Measure resistance between either Pin 1 or Pin 85 and all other pins of the Fuel Pump Relay. One measurement should be between 40 and 120 ohms, with the other measurements being greater than 10,000 ohms. ● Are all resistance checks OK?	Yes No	GO to KA3. REPLACE fuel pump relay. RESTORE vehicle. RERUN Quick Test.
KA3	CHECK FUEL PUMP (FP) CIRCUIT FOR SHORT TO POWER IN HARNESS		
	● Install breakout box, leave PCM disconnected. ● Key on, engine off. ● Measure voltage between PCM test pin 80 (54 for 2.5L Contour/Mystique, Cougar) and ground. ● Key off. ● Was voltage less than 1.0 volt?	Yes No	GO to KA4. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
KA4	CHECK FP CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	● Disconnect scan tool from DLC. ● Measure resistance between PCM test pin 80 (54 for Contour/Mystique, Cougar) and ground. ● Is resistance greater than 10,000 ohms?	Yes No	GO to KA5. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
KA5	CHECK FP CIRCUIT FOR OPEN IN HARNESS		
	- Measure resistance of Fuel Pump (FP) circuit between fuel pump relay harness connector and PCM test pin 80. - Is resistance less than 5.0 ohms?	Yes No	If Key On Engine Off (KOEO) DTC P0231 or P0232 is also present with the P0230: GO to KA6. All others: REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
KA6	CHECK THE FUEL PUMP PRIMARY CIRCUIT INSIDE THE PCM		
	NOTE: The next two test steps will check the FP circuit in the PCM. To do this the FPF PID will be monitored. The FPF PID is able to detect for faults on the FP circuit, and will indicate NO when no fault is detected and YES when a fault is detected. - Remove breakout box. - Reconnect PCM, fuel pump relay and scan tool. - Key on, engine off. - Access FPF PID. - Is the FPF PID Yes?	Yes No	Key off. REPLACE PCM. RESTORE vehicle. RERUN Quick Test. GO to KA7.
KA7	CHECK THE FUEL PUMP PRIMARY CIRCUIT INSIDE THE PCM WHILE CRANKING ENGINE		
	NOTE: The scan tool must be connected to a reliable power source that is powered with the key in the START position (such as directly to the vehicle battery). Also verify that the vehicle battery is fully charged. - While viewing the FPF PID, crank engine. - Key off. - Was the FPF PID Yes during crank?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. The fuel pump primary circuit is OK in the harness and PCM. If KOEO P0231 is present: GO to KA20. If KOEO P0232 is present: GO to KA10.

Test Step		Result	Action to Take
KA10	DTC P0232: DOES ENGINE START?		
Diagnostic Trouble Code (DTC) P0232 indicates that the powertrain control module (PCM) detected the FPM circuit voltage was high when the fuel pump was commanded off. The FPM circuit is wired to a pull-up voltage inside the PCM. The FPM circuit will go high if, with the key on and the fuel pump commanded off, the FPM/FP PWR circuit loses its path to ground through the fuel pump. The FPM circuit will also be high if the FPM/FP PWR circuit is shorted to power. Possible causes: No Start: — Inertia fuel shutoff (IFS) switch not reset or electrically open. — Open circuit between the fuel pump and FPM circuit connection to the FP PWR circuit. — Poor fuel pump ground. — Fuel pump electrically open. Engine Starts: — Fuel pump secondary circuit short to power. — Fuel pump relay contacts always closed. — Open in FPM circuit between PCM and connection to the FP PWR circuit. — Damaged PCM. ● Does the engine start?		Yes ► GO to KA11. No ► GO to KA15.	
KA11	VERIFY THAT FUEL PUMP IS OFF		
● Key on, wait five seconds. ● Listen for motor noise from fuel pump (it may be necessary to listen near fuel tank). ● Key off. ● Was fuel pump off with the key on?		Yes ► GO to KA13. No ► GO to KA12.	
KA12	CHECK FOR FUEL PUMP RELAY ALWAYS CLOSED		
● Disconnect fuel pump relay. ● Key on. ● Key off. ● Was fuel pump off with relay disconnected and the key on?		Yes ► REPLACE fuel pump relay. RERUN Quick Test. No ► REPAIR short to power in FP PWR/FPM circuit. RESTORE vehicle. RERUN Quick Test.	
KA13	CHECK FOR OPEN FPM CIRCUIT		
● Install breakout box, leave PCM disconnected. ● Disconnect fuel pump relay. ● Measure resistance between PCM test pin 40 (FPM) and FP PWR circuit at the fuel pump relay harness connector. ● Is resistance less than 5.0 ohms?		Yes ► GO to KA14. No ► REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.	

Test Step		Result	Action to Take
KA14	CHECK FPM CIRCUIT IN PCM		
- Remove breakout box. - Reconnect PCM and fuel pump relay. - Key on, engine off. - Access FPM PID. - Is the FPM PID OFF?		Yes	Key off. For 5.4L/6.8L F250/350/450 over 8500 lb GVW with two speed fuel pump: GO to KA55 . All others: No fault is detected. The FPM circuit is OK in the harness and PCM. DISREGARD DTC P0232 at this time. RETURN to the Diagnostic Subroutines where DTC P0232 was received and CONTINUE diagnosis as directed.
		No	Key off. REPLACE PCM. RERUN Quick Test.
KA15	CHECK INERTIA FUEL SHUTOFF (IFS) SWITCH		
- Locate and disconnect inertia fuel shutoff (IFS) switch (verify that switch is reset). - Measure resistance between the C and NC pins of the IFS switch. - Is resistance less than 5.0 ohms?		Yes	GO to KA16 .
		No	REPLACE or RESET IFS switch. RERUN Quick Test.
KA16	CHECK FOR OPEN FP PWR CIRCUIT BETWEEN IFS SWITCH AND FUEL PUMP RELAY		
- Disconnect fuel pump relay. - Measure resistance of the FP PWR circuit between fuel pump relay and IFS switch harness connectors. - Is resistance less than 5.0 ohms?		Yes	RECONNECT fuel pump relay. GO to KA17 .
		No	REPAIR open in FP PWR circuit between IFS switch and FPM connection to circuit. RESTORE vehicle. RERUN Quick Test.
KA17	CHECK FOR OPEN FUEL PUMP GROUND CIRCUIT		
- Disconnect fuel pump. - Measure resistance of fuel pump ground circuit between fuel pump harness connector and ground. - Is resistance less than 5.0 ohms?		Yes	GO to KA18 .
		No	REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
KA18	CHECK FOR OPEN FP PWR CIRCUIT BETWEEN IFS SWITCH AND FUEL PUMP		
	- Measure resistance of FP PWR circuit between IFS switch and fuel pump harness connectors. - Is resistance less than 5.0 ohms?	Yes No	GO to KA19 . REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
KA19	CHECK INTERNAL RESISTANCE OF FUEL PUMP		
	- Measure internal resistance of fuel pump between FP PWR pin and ground pin of the fuel pump. - Is resistance less than 10.0 ohms?	Yes No	All fuel pump circuit checks are OK. VERIFY test step results. If all test steps are OK, RECONNECT all components. Disregard DTC P0232 at this time. RETURN to Diagnostic Subroutines where DTC was received and CONTINUE diagnosis as directed. REPLACE fuel pump. RESTORE vehicle. RERUN Quick Test.
KA20	DTC P0231: DOES ENGINE START?		
	NOTE: If key on, engine off DTC P0230 is also present and has not been diagnosed, go to KA1 (to check the primary fuel pump circuits first). Diagnostic Trouble Code (DTC) P0231 indicates a fuel pump secondary circuit failure between the B+ supply and the FPM connection to the FP PWR circuit. Possible causes: No Start: - Open circuit between the B+ supply and the FPM connection to the FP PWR circuit. - Fuel pump relay contacts always open. Engine Starts: - Damaged PCM. - Does the engine start?	Yes No	REPLACE PCM. RERUN Quick Test. GO to KA21 .
KA21	CHECK B+ VOLTAGE TO FUEL PUMP RELAY		
	- Disconnect fuel pump relay. - Measure B+ circuit voltage at fuel pump relay harness connector. - Is voltage greater than 10.5 volts?	Yes No	GO to KA22 . VERIFY integrity of fuse / fuse link for B+ supply to fuel pump relay. If OK, REPAIR open circuit. If fuse / fuse link is damaged, CHECK B+ and FP PWR circuits for short to ground before replacing. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
KA22	CHECK FOR OPEN FP PWR CIRCUIT BETWEEN FUEL PUMP RELAY AND FPM SPLICE		
	- Measure resistance between FP PWR circuit at the fuel pump relay harness connector and the battery negative post. Is resistance less than 10.0 ohms?	Yes No	REPLACE fuel pump relay. RERUN Quick Test. REPAIR open in FP PWR circuit between FPM splice and fuel pump relay. RESTORE vehicle. RERUN Quick Test.
KA30	CONTINUOUS MEMORY DTC P0232: CHECK FUEL PUMP SECONDARY CIRCUITS		
	NOTE: If Continuous Memory (DTC) P0230 is also present, GO to KA40. A Continuous Memory Diagnostic Trouble Code (DTC) P0232 indicates that one of the following intermittent conditions has occurred: - Fuel pump circuit activated when PCM expected circuit to be off (i.e., fuel system test or prime procedure). - Inertia Fuel Shutoff switch was tripped, then reset. - Open circuit in or between the fuel pump and FPM circuit at the PCM - Poor fuel pump ground. - FPM or FP PWR circuit short to power. - Fuel pump relay contacts stuck closed. - Engine stalls due to excessive load. - Key on, engine off. - Access FPM PID on Scan Tool. - Observe the FPM PID for an indication of a fault while performing the following (the FPM PID will turn ON when an open or short to power is detected): - Shake, wiggle, bend the FP PWR circuit between the FP PWR pin at the fuel pump relay and the fuel pump. - Shake, wiggle, bend the fuel pump ground circuit from the fuel pump to ground. - Shake, wiggle, bend the FPM circuit between the PCM and the splice to the FP PWR circuit. - Lightly tap the fuel pump, Inertia Fuel Shutoff switch and fuel pump relay to simulate road shock. - For 5.4L / 6.8L F-250 / 350 / 450 over 8500 lb GVW with two speed fuel pump, disconnect low speed fuel pump relay and note FPM PID. - Key off. Was a fault indicated / found?	Yes No	For 5.4L / 6.8L F-250 / 350 / 450 over 8500 lb GVW with two speed fuel pump: If the FPM PID is consistently on with the Low Speed Fuel Pump relay disconnected; VERIFY condition of fuel pump ground circuit resistor. If OK, REPAIR open circuit between low speed fuel pump relay, through resistor to splice. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. Otherwise, GO to All others Action to Take. All others: ISOLATE fault and REPAIR as necessary. COMPLETE PCM reset to clear DTCs. RERUN Quick Test. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step 21 with the following data: FPM PID and list of Possible causes.

Test Step		Result	Action to Take
KA35	CONTINUOUS MEMORY DTC P0231: CHECK HARNESS CIRCUITS		
A Continuous Memory Diagnostic Trouble Code (DTC) P0231 indicates that sometime during vehicle operation when the fuel pump was commanded on, the FPM circuit voltage went low. (Since there is no FP primary circuit DTC P0230, the primary circuit is assumed to be OK.) Possible causes: — Open in B+ circuit to the fuel pump relay. — Fuel pump relay contacts open. — Open in FP PWR circuit between the fuel pump relay and FPM splice. ● Disconnect PCM. ● Install breakout box. Leave PCM disconnected. ● Install a jumper wire between PCM Test Pin 80 (54 for 2.5L Contour/Mystique, Cougar) and PCM Test Pin 77. ● Connect a digital multimeter between PCM Test Pin 40 and PCM Test Pin 51. ● Key on. The fuel pump will turn on and voltage will be greater than 10.0 volts. ● Observe voltage for an indication of a fault while performing the following (voltage will change suddenly when a fault is detected, indicating an open): — Shake, wiggle, bend the B+ circuit to the fuel pump relay. — Lightly tap the fuel pump relay to simulate road shock. — Shake, wiggle, bend the FP PWR circuit between the fuel pump relay and the FPM splice. ● Key off. ● Inspect the fuel pump relay connector for corrosion and damaged pins. ● Is a fault indicated?		Yes	▶ ISOLATE fault and REPAIR as necessary. RESTORE vehicle. RERUN Quick Test. ▶ Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: FPM PID and list of Possible causes.
		No	

Test Step		Result	Action to Take
KA40	CONTINUOUS MEMORY DTC P0230: CHECK FUEL PUMP PRIMARY CIRCUITS		
	A Continuous Memory Diagnostic Trouble Code (DTC) P0230 indicates a fuel pump primary circuit failure has occurred during vehicle operation. Possible causes: — Open in VPWR circuit to fuel pump relay. — Open coil in fuel pump relay. — Open in Fuel Pump (FP) circuit PCM Pin 80 (54 for 2.5L Contour/Mystique, Cougar). ● Connect scan tool. ● Key on, engine off. Wait 5 seconds. ● Access FPF PID. The FPF PID will be NO, indicating that the PCM detects VPWR voltage through the fuel pump relay coil and FP circuit. ● Observe the FPF PID for an indication of a fault while performing the following (the FPF PID will read YES, when an open is detected (this is because the PCM will not detect VPWR voltage on Pin 80 (FP)) — Shake, wiggle, bend the Fuel Pump (FP) circuit between the PCM Pin 80 (54 for 2.5L Contour/Mystique, Cougar) and the fuel pump relay. — Shake, wiggle bend the VPWR circuit between the electronic engine control power relay and the fuel pump relay. — Lightly tap the fuel pump relay (to simulate road shock). ● Key off. ● Inspect the PCM and fuel pump relay connectors for corrosion, damaged pins. ● Is a fault indicated?	Yes No	ISOLATE fault and REPAIR as necessary. COMPLETE PCM reset to clear DTCs. RERUN Quick Test. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: FPF PID and list of Possible causes. When testing the FP circuit with the engine running, also monitor the FPM PID. This is because not all FP circuit failures can be detected using only the FPF PID.
KA45	DTC P1232: CHECK VPWR VOLTAGE TO LOW SPEED FUEL PUMP RELAY		
	DTC P1232 indicates a low speed fuel pump primary circuit failure. Possible causes: — Open or shorted circuit. — Damaged low speed fuel pump relay. — Damaged PCM. ● Disconnect low speed fuel pump relay. ● Key on, engine off. ● Measure VPWR circuit voltage at the low speed fuel pump relay harness connector. ● Key off. ● Was voltage greater than 10.5 volts?	Yes No	GO to KA46. REPAIR open in VPWR circuit between the Electronic Engine Control power relay and the low speed fuel pump relay. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
KA46	CHECK LOW SPEED FUEL PUMP RELAY		
	- Measure resistance between pin 85 and all other pin of the low speed fuel pump relay (pin numbers moulded on relay). One measurement must be between 40 and 85 ohms, with the other measurements being greater than 10,000 ohms. Are all resistance checks OK?	Yes No	GO to KA47 . REPLACE low speed fuel pump relay. RESTORE vehicle. RERUN Quick Test.
KA47	CHECK LOW FUEL PUMP (LFP) CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Disconnect PCM. - Key on. - Measure voltage between LFP circuit in harness and ground. - Key off. Was voltage less than 1.0 volt?	Yes No	GO to KA48 . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
KA48	CHECK LFP CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool from DLC. - Measure resistance between LFP circuit in harness and ground. Is resistance less than 10,000 ohms?	Yes No	GO to KA49 . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
KA49	CHECK FOR OPEN LFP CIRCUIT		
	- Install breakout box, leave PCM disconnected. - Measure resistance of LFP circuit between PCM test pin 19 and the low speed fuel pump relay harness connector. Is resistance less than 5.0 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
KA55	CHECK FOR OPEN FUEL PUMP GROUND CIRCUIT THROUGH RESISTOR		
	- Disconnect low speed fuel pump relay. - Key on, engine off. - Again, access FPM PID. - Key off. Was the FPM PID off?	Yes No	No fault is detected. The applicable fuel pump circuits of OK in the harness and PCM. DISREGARD DTC P0232 at this time. RETURN to the Diagnostic Subroutines where DTC P0232 was received and CONTINUE diagnosis as directed. VERIFY condition of fuel pump ground circuit resistor. If OK, REPAIR open circuit between low speed fuel pump relay, through resistor, to splice. RESTORE vehicle. RERUN Quick Test.

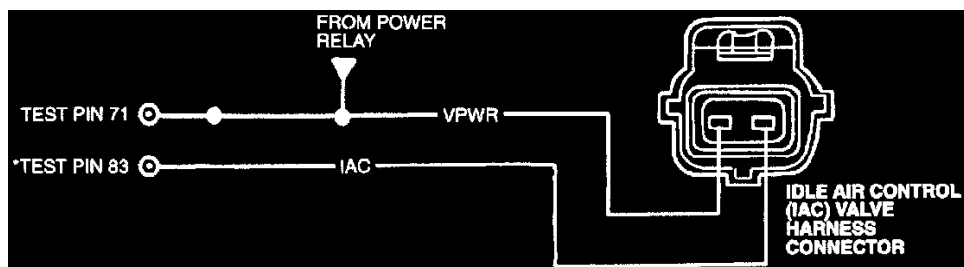
Test Step		Result	Action to Take
KA60	CONTINUOUS MEMORY DIAGNOSTIC TROUBLE CODE (DTC) P1232: CHECK LOW SPEED FUEL PUMP PRIMARY CIRCUITS		
A Continuous Memory DTC P1232 indicates a low speed fuel pump primary circuit failure has occurred during vehicle operation. Possible causes: — Open in VPWR circuit to low speed fuel pump relay. — Open coil in low speed fuel pump relay. — Open in Low Fuel Pump (LFP) circuit (PCM Pin 19). • Connect scan tool. • Key on, engine off. Wait 5 seconds. • Access LFPF PID. The LFPF PID will be NO, indicating that the PCM detects VPWR voltage through the low speed fuel pump relay coil and LFP circuit (Pin 19) to the PCM. • Observe the LFPF PID for an indication of a fault while performing the following (the LFPF PID will be YES if a fault is detected). — Shake, wiggle, bend the LFP circuit between the PCM (Pin 19) and the low speed fuel pump relay. — Shake, wiggle, bend the VPWR circuit between the electronic engine control power relay and the low speed fuel pump relay. — Lightly tap the low speed fuel pump relay (to simulate road shock). • Key off. • Inspect the PCM and low speed fuel pump relay connectors for corrosion, damaged pins. • Is a fault indicated?		Yes	ISOLATE fault and REPAIR as necessary. COMPLETE PCM reset to clear DTCs. RERUN Quick Test.
		No	Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step 21 with the following data: LFPF PID and list of Possible causes.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

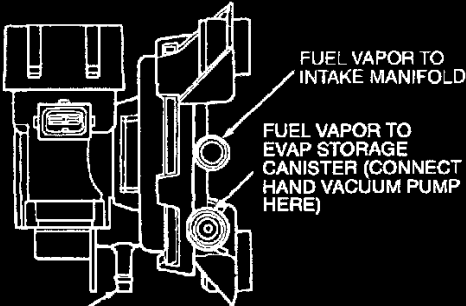
- Idle Air Control (IAC) valve assembly
- Harness Circuits: IAC and VPWR
- Powertrain control module



Test Step		Result	Action to Take
KE1	IDLE CONCERNS OR STALLS: RUN KOER SELF-TEST AND OUTPUT CONTINUOUS MEMORY DTCS		
	The Symptom Charts have indicated that there was no change in idle quality when the IAC valve was disconnected. ● Retrieve and record all Continuous Memory DTCS. ● NOTE: If unable to perform KOER Self-Test to completion, go directly to KE2. Run Key On Engine Running (KOER) Self-Test. ● Key off. ● Was DTC P0505, P1504 or P1507 retrieved during KOER Self-Test or from Continuous Memory?	Yes No	GO to KE2. The IAC system is OK. RETURN to Symptom Charts.
KE2	DTC P0505, P1504, P1507 OR STARTS ONLY AT PART THROTTLE: CHECK VPWR VOLTAGE TO IAC VALVE		
	DTC P0505 indicates that Self-Test has detected an IAC system malfunction. DTC P1504 indicates that Self-Test has detected an IAC circuit malfunction. DTC P1507 indicates that Self-Test has detected an IAC underspeed error. NOTE: If EGR DTC P0402 was output during Self Test, diagnose it first before continuing with this Pinpoint Test (Refer to Diagnostic Subroutines). Possible causes: — IAC circuit open. — IAC circuit shorted to PWR. — IAC circuit short to GND (P1504). — VPWR circuit open. — Air inlet plugged (P0505, P1507). — Air inlet leakage (P1507). — Damaged IAC valve. — Damaged throttle body (P0505, P1507). — Damaged PCM. ● Disconnect IAC valve assembly vehicle harness connector. ● Key on. ● Measure voltage of VPWR circuit between IAC valve harness connector and ground. ● Key off. ● Was voltage greater than 10.5 volts?	Yes No	GO to KE3. REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
KE3	CHECK IAC VALVE RESISTANCE		
	- Key off. - IAC valve disconnected. - NOTE: Due to diode in solenoid, place digital multimeter (+) lead on VPWR pin and (-) lead on IAC pin. Measure IAC valve resistance. - Is resistance between 6.0 and 13.0 ohms?	Yes No	GO to KE4 . REPLACE IAC valve. RESTORE vehicle. RERUN Quick Test.
KE4	CHECK IAC VALVE FOR AN INTERNAL SHORT TO IAC CASE		
	- Measure the resistance from either IAC valve pin to IAC valve case. - Is resistance greater than 10,000 ohms?	Yes No	For DTC P1504: GO to KE7 . All others: GO to KE5 . REPLACE IAC valve. RESTORE vehicle. RERUN Quick Test.
KE5	CHECK AIR INLET FOR PLUGGING		
	- Inspect the entire intake air system for debris, blockage and other damage. - Remove and inspect the air cleaner element for excessive dirt. - Is the intake air system OK?	Yes No	GO to KE6 . REPAIR as necessary. RESTORE vehicle. RERUN Quick Test.
KE6	CHECK FOR VACUUM LEAKS		
	- Key on, engine running. - With engine running at idle, listen for vacuum leaks. - Inspect the entire intake air system from the mass air flow (MAF) sensor to the intake manifold for leaks such as: - Cracked or punctured intake air tube. - Loose intake air tube at air cleaner housing or throttle body. - IAC valve or gasket seal. - EGR valve gasket seal. - Vacuum supply connector and hose. - PCV connectors and hose. - Key off. - Were any leaks detected in the above areas?	Yes No	REPAIR as necessary. RESTORE vehicle. RERUN Quick Test. GO to KE7 .
KE7	CHECK IAC CIRCUIT FOR OPEN IN HARNESS		
	- IAC valve disconnected. - Install breakout box, leave PCM disconnected. - Measure resistance of IAC circuit between PCM test pin 83 and IAC valve harness connector. - Is resistance less than 5.0 ohms?	Yes No	GO to KE8 . REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
KE8	CHECK IAC CIRCUIT FOR SHORT TO PWR IN HARNESS		
	● Key on, engine off. ● Measure voltage between PCM test pin 83 and ground. ● Key off. ● Was voltage less than 1.0 volt?	Yes No	GO to KE9 . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
KE9	CHECK IAC CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	● Disconnect scan tool from DLC. ● Measure resistance between PCM test pin 83 and PCM test pins 51 and 103. ● Is each resistance greater than 10,000 ohms?	Yes No	GO to KE10 . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
KE10	CHECK IAC SIGNAL FROM PCM		
	● Reconnect PCM. ● Reconnect IAC valve. ● Connect digital multimeter between Test Pin 83 and Test Pin 51. ● Start engine. ● Slowly increase rpm to 3000 rpm. ● Key off. ● Was voltage between 3.0 and 11.5 volts?	Yes No	For Continuous Memory DTCs P1504 and P1507: GO to KE30 . All others: INSPECT throttle body for damage. REPAIR as necessary. If OK, REPLACE IAC valve. RESET Keep Alive Random Access Memory (RAM). COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. REPLACE PCM. RESTORE vehicle. RERUN Quick Test.
KE20	DTC P1506: CHECK FOR VACUUM LEAKS		
	Diagnostic Trouble Code (DTC) P1506 indicates Self-Test has detected an IAC overspeed error. Possible causes: — IAC circuit short to GND. — IAC valve stuck open. — Vacuum leak. — Damaged IAC valve. — Damaged throttle body. — Damaged PCM.	Yes No	REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. GO to KE21 .
	● Key on, engine running. ● With the engine at idle, listen for vacuum leaks. ● Inspect the entire intake air system from the mass air flow (MAF) sensor to the intake manifold for damage or leaks such as: ● Cracked or punctured intake air tube. ● Loose intake air tube at the air cleaner housing or throttle body. ● IAC valve or gasket seal. ● Intake manifold assembly or gasket seal. ● EGR valve gasket seal. ● Vacuum supply connectors and hose. ● PCV valve, connectors and hose. ● Key off. ● Were any leaks detected in the above areas?		

Test Step		Result	Action to Take
KE21	CHECK EVAP SYSTEM FOR A STUCK OPEN VALVE		
	● Disconnect hoses at EVAP canister purge valve (or VMV). ● Connect a hand vacuum pump at the fuel vapor port to EVAP canister at the EVAP canister purge valve (or VMV). ● Apply 53 kPa (16 in-Hg) of vacuum to EVAP canister purge valve (or VMV). VMV SHOWN  AA0937-C ● Does the EVAP canister purge valve (or VMV) hold vacuum for 20 seconds?	Yes No	▶ RECONNECT hoses. GO to KE22. ▶ REPLACE EVAP canister purge valve. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
KE22	CHECK IAC VALVE ASSEMBLY FOR PROPER FUNCTION		
	● Key on, engine running. ● Bring engine to normal operating temperature. ● Transmission in PARK or NEUTRAL. ● Disconnect IAC valve. ● Key off. ● Did the rpm drop or engine stall?	Yes No	▶ GO to KE23. ▶ INSPECT throttle body for damage. REPAIR as necessary. If OK, REPLACE IAC valve. COMPLETE PCM Reset to clear DTCs. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.

Test Step		Result	Action to Take
KE23	CHECK IAC CIRCUIT FOR SHORT TO GND IN HARNESS		
	- Disconnect scan tool from DLC. - Install breakout box, leave PCM disconnected. - Measure resistance between PCM test pin 83 and PCM test pins 51 and 103. - Is each resistance greater than 10,000 ohms?	Yes ▶ No ▶	For fast idle symptom currently present: REPLACE PCM. REMOVE breakout box. RESTORE vehicle. RERUN Quick Test. All others: RESTORE vehicle. GO to KE30. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
KE25	DTC P1505: CHECK INTAKE AIR CONNECTION		
	Diagnostic Trouble Code (DTC) P1505 indicates the IAC system has reached the idle air trim limit. Possible causes: — Air leaks. — Plugged air cleaner. — Throttle body / linkage binding. — Contaminated or damaged IAC valve. — Damaged throttle body. - Inspect the entire intake air system for leaks such as loose connection at throttle body or air cleaner, cracked or punctured ducting. - Is there a leak or loose connection in the intake air system?	Yes ▶ No ▶	REPAIR as necessary. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test. GO to KE26.
KE26	CHECK FOR A PLUGGED AIR CLEANER ELEMENT		
	- Key off. - Remove air cleaner element and check for excessive dirt or moisture. - Is the air cleaner element plugged?	Yes ▶ No ▶	REPAIR as necessary. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test. GO to KE27.
KE27	INSPECT THROTTLE BODY AND LINKAGE		
	- Disconnect accelerator cable and air cleaner tube from throttle body. - Exercise both cable and throttle body linkage separately while checking for binding, interference and full freedom of travel. - Is a fault indicated?	Yes ▶ No ▶	GO to Pinpoint Test Step HU3. GO to Pinpoint Test Step HU8.
KE30	CHECK IAC SYSTEM FOR INTERMITTENT OPEN OR SHORT		
	- Scan tool connected. - Key on, engine running. - Access IAC PID and RPM PIDs. - With engine at normal operating temperature, accessories off and at idle, the IAC duty cycle must be between 20% and 45%. - Observe the PIDs for an indication of a fault while performing the following at idle: - Lightly tap on IAC valve and wiggle harness connector to simulate road shock. - Grasp the vehicle harness closest to the IAC valve. Shake and bend a small section of the harness from the IAC to the dash panel and from the dash panel to the PCM. - Do the IAC or RPM PIDs suddenly change in value indicating a fault?	Yes ▶ No ▶	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. For idle quality, starting or stalling symptoms currently present: REPLACE IAC valve assembly. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. All others: Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: IAC, RPM PIDs and list of Possible causes.

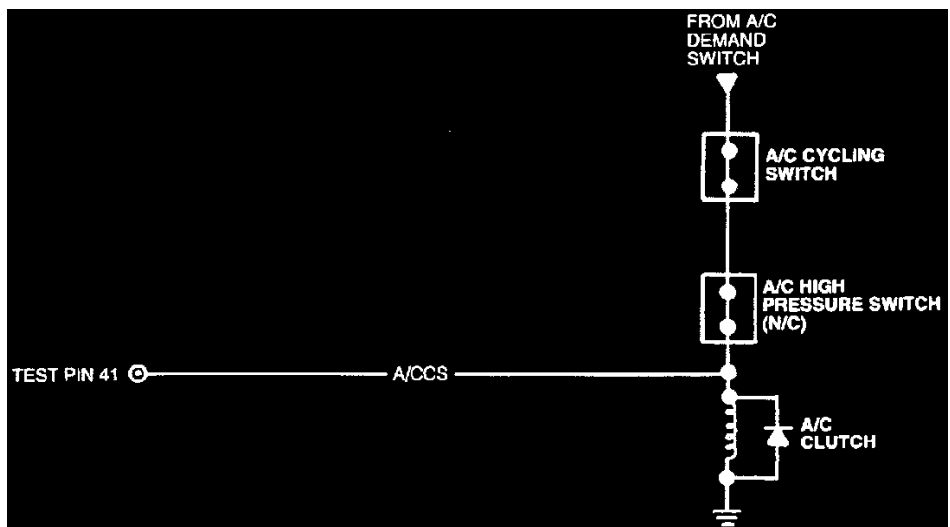
Test Notes

Enter this pinpoint test only when directed here.

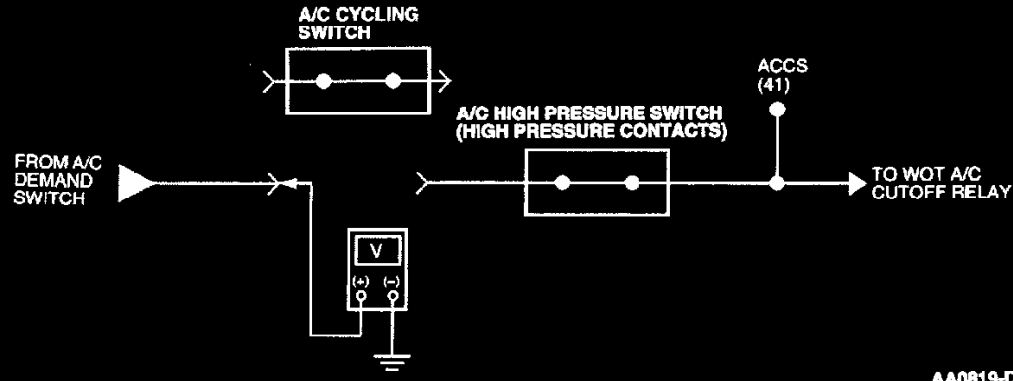
This pinpoint test is intended to diagnose the following:

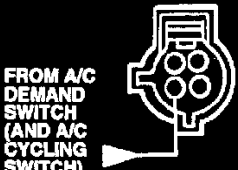
- Harness Circuits: VPWR, A/C demand to WOT A/C cutoff relay, A/CCS, WAC, A/C clutch PWR clutch
- Wide Open Throttle Air Conditioning (WOT A/C) cutoff relay

- Powertrain control module



Test Step		Result	Action to Take
KM1	KOEO/KOER DTC P1460: VERIFY ACCS PID IS OFF		
	Key On Engine Off (KOEO) and Key On Engine Running (KOER) Diagnostic Trouble Code (DTC) P1460 indicates a WAC circuit fault or the A/C was on during Self-Test. NOTE: Verify A/C and defrost were off during KOEO/KOER Self-Tests. If the vehicle is not equipped with A/C, the WOT A/C Cutoff (WAC) circuit is not used and the DTC P1460 can be ignored. Possible causes: — A/C on during Self-Test. — Open or shorted circuit. — Damaged WOT A/C cutoff relay. — Damaged PCM. • Start engine. • A/C and defroster off. • Access ACCS PID. • Key off. • Was the ACCS PID off?	Yes No	GO to KM2. GO to KM20 to check A/C circuits for short to power.
KM2	CHECK VPWR VOLTAGE TO WOT A/C CUTOFF RELAY		
	• Disconnect WOT A/C cutoff relay. • Key on, engine off. • Measure VPWR circuit voltage at the WOT A/C cutoff relay harness connector. • Key off. • Was voltage greater than 10.5 volts?	Yes No	GO to KM3. REPAIR open circuit. RESTORE vehicle. START engine. Turn A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test.
KM3	CHECK WOT A/C CUTOFF RELAY		
	• Refer to pin numbers moulded on WOT A/C cutoff relay. There will be either a Pin 1 or Pin 85. • Measure resistance between either Pin 1 or Pin 85 and all other pins of the WOT A/C cutoff relay. One measurement must be between 40 and 120 ohms, with the other measurements being greater than 10,000 ohms. • Are all resistance checks OK?	Yes No	GO to KM4. REPLACE WOT A/C cutoff relay. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test.
KM4	CHECK WOT A/C CUTOFF (WAC) CIRCUIT FOR SHORT TO POWER IN HARNESS		
	• Install breakout box, leave PCM disconnected. • Key on, engine off. • Measure voltage between PCM test pin 69 and ground. • Key off. • Was voltage less than 1.0 volt?	Yes No	GO to KM5. REPAIR short circuit. RESTORE vehicle. START engine. Turn A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test.
KM5	CHECK WAC CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	• Disconnect scan tool from DLC. • Measure resistance between PCM test pin 69 and ground. • Is resistance greater than 10,000 ohms?	Yes	GO to KM6. REPAIR short circuit. RESTORE vehicle. START engine. Turn A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test.
KM6	CHECK WAC CIRCUIT FOR OPEN IN HARNESS		
	• Measure resistance of WAC circuit between PCM Test Pin 69 and the WOT A/C cutoff relay harness connector. • Is resistance less than 5.0 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. START engine. Turn A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test. REPAIR open circuit. RESTORE vehicle. START engine. Turn A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test.

Test Step		Result	Action to Take
KM10	ACCS PID OFF WITH A/C ON: CHECK FOR VOLTAGE TO A/C CYCLING SWITCH		
	● Key on, engine off. ● Disconnect A/C cycling switch. ● A/C demand switch to A/C on. ● Measure voltage at the A/C demand switch side of the A/C cycling switch harness connector. ● Key off. ● Was voltage greater than 10.5 volts?	Yes No	GO to KM11. GO to Heating and Air conditioning to check A/C demand switch operation, applicable fuses, wiring to A/C cycling switch or other checks as directed.
			
KM11	CHECK IF A/C CYCLING SWITCH CONTACTS ARE CLOSED		
	● Measure resistance of the A/C cycling switch contacts at the A/C cycling switch connector. ● Is resistance less than 5.0 ohms?	Yes No	RECONNECT A/C cycling switch. GO to KM12. GO to Heating and Air conditioning to check for causes of A/C cycling switch being open (such as low refrigerant charge). REPAIR as necessary. RESTORE vehicle. VERIFY a symptom no longer exists.

Test Step		Result	Action to Take
KM12	CHECK FOR VOLTAGE TO A/C HIGH PRESSURE SWITCH		
- Disconnect A/C high pressure switch. - Key on, engine off. - A/C on. - Measure voltage at the A/C demand switch pin of the A/C high pressure switch harness connector. - Key off. - Was voltage greater than 10.5 volts?  "DUAL FUNCTION" A/C HIGH PRESSURE SWITCH (ACPSW) HARNESS CONNECTOR (CONTOUR/MYSTIQUE, WINDSTAR) AA3012-A		Yes No	GO to KM13. REPAIR open between A/C cycling switch and A/C high pressure switch. RESTORE vehicle. VERIFY a symptom no longer exists.
KM13	CHECK CONTINUITY OF A/C HIGH PRESSURE SWITCH HIGH PRESSURE CONTACTS		
- Measure resistance of the A/C high pressure switch high pressure contacts (these are the normally closed contacts). - Is resistance less than 5.0 ohms?		Yes No	RECONNECT A/C high pressure switch. GO to KM14. CHECK for overpressurized A/C system, etc. If OK, REPLACE A/C high pressure switch. VERIFY a symptom no longer exists.
KM14	CHECK ACCS CIRCUIT VOLTAGE TO PCM		
- Install breakout box, leave PCM disconnected. - Key on. - A/C ON. - Measure voltage at PCM test pin 41. - Is voltage greater than 10.5 volts?		Yes No	REPLACE PCM. RESTORE vehicle. VERIFY a symptom no longer exists. REPAIR open circuit between the A/C high pressure switch and PCM. RESTORE vehicle. VERIFY a symptom no longer exists.

Test Step		Result	Action to Take
KM15	NO/LOW VOLTAGE TO A/C CLUTCH (ACCS PID ON WITH A/C ON): CHECK A/C DEMAND SWITCH VOLTAGE TO WOT A/C CUTOFF RELAY		
	● Key off. ● Disconnect WOT A/C cutoff relay. ● Key on. ● A/C demand switch to A/C on. ● Measure voltage at the A/C demand switch input pin at the WOT A/C cutoff relay harness connector. ● Key off, A/C off. ● Was voltage greater than 10.5 volts?	Yes No	▶ For Contour/Mystique: GO to KM35. ▶ For all others: GO to KM16. ▶ REPAIR open in A/C demand circuit between WOT A/C cutoff relay and ACCS circuit splice to PCM. RESTORE vehicle. VERIFY a symptom no longer exists.
KM16	CHECK A/C CLUTCH PWR AND A/C CLUTCH GROUND CIRCUITS FOR OPEN IN HARNESS		
	● Disconnect A/C clutch. ● Disconnect scan tool from DLC. ● Measure resistance of the A/C clutch PWR circuit between the WOT A/C cutoff relay harness connector and the A/C clutch harness connector. ● Measure resistance of the A/C clutch ground circuit between the A/C clutch harness connector and ground. ● Is each resistance less than 5.0 ohms?	Yes No	▶ REPLACE WOT A/C cutoff relay. RESTORE vehicle. VERIFY a symptom no longer exists. ▶ REPAIR open circuit. RESTORE vehicle. VERIFY a symptom no longer exists.
KM19	DTC P1464: CHECK ACCS PID		
	Diagnostic Trouble Code (DTC) P1464 indicates the ACCS input to the Powertrain Control Module (PCM) was high during Self-Test. NOTE: Verify A/C and defrost were off during Self-Test. If A/C or defrost were on, turn off and rerun Self-Test. ● Key on, engine off. ● Connect scan tool. ● A/C and defrost off. ● Access ACCS PID. ● Key off. ● Was ACCS PID on?	Yes No	▶ GO to KM20. ▶ The ACCS PID indicates that the ACCS input to the PCM is low. VERIFY test results. With A/C and defrost off, RERUN Self-Test where P1464 was received.

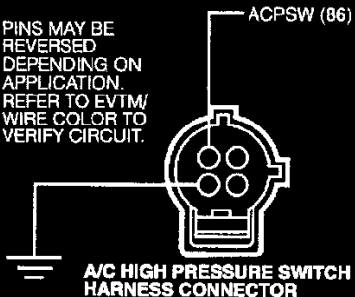
Test Step		Result	Action to Take
KM20	ACCS PID ON: DISCONNECT A/C CYCLING SWITCH AND CHECK IF ACCS PID TURNS OFF		
	- Disconnect A/C cycling switch. - Key on, engine off. - Access ACCS PID. - Key off. Was ACCS PID off?	Yes No	VERIFY operation of A/C demand switch. If OK, REPAIR short to power in A/C Demand circuit to A/C cycling switch. RESTORE vehicle. VERIFY a symptom no longer exists. For applications without WOT A/C cutoff relay (E/F Series, Expedition, Navigator): GO to KM22 For Contour/Mystique: GO to KM45. All others: GO to KM21.
KM21	CHECK A/C CLUTCH PWR CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Disconnect WOT A/C cutoff relay. - Key on, engine off. - Measure voltage between A/C Clutch PWR circuit in harness connector and ground. - Key off. Was voltage less the 1.0 volt?	Yes No	GO to KM22. REPAIR short circuit. RESTORE vehicle. VERIFY a symptom no longer exists.
KM22	CHECK ACCS CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Disconnect PCM. - Install breakout box, leave PCM disconnected. - Key on. - Measure voltage between PCM test pin 41 and ground. - Key off. Was voltage less than 1.0 volt?	Yes No	For application without WOT A/C cutoff relay: REPLACE PCM. RESTORE vehicle. RERUN Quick Test. All others: GO to KM23. REPAIR short circuit. RESTORE vehicle. VERIFY a symptom no longer exists.
KM23	CHECK ACCS CIRCUIT VOLTAGE TO PCM WITH WOT A/C CUTOFF RELAY CONNECTED		
	- Reconnect WOT A/C cutoff relay. - Key on. - Again, measure voltage between PCM test pin 41 and ground. - Key off. Was voltage less than 1.0 volt?	Yes No	REPLACE PCM. RESTORE vehicle. VERIFY a symptom no longer exists. REPLACE WOT A/C cutoff relay. RESTORE vehicle. VERIFY a symptom no longer exists.

Test Step		Result	Action to Take
KM25	NO WOT A/C CUTOFF W/NO DTCs: CHECK WOT A/C CUTOFF RELAY		
	● Connect scan tool. ● A/C clutch and WOT A/C cutoff relay connected. ● Key on, engine off. ● Access Output Test Mode on Scan Tool. ● A/C on. ● While listening to the A/C clutch, command the outputs off and on a couple times. ● Key off. ● Does the A/C clutch engage and disengage when the outputs are cycled off and on?	Yes No	▶ The Electronic Engine Control system is operating properly. If symptom is intermittent, GO to Pinpoint Test Step Z1 with the following data: WACF PID. Otherwise, testing is complete. Key off. RETURN to the symptom charts. ▶ VERIFY that the A/C clutch was engaged during testing. If not, REPEAT test with clutch engaged. If clutch was engaged, REPLACE WOT A/C cutoff relay. RESTORE vehicle. VERIFY a symptom no longer exists.
KM30	CONTINUOUS MEMORY DTC P 1460: CHECK WAC CIRCUIT FOR INTERMITTENT CONCERNS		
	A Continuous Memory Diagnostic Trouble Code (DTC) P1460 indicates a WOT A/C cutoff circuit fault has occurred during vehicle operation. NOTE: If the vehicle is not equipped with A/C, the WAC circuit is not used and the P1460 can be ignored. Possible causes: — Open or short in WAC circuit (PCM Pin 69). — Open VPWR to WOT A/C cutoff relay. ● Key off. ● Disconnect A/C cycling switch. ● Install a jumper wire in the A/C cycling switch harness connector (to complete the circuit). ● Key on, engine off. ● A/C demand switch on. ● Check WAC circuit for open or short to power while performing the following (the A/C clutch will click on when a fault is detected): — Shake, wiggle, bend the WAC circuit between the PCM (pin 69) and the WOT A/C cutoff relay. — Lightly tap on the WOT A/C cutoff relay (to simulate road shock). ● Is a fault indicated?	Yes No	▶ Key off. ISOLATE fault and REPAIR as necessary. REMOVE jumper wire. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. START engine. Turn A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test. ▶ GO to KM31.

Test Step		Result	Action to Take
KM31	CHECK WOT A/C CUTOFF CIRCUIT FOR INTERMITTENT CONCERNS		
	● Key on, engine off. ● Jumper wire installed in A/C cycling switch. ● A/C demand on. ● Access Output Test Mode on scan tool. ● Turn outputs off (this will prevent the WAC circuit from turning off the A/C clutch). ● Check WAC circuit for short to ground while performing the following (the A/C clutch will click off when a fault is detected): — Shake, wiggle, bend the WAC circuit between the PCM (pin 69) and the WOT A/C cutoff relay. — Shake, wiggle, bend the VPWR circuit to the WOT A/C cutoff relay. — Lightly tap on the WOT A/C cutoff relay (to simulate road shock). ● Key off, A/C off. ● Is a fault indicated?	Yes No	ISOLATE fault and REPAIR as necessary. REMOVE jumper wire. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. START engine. Turn A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: WACF PID and list of Possible causes.
KM35	CHECK NORMALLY CLOSED CONTACTS OF THE WOT A/C CUTOFF RELAY		
	● Measure resistance of the normally closed contacts of the WOT A/C cutoff relay (Pins 3 and 4 of relay.) ● Is resistance less than 5.0 ohms?	Yes No	GO to KM36. REPLACE WOT A/C cutoff relay. RESTORE vehicle. VERIFY a symptom no longer exists.
KM36	CHECK IGNITION RUN VOLTAGE TO A/C CLUTCH RELAY		
	● Disconnect A/C Clutch relay (refer to pinpoint test schematic). ● Key on, engine off. ● Measure ignition run circuit voltage at the A/C clutch relay harness connector. ● Key off. ● Was voltage greater than 10.5 volts?	Yes No	GO to KM37. CHECK condition of related fuse. If fuse is damaged, verify ignition run circuit is not shorted to ground. If OK, REPAIR open circuit. RESTORE vehicle. VERIFY a symptom no longer exists.
KM37	CHECK FOR OPEN GROUND CIRCUIT TO A/C CLUTCH RELAY		
	● Measure resistance of the ground circuit between the A/C clutch relay harness connector and ground. ● Is resistance less than 5.0 ohms?	Yes No	GO to KM38. REPAIR open circuit. RESTORE vehicle. VERIFY a symptom no longer exists.

Test Step		Result	Action to Take
KM38	CHECK A/C DEMAND CIRCUIT FOR OPEN BETWEEN WOT A/C CUTOFF RELAY AND A/C CLUTCH RELAY		
	- Measure resistance of the A/C demand circuit between the WOT A/C cutoff relay and A/C clutch relay harness connectors. - Is resistance less than 5.0 ohms?	Yes No	GO to KM39 . REPAIR open circuit. RESTORE vehicle. VERIFY a symptom no longer exists.
KM39	CHECK A/C CLUTCH PWR AND A/C CLUTCH GROUND CIRCUITS FOR OPEN IN HARNESS		
	- Disconnect A/C clutch. - Disconnect scan tool from DLC. - Measure resistance of A/C clutch PWR circuit between A/C clutch relay and the A/C clutch harness connector. - Measure resistance of A/C clutch ground circuit between A/C clutch harness connector and ground. - Is each resistance less than 5.0 ohms?	Yes No	REPLACE A/C Clutch relay. RESTORE vehicle. VERIFY a symptom no longer exists. REPAIR open circuit. RESTORE vehicle. VERIFY a symptom no longer exists.
KM45	DISCONNECT A/C CLUTCH RELAY AND CHECK IF ACCS PID TURNS OFF		
	- Key off. - A/C high pressure switch disconnected. - Disconnect A/C clutch relay (refer to pinpoint test schematic). - Key on, engine off. - Again, access ACCS PID. - Is ACCS PID now off?	Yes No	Key off. REPLACE A/C clutch relay. RESTORE vehicle. VERIFY a symptom no longer exists. GO to KM46 .
KM46	CHECK A/C DEMAND CIRCUIT BETWEEN WOT A/C CUTOFF RELAY AND A/C CLUTCH RELAY FOR SHORT TO POWER		
	- Disconnect WOT A/C cutoff relay. - Key on, engine off. - Measure voltage between the A/C demand to A/C clutch relay circuit at the WOT A/C cutoff relay harness connector and ground. - Key off. - Was voltage less than 1.0 volt?	Yes No	GO to KM47 . REPAIR short to power. RESTORE vehicle. VERIFY a symptom no longer exists.
KM47	CHECK ACCS PID WITH WOT A/C CUTOFF RELAY DISCONNECTED		
	- Key on, engine off. - Again, access ACCS PID. - Key off. - Was ACCS PID off?	Yes No	REPLACE WOT A/C cutoff relay. RESTORE vehicle. VERIFY a symptom no longer exists. GO to KM48 .

Test Step		Result	Action to Take
KM48	CHECK ACCS CIRCUIT TO PCM FOR SHORT TO POWER IN HARNESS		
	- Disconnect PCM. - Install breakout box, leave PCM disconnected. - Key on. - Measure voltage between PCM test pin 41 and ground. - Key off. - Was voltage less than 1.0 volt?	Yes No	REPLACE PCM. RESTORE vehicle. VERIFY a symptom no longer exists. REPAIR short to power. RESTORE vehicle. VERIFY a symptom no longer exists.
KM50	VOLTAGE ALWAYS AT A/C CLUTCH (ACCS PID OFF): CHECK FOR A/C CLUTCH RELAY CONTACTS STUCK CLOSED		
	- Disconnect A/C clutch. - Disconnect A/C clutch relay (refer to Pinpoint Test Schematic). - Key on, engine off. - Again measure voltage between the power pin and ground pin at the A/C clutch harness connector. - Key off. - Was voltage less than 2.0 volts?	Yes No	REPLACE A/C clutch relay. RESTORE vehicle. VERIFY a symptom no longer exists. REPAIR A/C Clutch PWR circuit short to power. RESTORE vehicle. VERIFY a symptom no longer exists.

Test Step		Result	Action to Take
KM55	CHECK A/C HIGH PRESSURE SWITCH MEDIUM PRESSURE CIRCUITS		
NOTE: An A/C high pressure switch medium pressure circuit concern can result in the high speed cooling fan not coming on when the A/C refrigerant pressure becomes high. In hot ambient conditions, this may result in the refrigerant pressure continuing to increase until the A/C high pressure switch high pressure contacts open, shutting off the A/C until the pressure drops to an acceptable range. ● Key off. ● Disconnect A/C high pressure switch. ● A/C off (to prevent chance of short circuits). ● Connect a jumper wire between the A/C high pressure switch circuit and ground circuit at the A/C high pressure switch harness connector. ● Start engine, wait 15 seconds. ● Does the high speed fan come on? PINS MAY BE REVERSED DEPENDING ON APPLICATION. REFER TO EVTM/ WIRE COLOR TO VERIFY CIRCUIT.  AA0818-B		Yes ▶ Key off. A/C high pressure switch medium pressure circuits are OK. REMOVE jumper. RECONNECT A/C high pressure switch. DIAGNOSE pressure problem. No ▶ An A/C high pressure switch medium pressure circuit concern may exist. GO to KM56.	
KM56	CHECK FOR OPEN GROUND CIRCUIT TO A/C HIGH PRESSURE SWITCH		
● Key on, engine running. ● Connect jumper wire between the A/C high pressure switch circuit at the A/C high pressure switch harness connector and the battery negative post. ● Wait 15 seconds. ● Does the high speed fan come on now?		Yes ▶ Key off. REPAIR open ground circuit to the A/C high pressure switch. REMOVE jumper wire. RESTORE vehicle. VERIFY a symptom no longer exists. No ▶ Key off. REMOVE jumper wire. GO to KM57.	
KM57	CHECK FOR OPEN A/C HIGH PRESSURE SWITCH (ACPSW) CIRCUIT BETWEEN A/C HIGH PRESSURE SWITCH AND PCM		
● Disconnect PCM. ● Install breakout box, leave PCM disconnected. ● Measure resistance of the ACPSW circuit between PCM test pin 86 and the A/C high pressure switch harness connector. ● Is resistance less than 5.0 ohms?		Yes ▶ REPLACE PCM. RESTORE vehicle. VERIFY a symptom no longer exists. No ▶ REPAIR open circuit. RESTORE vehicle. VERIFY a symptom no longer exists.	

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Connection between the scan tool and the powertrain control module.
- Connection between the scan tool and the battery power supply.
- Proper key sequence executed for output(s).

Test Step		Result	Action to Take
MB1	CHECK VEHICLE DLC TO SCAN TOOL CONNECTION AND WIRING		
- Inspect the connection between the scan tool and data link connector (DLC) for damaged or pushed out pins. - Inspect the scan tool wiring cable for obvious damage. Are the DLC and scan tool properly connected and is the scan tool wiring cable OK?		Yes No	GO to MB2 . REPAIR as necessary. RUN the Scan Tool On-Board System Readiness test to verify communication between the scan tool and PCM
MB2	CHECK SCAN TOOL POWER SUPPLY CONNECTOR AND WIRING CABLE		
- Inspect the connector and wiring cable between the scan tool and the vehicle battery power supply (or at the cigar lighter) for obvious damage. Are the power supply connector and wiring cable OK?		Yes No	There are no installation concerns between the Scan Tool and the vehicle. GO to Output Test Mode. VERIFY that the proper key sequence was used for output(s) in the Output Test Mode. REPAIR as necessary. RUN the Scan Tool On-Board System Readiness test to verify communication between the Scan Tool and PCM

Test Notes

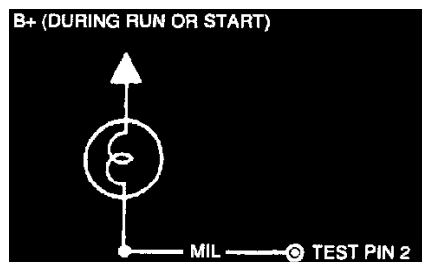
Enter this pinpoint test only when directed here.

To prevent the replacement of good components, be aware that the following non-Electronic Engine Control areas may be at fault:

- Fuse, bulb or socket

This pinpoint test is intended to diagnose the following:

- Malfunction Indicator Lamp (MIL) circuit
- Powertrain control module



Test Step		Result	Action to Take
NB1	MALFUNCTION INDICATOR LAMP (MIL) ALWAYS ON: CHECK MIL CIRCUIT FOR SHORTS TO GROUND IN HARNESS		
	NOTE: If vehicle will not start, go to Pinpoint Test Step A1 . ● If any Key On Engine Off or Continuous Memory Diagnostic Trouble Codes are present, repair before proceeding. ● Install breakout box, leave PCM disconnected. ● Measure resistance between PCM Test Pin 2 and PCM Test Pin 51 or 103. ● Is resistance less than 5.0 ohms?	Yes No	REPAIR short circuit. RESTORE vehicle. RERUN Quick Test. REPLACE PCM. RESTORE vehicle. RERUN Quick Test.
NB2	MALFUNCTION INDICATOR LAMP (MIL) NEVER ON		
	NOTE: If vehicle will not start, go to Pinpoint Test Step A1 . ● Key on, engine off. ● Measure voltage from battery negative post to Ground side of the MIL fuse. ● Key off. ● Was voltage greater than 10.5 volts?	Yes No	GO to NB4 . GO to NB3 .
NB3	CHECK B+ VOLTAGE TO FUSE		
	● Key on, engine off. ● Measure voltage from battery negative post to B+ side of the fuse. ● Key off. ● Was voltage greater than 10.5 volts?	Yes No	REPLACE the fuse. VERIFY repair by turning Ignition key to the on position. REPAIR power distribution (to the fuse) from the Power Distribution Box.
NB4	CHECK VOLTAGE ON THE B+ CIRCUIT		
	● Disconnect Instrument Cluster harness connector. ● Key on, engine off. ● Measure voltage of B+ circuit between the Instrument Cluster harness connector and Battery Negative Post. ● Key off. ● Was voltage greater than 10.5 volts?	Yes No	GO to NB5 . REPAIR open circuit.
NB5	CHECK FOR OPEN MIL CIRCUIT BETWEEN PCM AND INSTRUMENT CLUSTER		
	● Install breakout box, leave PCM disconnected. ● Measure resistance between PCM Test Pin 2 and MIL circuit at the instrument cluster connector. ● Is resistance less than 5.0 ohms?	Yes No	DIAGNOSE Instrument Cluster and Bulb. If OK, REPLACE PCM. VERIFY the repair by turning key to the, ON position. REPAIR open circuit. VERIFY repair by turning key to the ON position.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Powertrain control module

Test Step		Result	Action to Take
NC 1	DTC P0320: ERRATIC IGNITION		
Continuous Memory Diagnostic Trouble Code (DTC) P0320 indicates two successive erratic Profile Ignition Pickup (PIP) pulses occurred resulting in a possible engine miss or stall. Possible causes: — Loose wires / connectors. — Arcing secondary ignition components (coil, wires and plugs). — On-board transmitter (2-way radio). NOTE: Verify all 2-way radio installations. Carefully follow manufacturer's installation instructions regarding the routing of antenna and power leads. • Are any of the above present?		Yes	REPAIR as necessary. Complete PCM Reset to clear DTCs. RERUN Quick Test.
		No	For No Starts: GO to Pinpoint Test Step A1 . For Intermittent Faults: GO to Pinpoint Test Step Z1 . All others: Loss of PIP. REPLACE PCM.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the engine RPM/vehicle speed limiter only.

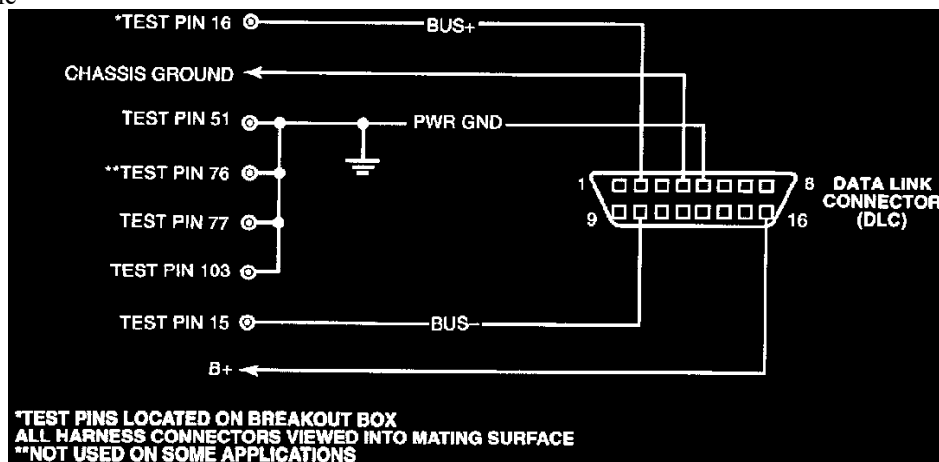
Test Step		Result	Action to Take
ND 1	DTC P 1270: EXCESSIVE ENGINE RPM / VEHICLE SPEED		
Diagnostic Trouble Code (DTC) P 1270 indicates the vehicle has been operated in a manner which caused the engine or vehicle speed to exceed a calibrated limit. Possible causes: — Wheel slippage (water, ice, mud and snow). — Excessive engine rpm in NEUTRAL. — Vehicle driven at high rate of speed. • Was the vehicle operating in any of the above conditions?		Yes	OBD II system is OK. COMPLETE PCM Reset to clear DTCs. RETURN vehicle to customer with information about DTC P1270.
		No	COMPLETE PCM Reset to clear DTCs. GO to the Symptom Charts. If there are no other symptoms, RETURN vehicle to customer.

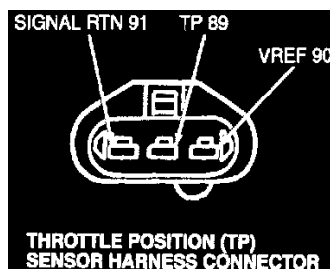
Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Standard Corporate Protocol (SCP) communication bus harness circuits: BUS+, BUS-
- Data link connector harness circuits: Chassis ground, Power Ground (PWR GND), Battery Positive Voltage (B+)
- Powertrain control module





Test Step		Result	Action to Take
QA1	VERIFY SELF-TEST PROCEDURE		
	Diagnostic Trouble Code (DTC) P1001 Indicates that Key On Engine Running (KOER) Self-Test cannot be completed. This Pinpoint Test addresses the following concerns: — Unable to access Continuous Memory DTCs. — Unable to activate KOEO Self-Test. — Unable to activate KOER Self-Test. — Scan tool communication concern. — DTC displayed by scan tool not listed. — Power Take Off (PTO), if equipped. Possible causes: — Damaged DLC. — Incorrect Self-Test procedure. — VREF is not in specification. — Idle rpm out of specification. — Open in DLC harness circuit. — Short in DLC harness circuit. — Damaged PCM power relay circuit. — Damaged PCM. — PTO circuit, if equipped. ● Disconnect Scan Tool from DLC. Inspect DLC for damage. Repair as necessary. ● PTO switch / actuator in OFF position. ● Verify that the correct procedure was used to activate CONT, KOEO or KOER Self-Test for the Scan Tool. ● Was the correct Self-Test procedure used?	Yes No	▶ Correct procedure was used for activating Self-Test. GO to QA2. ▶ Correct procedure was not used for activating Self-Test. COMPLETE Self-Test using the correct procedure.
QA2	CHECK VREF VOLTAGE TO TP SENSOR		
	● Throttle Position sensor disconnected. ● Key on, engine off. ● Measure voltage between VREF and SIG RTN circuits at the TP sensor harness connector. ● Key off. ● Was the voltage between 4.0 and 6.0 volts?	Yes No	▶ Voltage is in specification. RECONNECT the TP sensor. GO to QA3. ▶ Voltage is not in specification. RECONNECT the TP sensor. GO to Pinpoint Test Step C1.
QA3	ABILITY TO ACCESS CONTINUOUS MEMORY DTCs		
	● Can Continuous Memory DTCs be accessed?	Yes No	▶ GO to QA4. ▶ UNABLE to access Continuous Memory DTCs. GO to QA8.
QA4	ABILITY TO ACTIVATE KOEO SELF-TEST		
	● Can KOEO Self-Test be activated?	Yes No	▶ GO to QA5. ▶ UNABLE to activate KOEO Self-Test. GO to QA7.

Test Step		Result	Action to Take
QA5	ABILITY TO ACTIVATE KOER SELF-TEST		
	Can KOER Self-Test be activated?	Yes	▶ The DTC is not listed in the Powertrain Diagnostic Trouble Code (DTC) Charts. CHECK that the correct PCM is installed on the vehicle. Also CHECK for a Technical Repair Bulletin (TSB) or OASIS broadcast message that indicates a PCM change.
		No	▶ UNABLE to activate or complete KOER Self-Test. Alternative fuel vehicles: GO to QA6 . All others: GO to QA7 .
QA6	CHECK FUEL TYPE USED DURING KOER SELF-TEST		
	NOTE 1: Some alternative fuel vehicles that are capable of running on either gasoline or Compressed Natural Gas (CNG) contain Electronic Engine Control strategy software that does not allow the completion of KOER Self-Test while running on CNG. NOTE 2: Some alternative fuel vehicles that are capable of running on either gasoline or Liquified Petroleum Gas (LPG) contain Electronic EC strategy software that does not allow the completion of KOER Self-Test while running on LPG. Was the alternative fuel vehicle running on CNG or LPG during KOER Self-Test?	Yes	▶ RERUN KOER Self-Test with the alternative fuel vehicle running on gasoline. If the alternative fuel vehicle still cannot complete KOER Self-Test, GO to QA7 .
		No	▶ The vehicle was not running on CNG or LPG during KOER Self-Test. GO to QA7 .

Test Step		Result	Action to Take
QA7	RETRIEVE ANY CONTINUOUS MEMORY DTCs		
	NOTE 1: If failures are present in the following components or systems, this can prevent the Electronic EC strategy from completing KOER Self-Test or cause the PCM to generate a Scan Tool communication error message: idle speed control; EGR system; fuel control system; electronic secondary air system; vehicle speed sensor circuits; mass air flow sensor circuits; transmission range sensor circuits. • Scan Tool connected. • Key on, engine off. • Retrieve and record all Continuous Memory DTCs (MIL and non-MIL). • Key off. • Were any Continuous Memory DTCs present?	Yes No	Continuous Memory DTCs are present. DIAGNOSE these DTCs. UNABLE to retrieve any Self-Test DTCs. GO to QA8.
QA8	CHECK B+ VOLTAGE TO DATA LINK CONNECTOR (DLC)		
	• Inspect the DLC for damage. Repair as necessary. • Measure voltage between B+ circuit cavity at the DLC and engine block ground. • Was voltage greater than 10.5 volts?	Yes No	GO to QA9. REPAIR open in DLC B+ circuit. RERUN Quick Test.
QA9	CHECK DLC CHASSIS GROUND CIRCUIT FOR OPEN IN HARNESS		
	• Measure resistance between chassis ground circuit cavity at the DLC and chassis ground. • Is resistance less than 5.0 ohms?	Yes No	GO to QA10. REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
QA10	CHECK DLC PWR GND CIRCUIT FOR OPEN IN HARNESS		
	• Install breakout box, leave PCM disconnected. • Disconnect Scan Tool from DLC. • Measure resistance between PCM Test Pins 51 or 103 and the PWR GND circuit cavity at the DLC. • Is resistance less than 5.0 ohms?	Yes No	GO to QA11. REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
QA11	CHECK DLC BUS- CIRCUIT FOR OPEN IN HARNESS		
	• Measure resistance between PCM Test Pin 15 and the BUS- circuit at the DLC. • Is resistance less than 5.0 ohms?	Yes No	GO to QA12. REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

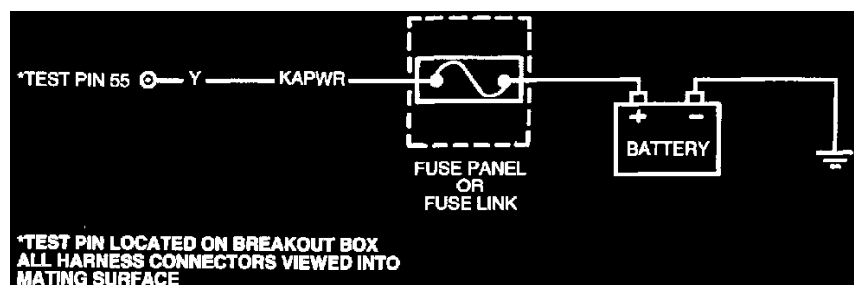
Test Step		Result	Action to Take
QA12	CHECK BUS- CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Measure resistance between PCM Test Pin 15 and chassis ground. Is resistance greater than 10,000 ohms?	Yes No	GO to QA13 . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
QA13	CHECK BUS- CIRCUIT FOR SHORT TO B+ IN HARNESS		
	- Key on, engine off. - Measure voltage between PCM Test Pins 15 and 51 or 103. - Key off. Was the voltage greater than 6.0 volts?	Yes No	REPAIR short circuit. RESTORE vehicle. RERUN Quick Test. GO to QA14 .
QA14	CHECK DLC BUS+ CIRCUIT FOR OPEN IN HARNESS		
	- Measure resistance between PCM Test Pin 16 and BUS+ circuit at the DLC. Is resistance less than 5.0 ohms?	Yes No	GO to QA15 . REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
QA15	CHECK BUS+ CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Measure resistance between PCM Test Pin 16 and chassis ground. Is resistance greater than 10,000 ohms?	Yes No	GO to QA16 . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
QA16	CHECK BUS+ CIRCUIT FOR SHORT TO B+ IN HARNESS		
	- Key on, engine off. - Measure voltage between PCM Test Pins 16 and 51 or 103. - Key off. Was the voltage greater than 1.0 volt?	Yes No	REPAIR short circuit. RESTORE vehicle. RERUN Quick Test. GO to QA17 .
QA17	POWER TAKE OFF (PTO) APPLICATIONS		
	Is the vehicle equipped with a Power Take Off?	Yes No	GO to QA18 . Vehicle is not equipped with PTO. REPLACE the PCM. RESTORE vehicle. RERUN Quick Test.
QA18	CHECK PTO ON / OFF INPUT		
	- Key on, engine off. - Measure the voltage between PCM Test Pins 4 and 51 or 103 while cycling the PTO switch / actuator. NOTE: Allow for a slight delay for the voltage change when cycling the switch / actuator. - Key off. Did the voltage cycle greater than 1.0 volt with the PTO on, and less than 1.0 volt with the PTO off?	Yes No	PTO circuit is OK. REPLACE the PCM. RESTORE vehicle. RERUN Quick Test. PTO circuit is not OK. GO to Pinpoint Test Step FB1 for further diagnosis.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Battery terminal condition
- Keep Alive Power (**KAPWR**) wire routing
- Harness circuit: KAPWR
- Powertrain control module



Test Step		Result	Action to Take
QB1	CHECK BATTERY TERMINALS		
	NOTE: If KAPWR is interrupted to the PCM (that is, when a breakout box is installed or the battery is disconnected), DTC P0603 / P1605 can be generated on the first power-up. Diagnostic Trouble Code (DTC) P0603 / P1605 indicates the PCM has experienced a power interrupt in the KAPWR circuit. Possible causes: — Battery terminal corrosion or loose connections. — Improper KAPWR circuit wire routing. — Harness open in KAPWR circuit. — Damaged PCM. ● Inspect the battery cables for loose connections, corrosion. ● Are the battery terminal connections in good condition?	Yes No	Battery terminals are OK. GO to QB2. REPAIR battery terminals as necessary. RERUN Quick Test.
QB2	INSPECT ENGINE COMPARTMENT FOR PROPER WIRE ROUTING		
	● Inspect Electronic Engine Control (EC) System wiring for proximity to ignition components or wires. ● Is wiring too close to ignition components or wires?	Yes No	REROUTE as necessary. RERUN Quick Test. Engine compartment wire routing is OK. GO to QB3.
QB3	CHECK KEEP ALIVE POWER (KAPWR) TO PCM		
	● Install breakout box, leave PCM disconnected. ● Measure voltage between PCM Test Pin 55 and ground. ● While observing digital multimeter, grasp the Electronic EC harness and wiggle, shake or bend a small section while working from the PCM to the dash panel. ● Does the voltage reading indicate less than 10.5 volts?	Yes No	ISOLATE and REPAIR open circuit. RESTORE vehicle. RERUN Quick Test. No open in KAPWR harness circuit detected. RESTORE vehicle. GO to QB4.
QB4	CHECK FOR REPEAT OF DTC P0603 / P1605		
	● Activate Key On Engine Off Self-Test. ● Is DTC P0603 / P1605 present?	Yes No	REPLACE the PCM. RERUN Quick Test. REPAIR other DTCs as necessary. If none, testing is complete. DTC P0603 / P1605 was due to previous repair action mentioned in the NOTE in QB1.

Test Notes

Enter this pinpoint test only when directed here.

NOTE: It is not necessary to clear DTC P1000 from the PCM by driving the vehicle unless it is requested by the customer to pass an inspection/maintenance test. Inform the customer of the need for additional driving when required to pass an inspection/maintenance test.

DESCRIPTION

Diagnostic Trouble Code (DTC) P1000 indicates that not all of the On Board Diagnostic II (OBD II) monitors have completed. In some states, this DTC must be cleared to pass an inspection/maintenance test. The customer should be informed that the law specifies additional city and highway driving must be done to complete the check of the on board diagnostic system. This additional driving must occur before the vehicle is tested at the inspection/maintenance station. The amount of driving required varies with individual driving patterns.

NOTE: The only way a DTC P1000 can be removed from memory is when all the OBD II monitors have successfully completed.

DTC P1000 is set by the PCM with any of the following conditions:

- The vehicle is new from the factory and has not yet completed an OBD II drive cycle.
- The battery or PCM has been disconnected.
- An OBD II monitor failure had occurred before completion of an OBD II drive cycle.
- The PCM DTCs have been cleared with a scan tool as part of a service process.

DTC P1000 cannot be cleared from the PCM when:

- If the vehicle has a Power Take Off (PTO), the circuit is shorted to VPWR or B+, or the PTO is ON during testing.

Test Step		Result	Action to Take
QC1	DTC P1000: CHECK FOR OTHER DTCS		
	NOTE: Only perform this pinpoint test if a Diagnostic Trouble Code (DTC) P1000 was received from Continuous Memory. Ignore any DTC P1000s in KOEO or KOER. DTC P1000 indicates that all of the OBD II monitors have not yet been successfully tested. Were any other DTCs received with the P1000?	Yes No	GO to Diagnostic Subroutines, for Pinpoint Test direction and REPAIR other DTCs. For vehicles with PTO: GO to QC2. All others: GO to QC3.
QC2	CHECK PTO PID		
	- Connect scan tool. - Key on, engine running. - Access PTO STAT PID. - Cycle PTO switch / actuator ON and OFF (follow PTO aftermarket instructions). - Did PTO PID cycle ON, delay, then OFF?	Yes No	PTO circuit is OK. GO to QC3. GO to Pinpoint Test Step FB1.
QC3	REQUEST TO CLEAR DTC P1000		
	NOTE: A complete OBD II Drive Cycle has not yet been performed to clear the DTC P1000 from the PCM. Has the customer requested the DTC P1000 be cleared from the PCM memory?	Yes No	PERFORM the OBD II Drive Cycle. INFORM the customer that if the law in this state requires additional driving in order to clear the DTC P1000 from the PCM memory, it must be performed before an inspection / maintenance test.

Test Notes

Enter this pinpoint test only when directed here.

DESCRIPTION

Continuous memory Diagnostic Trouble Code (DTC) P1260 indicates the anti-theft system has detected a break in the on-board security test due to an attempted theft or system hardware failure. When the PCM receives the message that a theft condition exists, fuel delivery to the engine is disabled on start-up. As a fail safe, fuel delivery is not disabled if the vehicle is operating and a system failure occurs. Use the proper key or remote or keyless entry to unlock the door; this will disarm the anti-theft system and enable fuel delivery to start the vehicle.

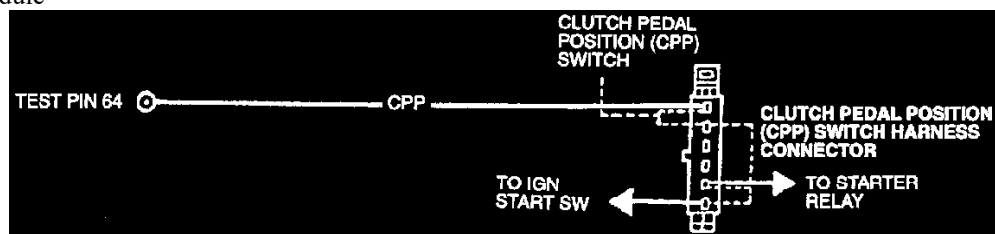
Test Step		Result	Action to Take
QD1	CHECK ALL OTHER DTCs BEFORE DTC P1260		
	NOTE: All other DTCs must be diagnosed before DTC P1260. Diagnostic Trouble Code (DTC) P1260 indicates the lighting control module (LCM) or passive anti-theft system (PATS) module determined a theft condition existed and the and the engine is disabled. Have all other DTCs been diagnosed?	Yes No	GO to QD2. REPAIR other DTC's.
QD2	ATTEMPT TO START ENGINE		
	- Disarm the Anti-Theft system. - Complete PCM Reset to clear DTC P1260. - Attempt to start the engine. Will the engine start?	Yes No	No system faults exist at present. RETURN vehicle to customer and advise that a theft condition existed some time in the past. GO to QD3.
QD3	CHECK TO SEE IF DTC P1260 IS PRESENT		
	- Retrieve Continuous Memory DTCs. - Is DTC P1260 present?	Yes No	COMPLETE PCM Reset to clear DTC. GO to Anti-Theft and Alarm Systems. DTC P1260 is not the cause of the No Start. GO to the Symptom Charts to diagnose the No Start symptom.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Clutch pedal position switch
- Park neutral position switch
- Harness circuits: CPP, PNP and SIG RTN
- Powertrain control module



Test Step		Result	Action to Take
TA1	CHECK CPP OR PNP SWITCH FUNCTION		
Diagnostic Trouble Code (DTC) P1709 indicates the voltage is high or the switch is open when the voltage should be low or the switch should be closed grounding the circuit. DTC P0704 indicates a malfunction of the Clutch Pedal Position (CPP) or Park / Neutral Position (PNP) switch. Possible causes: — Starter Relay disconnected during Quick Test. — CPP circuit shorted to power. — Open in the SIG RTN circuit. — Damaged CPP or PNP switch. — Damaged PCM. NOTE: During KOEO Self-Test, clutch pedal must be down or gearshift lever in NEUTRAL. ● Key off. ● Connect scan tool. ● Key on, engine off. ● Access CPP / PNP PID and observe PID cycling ON / OFF with clutch pedal up, then down or gear shift lever in gear, then NEUTRAL. ● Does reading change from ON to OFF?		Yes	Fault intermittent DISCONNECT PCM. INSPECT both ends of the connector for damaged or pushed out pins, corrosion, loose wires. REPAIR as necessary. If OK, REPLACE PCM. RERUN Quick Test.
		No	GO to TA2.
TA2	CHECK CPP OR PNP SWITCH RESISTANCE		
● Key off. ● Locate the CPP switch or the PNP switch near the transmission shift linkage. ● Inspect switch and bracket for damage, bent or broken conditions. Repair as required. ● Disconnect CPP or PNP harness connector. ● Measure the CPP or PNP switch resistance with the clutch pedal down. ● Is the resistance less than 5.0 ohms?		Yes	GO to TA3.
		No	REPLACE the CPP or PNP switch. RESTORE vehicle. RERUN Quick Test.
TA3	CHECK CPP / PNP CIRCUIT FOR OPEN IN HARNESS		
● Disconnect scan tool. ● Install breakout box, leave PCM disconnected. ● Measure resistance of the (CPP / PNP) circuit between PCM Test Pin 64 and CPP or PNP switch harness connector. ● Where applicable, measure resistance of the SIG RTN circuit between PCM Test Pin 91 and CPP or PNP switch harness connector. ● Are both resistances less than 5.0 ohms?		Yes	GO to TA4.
		No	REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
TA4	CHECK CPP OR PNP CIRCUIT FOR SHORT TO SIG RTN OR CHASSIS GROUND IN HARNESS		
	- Measure resistance between PCM Test Pins 64 and 91. - Measure resistance between PCM Test Pin 64 and chassis ground. - Are both resistances greater than 10,000 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
TA5	CHECK CPP /PNP SWITCH FUNCTION		
	Diagnostic Trouble Code (DTC) P1709 or P1705 indicates the voltage is high or the switch is open when voltage should be low or switch closed, grounding the circuit. DTC P0704 indicates malfunction of the CPP or PNP switch. Possible causes: — Crank engine while In Self Test. — Starter Relay disconnected during Quick Test. — CPP circuit shorted to power. — Damaged CPP or PNP switch. — Damaged PCM. NOTE: During Self Test, clutch pedal must be down and gearshift lever in NEUTRAL. • Key off. • Connect scan tool. • Key on, engine off. • Look for CPP /PNP PID cycling ON /OFF with: — Transmission in NEUTRAL, then shift into gear and the clutch pedal up. — Transmission in GEAR and the clutch pedal up then down. PNP SWITCH OPEN IN ANY GEAR TEST PIN 64 ○ PNP CIRCUIT CPP SWITCH OPEN WHEN PEDAL IS UP TEST PIN 91 ○ SIG. RTN. A9853-G • Does reading change from ON to OFF for both switches?	Yes No	Fault intermittent DISCONNECT PCM. INSPECT both ends of the connector for damaged or pushed out pins, corrosion and loose wires. REPAIR as necessary. If OK, REPLACE PCM. RERUN Quick Test. GO to TA6.

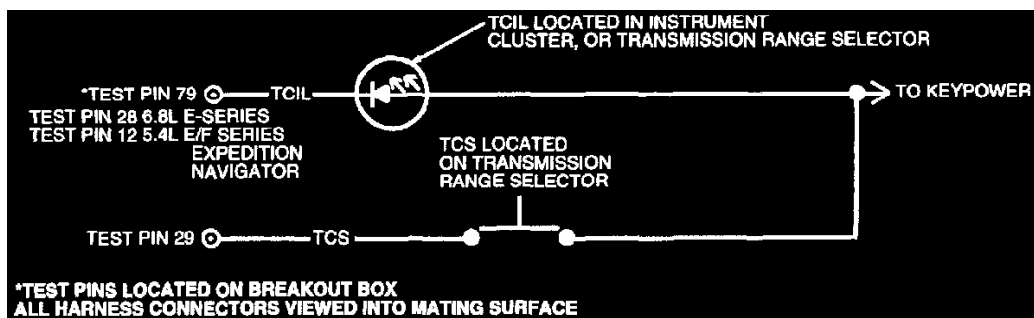
Test Step		Result	Action to Take
TA6	CHECK CPP /PNP SWITCHES RESISTANCE		
	- Located the CPP switch near the clutch pedal and the PNP switch near the transmission shift linkage. - Inspect both switches and brackets for damage. Repair as required. - Disconnect CPP and PNP harness connector. - Measure CPP switch resistance with the clutch pedal down. - Measure PNP switch resistance with the shift lever in NEUTRAL. - Is the resistance less than 5.0 ohms for both switches?	Yes No	GO to TA7 . REPLACE damaged CPP or PNP switch. RESTORE vehicle. RERUN Quick Test.
TA7	CHECK CPP /PNP CIRCUIT FOR OPEN IN HARNESS		
	- Disconnect scan tool. - Install breakout box, leave PCM disconnected. - Measure resistance of the SIG RTN circuit between PCM Test Pin 91 and CPP or PNP switch harness connector. - Measure resistance of the CPP /PNP circuit between PCM Test Pin 64 and CPP or PNP switch harness connector. - Are both resistances less than 5.0 ohms?	Yes No	GO to TA8 . REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
TA8	CHECK CPP /PNP CIRCUIT FOR SHORT TO SIG RTN OR CHASSIS GROUND IN HARNESS		
	- Measure resistance between the PCM Test Pins 64 and 91. - Measure resistance between the PCM Test Pin 64 and chassis ground. - Are both resistances greater than 10,000 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Harness circuits: Transmission Control Indicator Lamp (TCIL) and Transmission Control Switch (TCS)
- Powertrain control module



Test Step		Result	Action to Take
TB1	CHECK TCS FUNCTION		
Diagnostic Trouble Code (DTC) P1780 Indicates the transmission control switch (TCS) was not cycled during Key On Engine Running (KOER) Self-Test. Possible causes: — TCS damaged or not cycled during Self-Test. — Shorted or open harness. — Damaged PCM. ● Connect scan tool. ● Key on, engine off. ● Access the TCS PID. ● Cycle the TCS switch button, then hold it depressed. ● Key off. ● Did TCS PID reading switch from ON to OFF, and did reading indicate ON when button was depressed?		Yes	▶ RERUN KOER Self-Test to cycle TCS.
		No	▶ GO to TB2 .

Test Step		Result	Action to Take
TB2	CHECK VOLTAGE TO TCS		
	- Install breakout box, leave PCM disconnected. - Key on, engine off. - Measure the voltage between the PCM Test Pin 29 and PCM Test Pins 24 and 77 while cycling the TCS several times. - Key off. Did the voltage cycle?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. GO to TB3 .
TB3	CHECK TCS CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect TCS. - Measure the resistance between PCM Test Pin 29 and PCM Test Pins 24 and 77. Are both resistances greater than 10,000 ohms?	Yes No	GO to TB4 . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
TB4	CHECK TCS CIRCUIT FOR OPEN IN HARNESS		
	- Measure the resistance of the TCS keypower between fuse junction panel and power side of the TCS harness connector. - Measure resistance of TCS circuit between PCM Test Pin 29 and the transmission control switch harness connector. Are both resistances less than 5.0 ohms?	Yes No	GO to TB5 . REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
TB5	CHECK TCS CIRCUIT FOR SHORTS TO POWER IN HARNESS		
	- Measure the resistance between PCM Test Pin 29 and PCM Test Pins 71 and 97. Are both resistances greater than 10,000 ohms?	Yes No	REPLACE damaged transmission control switch. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
TB6	CHECK TCIL FUNCTION		
	- Connect scan tool. - Key on, engine off. - Access TCIL PID. - Cycle the transmission control switch (TCS). - Key off. Did the TCIL PID reading change from ON to OFF?	Yes No	GO to Pinpoint Test Step Z1 to check for an intermittent concern. GO to TB7 .
TB7	CHECK TCIL CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect PCM. - Key on, engine off. Does the TCIL remain on?	Yes No	REPAIR short circuit between bulb and the TCIL Test Pin. VERIFY a symptom no longer exists. TCIL turns off when PCM is disconnected. REPLACE PCM. RERUN Quick Test.
TB8	CHECK FOR DTC P1780		
	- Run Key On Engine Running (KOER) Self-Test. Is DTC P1780 present?	Yes No	REPAIR DTC 1780. GO to TB1 . GO to TB9 .
TB9	CHECK VOLTAGE TO TCIL		
	- Key off. - Install breakout box, leave PCM disconnected. - Key on, engine off. - Measure voltage between PCM Test Pin (refer to schematic for TCIL pin by application) and PCM Test Pins 24 and 76. Are voltage readings greater than 2.0 volts?	Yes No	REPLACE PCM. CYCLE TCS to check operation of TCIL. CHECK indicator bulb and fuse. If OK, open is in the wiring between the Ignition switch and the TCIL Test Pin at the harness connector. REPAIR as necessary.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Constant Control Relay Module (CCRM)
 - + Power Relay
 - + Fuel Pump Relay
 - + Fan Control/Low Speed Fan Control Relay

- + High Speed Fan Control Relay
- + Wide Open Throttle (WOT) A/C Cutoff Relay
- Harness circuits: B+, FP, LFP, FPM, FC, LFC, HFC, ACCS, WAC, VPWR (TO CCRM), A/C Clutch PWR, FP PWR, (Low/High) Fan PWR
- Low speed fuel pump relay
- Powertrain control module

Test Step		Result	Action to Take
X1	VPWR CHECK AT IAC VALVE FAILED IN PINPOINT TEST C: CHECK FOR OPEN VPWR CIRCUIT BETWEEN IAC VALVE AND CCRM		
	- Disconnect IAC valve. - Disconnect CCRM. - Disconnect scan tool from DLC. - Measure resistance of VPWR circuit between IAC valve harness connector and pins 12 and 24 (VPWR) of the CCRM harness connector. - Is either resistance less than 5.0 ohms?	Yes No	RECONNECT IAC valve. GO to X2 . BOTH resistances GREATER than 5.0 ohms. REPAIR open VPWR circuit between the CCRM and the splice to the IAC valve. RESTORE vehicle. RERUN Quick Test.
X2	CHECK B+ AND IGN START/RUN VOLTAGE TO CCRM		
	- Measure voltage to Pin 8 and Pin 10 (B+) of the CCRM harness connector. - Key on, engine off. - Measure voltage to Pin 13 (IGN START/RUN) of the CCRM harness connector. - Key off. - Were all voltages greater than 10.5 volts?	Yes No	GO to X3 . B + or IGN START/RUN circuit fault. CHECK condition of related fuse(s). If OK, REPAIR open circuit. If fuse is damaged, CHECK IGN START/RUN or B+ and VPWR circuits for short to ground before replacing. RERUN Quick Test.
X3	CHECK CCRM GROUND CIRCUIT		
	- Measure voltage between pin 8 (B+) and pin 15 (GND) at the CCRM harness connector. - Is voltage greater than 10.5 volts?	Yes No	REPLACE CCRM. RESTORE vehicle. RERUN Quick Test. REPAIR open ground circuit to CCRM (pin 15). RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take						
X15	DTC P1479: CHECK HIGH SPEED FAN CONTROL (FC) RELAY AND HFC CIRCUIT IN CCRM								
Diagnostic Trouble Code (DTC) P1479 indicates a High Speed Fan Control (HFC) primary circuit failure. NOTE: For one-speed fan applications, disregard DTC P1479. Possible causes: — Open or shorted HFC circuit. — Damaged CCRM. — Damaged PCM. ● Disconnect CCRM. ● Check high speed FC relay coil resistance: — Measure resistance between pin 17 and pin 24 of the CCRM. — Resistance must be between 65 and 100 ohms. ● Check CCRM for internal shorts: — Measure resistance of CCRM between pin 17 and the following pins: 1 through 11, 13, 15 and 21. — Measure resistance between pin 17 and the CCRM case. — Each resistance must be greater than 1,000 ohms. ● Are the CCRM checks OK?		Yes No	▶ GO to X16 . ▶ REPLACE CCRM. RERUN Quick Test.						
X16	CHECK FOR OPEN HFC CIRCUIT								
● Install breakout box, leave PCM disconnected. ● Measure resistance of HFC circuit between HFC PCM test pin and pin 17 (HFC) of CCRM harness connector. ● Is resistance less than 5.0 ohms? <table><tr><th>Application</th><th>HFC PCM Test Pin</th></tr><tr><td>Escort/Tracer</td><td>17</td></tr><tr><td>Mustang</td><td>46</td></tr></table>		Application	HFC PCM Test Pin	Escort/Tracer	17	Mustang	46	Yes No	▶ GO to X17 . ▶ REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
Application	HFC PCM Test Pin								
Escort/Tracer	17								
Mustang	46								
X17	CHECK HFC CIRCUIT FOR SHORT TO POWER IN HARNESS								
● Key on. ● Measure voltage between HFC PCM test pin and ground. ● Key off. ● Was voltage less than 1.0 volt?		Yes No	▶ GO to X18 . ▶ REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.						

Test Step		Result	Action to Take
X18	CHECK HFC CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool from DLC. - Measure resistance between HFC PCM test pin and ground. - Is resistance greater than 10,000 ohms?	Yes No	CONNECT scan tool to DLC. Key on, engine off. Access Output Test Mode on scan tool. Command high speed fan on, wait 10 seconds, then turn fan off. If high speed fan turns on, and off as expected, disregard P1479 and return to Diagnostic Subroutines. If fan does not operate correctly, REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
X20	DTC P1474: DOES FAN RUN WITH KEY ON?		
	Diagnostic Trouble Code (DTC) P1474 indicates a low fan control (LFC) [fan control (FC) for one-speed fan applications] primary circuit failure. Possible causes: - Open or shorted FC/LFC circuit. - Damaged CCRM. - Damaged PCM. - Does the cooling fan always run with the key on?	Yes No	Key off. GO to X24. Key off. GO to X21.
X21	CHECK FC/LFC CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool from DLC. - Install breakout box, leave PCM disconnected. - Disconnect CCRM. - Measure resistance between PCM test pin 45 and ground. - Is resistance greater than 10,000 ohms?	Yes No	GO to X22. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
X22	CHECK FAN RUNNING MODE		
	- Connect CCRM. - Key on, engine off. - Check if the fan is running. - Key off. - Was fan running with the key on?	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPLACE CCRM. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
X24	CHECK FOR OPEN FC/LFC CIRCUIT IN HARNESS		
	- Install breakout box, leave PCM disconnected. - Disconnect CCRM. - Measure resistance of the FC/LFC circuit between PCM test pin 45 and pin 14 at the CCRM harness connector. - Is resistance less than 5.0 ohms?	Yes No	GO to X25 . REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
X25	CHECK FC/LFC CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Key on. - Measure voltage between PCM test pin 45 and ground. - Is voltage less than 1.0 volt?	Yes No	GO to X26 . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
X26	FC/LFC CIRCUIT FAULT ISOLATION CHECK		
	- Reconnect CCRM. - Key on, engine off. - Jumper PCM test pin 45 to PCM test pin 77 at the breakout box. - Does fan continue to run?	Yes No	Key off. REPLACE CCRM. RESTORE vehicle. RERUN Quick Test. Key off. REPLACE PCM. RESTORE vehicle. RERUN Quick Test.
X30	CONTINUOUS MEMORY DTC P1474: CHECK FAN CONTROL (FC) OR LOW FAN CONTROL (LFC) CIRCUIT FOR OPEN OR SHORT TO POWER		
	Continuous Memory Diagnostic Trouble Code (DTC) P1474 indicates that an LFC (FC for one-speed fan applications) circuit failure has occurred during vehicle operation. Possible causes: - Open or shorted FC/LFC circuit. - Disconnect cooling fan connector. - Connect a non-powered test lamp between the (LOW) FAN PWR circuit and ground circuit at the cooling fan harness connector. - Key on, engine off. - Observe test lamp for an indication of a fault while performing the following (since the FC/LFC circuit is grounded to turn the fan OFF, the lamp will illuminate when an open or short to power is detected): - Shake, wiggle, bend the FC/LFC circuit between the PCM and CCRM. - Lightly tap on the CCRM to simulate road shock. - Is a fault indicated?	Yes No	Key off. ISOLATE fault and REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. GO to X31 .

Test Step		Result	Action to Take
X31	CHECK FC/LFC CIRCUIT FOR SHORT TO GROUND		
	● Key on, engine off. ● Cooling fan disconnected, test lamp installed. ● Access Output Test Mode on scan tool. ● Command Low Speed Fan on. ● Observe test lamp for an indication of a fault while performing the following (the lamp will turn off when a fault is detected, indicating a short to ground or an open in VPWR): — Shake, wiggle, bend the FC/LFC circuit between the PCM and CCRM. — Lightly tap on the CCRM to simulate road shock. ● Key off. ● Is a fault indicated?	Yes ▶ No ▶	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. GO to Pinpoint Test Step Z1 with the following data: LFCF PID and list of Possible causes.
X35	DTC P1479: CHECK HIGH FAN CONTROL (HFC) CIRCUIT FOR OPEN OR SHORT TO POWER		
	Continuous Memory Diagnostic Trouble Code (DTC) P1479 indicates that an HFC circuit failure has occurred during vehicle operation. NOTE: For one-speed fan applications, disregard DTC P1479. Possible causes: — Open or shorted HFC circuit. ● Disconnect cooling fan connector. Inspect connector for damaged or pushed out pins, corrosion and loose wires. Repair as necessary. ● Connect a non-powered test lamp between the HIGH FAN PWR circuit and ground circuit at the cooling fan harness connector. ● Key on, engine off. ● Access Output Test Mode on scan tool. ● Command high speed fan on. ● Observe test lamp for an indication of a fault while performing the following (the lamp will turn off when a fault is detected, indicating an open or short to power): — Shake, wiggle, bend the HFC circuit between the PCM and CCRM. — Lightly tap on the CCRM to simulate road shock. ● Is a fault indicated?	Yes ▶ No ▶	Key off. ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. GO to X36.

Test Step		Result	Action to Take
X36	CHECK HFC CIRCUIT FOR SHORT TO GROUND		
	● Key on, engine off. ● Cooling fan disconnected, test lamp installed. ● Scan Tool connected. ● Command high speed fan off. ● Observe test lamp for an indication of a fault while performing the following (the lamp will turn on when a fault is detected, indicating a short to ground): — Shake, wiggle, bend the HFC circuit between the PCM and CCRM. — Lightly tap on the CCRM to simulate road shock. ● Key off. ● Is a fault indicated?	Yes No	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. GO to Pinpoint Test Step Z1 with the following data: HFCF PID and list of Possible causes.
X40	ELECTRIC COOLING FAN CONCERN: DID THE FAN OPERATE AT ANY SPEED?		
	NOTE: For the proper results of these pinpoint tests, no DTCs must have been present during PCM Quick Test. ● For 3.8L Mustang, GO directly to X41. ● During the operational check of both fan speeds, did the fan operate at any speed?	Yes No	Only one fan speed is operational. GO to X50. Cooling fan will not operate at any speed. GO to X41.
X41	COOLING FAN WILL NOT OPERATE AT ANY SPEED: COMMAND FAN ON (HIGH SPEED FOR TWO-SPEED APPLICATIONS) AND CHECK FOR VOLTAGE AT FAN		
	● Key on, engine off. ● Still in Output Test Mode, with fan commanded off. ● Disconnect cooling fan. ● Command fan on (high speed for two speed fan applications). ● Measure voltage between the (HIGH) FAN PWR circuit at the cooling fan vehicle harness connector and chassis ground. ● Key off. ● Was voltage greater than 10.0 volts?	Yes No	Power is being supplied to fan. GO to X45. GO to X42.

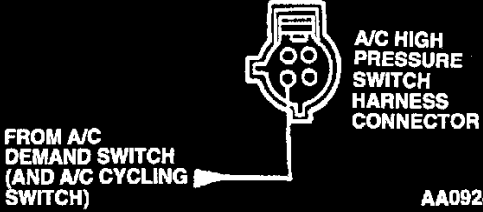
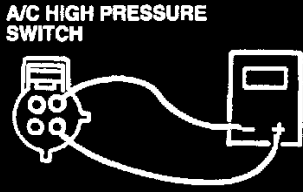
Test Step		Result	Action to Take
X42	CHECK FOR B+ TO FAN CONTROL RELAYS IN CCRM		
	- Disconnect CCRM. - Measure voltage at pins 3 and 4 of the CCRM harness connector. - Is voltage greater than 10.0 volts?	Yes No	GO to X43 . B+ fault. CHECK condition of related fuses / fuse links. If OK, REPAIR open circuit. If fuse / fuse link is damaged, CHECK B+ and FAN PWR circuits for short to ground before replacing. RESTORE vehicle. VERIFY a symptom no longer exists.
X43	CHECK FOR OPEN FAN PWR CIRCUIT BETWEEN CCRM AND COOLING FAN		
	- For 3.8L Mustang: - Measure resistance of FAN PWR circuit between pin 2 of the CCRM harness connector and the fan harness connector. - All others: - Measure resistance of HIGH FAN PWR circuit between pin 6 of the CCRM harness connector and the fan harness connector. - Measure resistance of LOW FAN PWR circuit between pin 2 of the CCRM harness connector and the fan harness connector. - Is each resistance less than 7.0 ohms?	Yes No	For 3.8L Mustang: GO to X70 . All others: REPLACE CCRM. VERIFY FAN PWR circuit(s) are not short to ground. RESTORE vehicle. VERIFY a symptom no longer exists. REPAIR open circuit(s). RESTORE vehicle. VERIFY a symptom no longer exists.
X45	CHECK FOR OPEN COOLING FAN GROUND CIRCUIT		
	- Disconnect scan tool from DLC. - Measure resistance of ground circuit between the cooling fan harness connector and chassis ground. - Is resistance less than 5.0 ohms?	Yes No	REPLACE fan motor. RESTORE vehicle. VERIFY a symptom no longer exists. REPAIR open circuit. RESTORE vehicle. VERIFY a symptom no longer exists.
X50	DETERMINE WHICH FAN SPEED IS OPERATIONAL		
	Was the low speed fan operational?	Yes No	High speed fan inoperative. GO to X65 . Low speed fan inoperative. GO to X51 .

Test Step		Result	Action to Take
X51	LOW SPEED FAN INOPERATIVE: COMMAND LOW SPEED FAN ON AND CHECK FOR VOLTAGE TO COOLING FAN		
	- Key on, engine off. - Still in Output Test Mode with fan commanded off. - Disconnect cooling fan. - Command low speed fan on. - Measure LOW FAN PWR circuit voltage at the cooling fan harness connector. - Key off. Was voltage greater than 10.0 volts?	Yes No	REPLACE fan motor. RESTORE vehicle. VERIFY a symptom no longer exists. GO to X52 .
X52	CHECK FOR OPEN LOW FAN PWR CIRCUIT BETWEEN CCRM AND FAN		
	- Disconnect CCRM. - Measure resistance of the LOW FAN PWR circuit between the cooling fan harness connector and pins 1 and 2 of the CCRM harness connector. Are both resistances less than 5.0 ohms?	Yes No	GO to X70 . REPAIR open circuit. RESTORE vehicle. VERIFY a symptom no longer exists.
X65	HIGH SPEED FAN INOPERATIVE: COMMAND HIGH SPEED FAN ON AND CHECK FOR VOLTAGE TO COOLING FAN		
	- Key on, engine off. - Still in Output Test Mode with fan commanded off. - Disconnect cooling fan. - Command high speed fan on. - Measure HIGH FAN PWR circuit voltage at the cooling fan harness connector. - Key off. Was voltage greater than 10.5 volts?	Yes No	REPLACE fan motor. RESTORE vehicle. VERIFY a symptom no longer exists. GO to X66 .
X66	CHECK FOR OPEN HIGH FAN PWR CIRCUIT		
	- Disconnect CCRM. - Measure resistance of HIGH FAN PWR circuit between the cooling fan harness connector and pin 6 of the CCRM harness connector. Is resistance less than 5.0 ohms?	Yes No	GO to X70 . REPAIR open circuit. RESTORE vehicle. VERIFY a symptom no longer exists.
X70	IS SCAN TOOL CAPABLE OF VIEWING PIDS WHILE IN OUTPUT TEST MODE?		
	NOTE: The symptom low speed fan or high speed fan inoperative can be caused by a primary circuit fault, even though a DTC was not set. The next test step will check the primary circuit operation. Is scan tool being used capable of viewing PIDS while in Output Test Mode?	Yes No	GO to X71 . For low speed fan inoperative (fan inoperative for 3.8L Mustang): GO to X73 . For high speed fan inoperative. GO to X74 .

Test Step		Result	Action to Take
X71	CHECK OPERATION OF LOW SPEED FAN OR HIGH SPEED FAN PRIMARY CIRCUITS		
	● Reconnect CCRM and cooling fan. ● Key on, engine off. ● Access Output Test Mode on scan tool. ● For low speed fan inoperative (fan inoperative for 3.8L Mustang): — Access LFC and LFCF PIDs. — With LFC PID off (low speed fan commanded off by PCM), the LFCF PID must be no. — Command the Low Speed Fan on (the LFC PID will now be on). — The LFCF PID must still be no. ● For high speed fan inoperative: — Access HFC and HFCF PIDs. — With HFC PID off (high speed fan commanded off by PCM), the HFCF PID must be no. — Command the high speed fan on (the HFC PID will now be on). — The HFCF PID must still be no. ● Key off. ● Was the HFCF or LFCF PID yes with the fan commanded on or off?	Yes No	▶ An HFC or LFC primary fault is detected. If the HFCF PID was yes: GO to X15 and follow DTC P1479 diagnosis. If the LFCF PID was yes: GO to X20 and follow DTC P1474 diagnosis. ▶ Primary circuits OK. REPLACE CCRM. VERIFY applicable FAN PWR circuit is not short to ground. RESTORE vehicle. VERIFY a symptom no longer exists.
X73	CHECK OPERATION OF FAN (LOW SPEED) PRIMARY CIRCUITS		
	● Reconnect CCRM and cooling fan. ● Install breakout box, connect PCM to breakout box. ● Scan tool connected to DLC. ● Key on, engine off. ● Measure voltage between PCM test pins 45 and 77. Note voltage. ● Access Output Test Mode on scan tool. ● Command Low Speed Fan on. ● Again measure voltage between PCM test pins 45 and 77. Note voltage. ● Did voltage change more than 6.0 volts when the low speed fan was commanded on?	Yes No	▶ Primary circuits OK. Key off. REPLACE CCRM. VERIFY applicable FAN PWR circuit is not shorted to ground. RESTORE vehicle. VERIFY a symptom no longer exists. ▶ VERIFY test results. If voltage still does not change as required, a primary circuit fault is present. Key off. GO to X20.

Test Step		Result	Action to Take						
X74	CHECK OPERATION OF HIGH SPEED FAN PRIMARY CIRCUITS								
● Reconnect CCRM and cooling fan. ● Install breakout box, connect PCM to breakout box. ● Scan tool connected to DLC. ● Key on, engine off. ● Measure voltage between the HFC PCM test pin and PCM test pin 77. Note voltage. ● Access Output Test Mode on scan tool. ● Command high speed fan on, wait 10 seconds. ● Again measure voltage between the HFC PCM test pin and PCM test pin 77. Note voltage. ● Did voltage change more than 6.0 volts when the High Speed Fan was commanded on? <table border="1"><thead><tr><th>Application</th><th>HFC PCM Test Pin</th></tr></thead><tbody><tr><td>Escort/Tracer</td><td>17</td></tr><tr><td>Mustang</td><td>46</td></tr></tbody></table>		Application	HFC PCM Test Pin	Escort/Tracer	17	Mustang	46	Yes No	Primary circuits OK. Key off. REPLACE CCRM. VERIFY applicable FAN PWR circuit is not shorted to ground. RESTORE vehicle. VERIFY a symptom no longer exists. VERIFY test results. If voltage still does not change as required, a primary circuit fault is present. Key off. GO to X15.
Application	HFC PCM Test Pin								
Escort/Tracer	17								
Mustang	46								
X80	COOLING FAN ALWAYS RUNS: DISCONNECT CCRM AND CHECK IF FAN STILL RUNS								
NOTE: For proper results of these pinpoint tests, no DTCs must have been received during PCM Quick Test. For two-speed fan applications, the ACP PID check must also have been performed. ● Accessories off (A/C, blower, lamps). ● Key on, verify cooling fan always on symptom. ● Key off. ● Disconnect CCRM. ● Key on, engine off. ● Is cooling fan still on?		Yes No	Key off. For 3.8L Mustang: REPAIR FAN PWR circuit short to power. RESTORE vehicle. VERIFY a symptom no longer exists. For all others: GO to X81. Key off. GO to X83.						
X81	CHECK LOW FAN PWR AND HIGH FAN PWR CIRCUITS FOR SHORT TO POWER								
● Disconnect cooling fan. ● Key on, engine off. ● Check for voltage on both the LOW FAN PWR and HIGH FAN PWR circuits at the cooling fan harness connector. ● Are both voltages less than 1.0 volt?		Yes No	No fault is indicated at this time. VERIFY results of previous test steps. If OK, RECONNECT all components and RETURN to the symptom Charts for further diagnosis of this or any other symptom. REPAIR short circuit. RESTORE vehicle. VERIFY a symptom no longer exists.						

Test Step		Result	Action to Take
X83	CHECK OPERATION OF LOW SPEED FAN OR HIGH SPEED FAN PRIMARY CIRCUITS		
	NOTE: The symptom cooling fan always runs can be caused by a primary circuit fault, even though a DTC was not set. This step will check the primary circuit operation. - Reconnect CCRM. - Key on, engine off. - For 3.8L Mustang, or if fan stops running with the low speed FC relay disconnected: - Access LFC and LFCF PIDs. - With LFC PID off (low speed fan commanded off by PCM), the LFCF PID must be no. - If fan stops running with the high speed FC relay disconnected: - Access HFC and HFCF PIDs. - With HFC PID off (high speed fan commanded off by PCM), the HFCF PID must be no. - Key off. - Was the HFCF or LFCF PID yes with the fan commanded off?	Yes No	An HFC or LFC primary circuit fault is detected. If the HFCF PID was yes: GO to X15 and follow DTC P 1479 diagnosis. If the LFCF PID was yes: GO to X20 and follow DTC P 1474 diagnosis. Primary circuits OK. REPLACE CCRM. RESTORE vehicle. VERIFY a symptom no longer exists.
X100	ACCS PID OFF WITH A/C ON: CHECK FOR VOLTAGE TO A/C CYCLING SWITCH		
	- Key on, engine off. - Disconnect A/C cycling switch. - A/C demand switch to A/C on. - Measure voltage at the A/C demand switch side of the A/C cycling switch harness connector. - Key off. - Was voltage greater than 10.5 volts?	Yes No	GO to X101. CHECK for causes of no voltage to the A/C cycling switch.
X101	CHECK IF A/C CYCLING SWITCH CONTACTS ARE CLOSED		
	- Measure resistance of the A/C cycling switch contacts at the A/C cycling switch connector. - Is resistance less than 5.0 ohms?	Yes No	For 2.0L (4V) Escort/Tracer: RECONNECT A/C cycling switch. GO to X104. All others: GO to X102. Check the operation of the A/C cycling switch and for a proper refrigerant charge. REPAIR as necessary. RESTORE vehicle. VERIFY a symptom no longer exists.

	Test Step	Result	Action to Take
X102	CHECK FOR VOLTAGE TO DUAL FUNCTION A/C HIGH PRESSURE SWITCH		
	● Reconnect A/C cycling switch. ● Disconnect A/C high pressure switch. ● Key on, engine off. ● A/C on. ● Measure voltage on the A/C demand switch pin at the A/C high pressure switch harness connector. ● Key off. ● Was voltage greater than 10.5 volts? 	Yes No	GO to X103 . REPAIR open between A/C cycling switch and A/C high pressure switch. RESTORE vehicle. VERIFY a symptom no longer exists.
X103	CHECK RESISTANCE OF A/C HIGH PRESSURE SWITCH HIGH PRESSURE CONTACTS		
	● Measure resistance of the normally closed A/C high pressure switch high pressure contacts. ● Is resistance less than 5.0 ohms? 	Yes No	GO to X104 . CHECK for overpressurized A/C system. If OK, replace A/C high pressure switch.
X104	CHECK FOR VOLTAGE TO PCM ON ACCS CIRCUIT		
	● Reconnect A/C high pressure switch (all except 2.0L (4V) Escort/Tracer). ● Install breakout box, leave PCM disconnected. ● Key on. ● A/C ON. ● Measure voltage at PCM test pin 41. ● Is voltage greater than 10.5 volts?	Yes No	REPLACE PCM. RESTORE vehicle. VERIFY a symptom no longer exists. REPAIR open circuit between the A/C high pressure switch (A/C cycling switch for 2.0L (4V) Escort/Tracer) and PCM. RESTORE vehicle. VERIFY a symptom no longer exists.

Test Step		Result	Action to Take
X105	KOEO / KOER DTC P1460: VERIFY ACCS PID IS OFF		
	Key On Engine Off (KOEO) and Key On Engine Running (KOER) Diagnostic Trouble Code (DTC) P1460 indicates a WAC circuit fault or that the A/C was on during Self-Test. NOTE: Verify A/C and Defrost were off during KOEO / KOER Self-Test. If vehicle is not equipped with A/C, the WAC circuit is not used and the DTC P1460 can be ignored. Possible causes: — A/C on during Self-Test. — Open or shorted circuit. — Damaged CCRM. — Damaged PCM. ● Scan tool connected to DLC. ● Start engine. ● A/C and defroster off. ● Access ACCS PID. ● Is the ACCS PID off?	Yes No	Key off. GO to X106. Key off. GO to X125 (to check A/C circuits for short to power).
X106	CHECK WAC CIRCUIT AND WOT A/C CUTOFF RELAY IN CCRM		
	● Disconnect CCRM. ● Check WOT A/C cutoff relay coil resistance: — Measure resistance between pin 22 and pin 24 of the CCRM. — Resistance must be between 130 and 200 ohms. ● Check CCRM for internal short circuit: — Measure resistance of CCRM between pin 22 and the following pins: 1 through 11, 13, 15 and 21. — Measure resistance between pin 22 and the CCRM case. — Each resistance must be greater than 1,000 ohms. ● Are the CCRM checks OK?	Yes No	GO to X107. REPLACE CCRM. RESTORE vehicle. Start engine. TURN A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test.
X107	CHECK WAC CIRCUIT FOR SHORT TO POWER IN HARNESS		
	● CCRM disconnected. ● Install breakout box, leave PCM disconnected. ● Key on. ● Measure voltage between PCM test pin 69 and ground. ● Key off. ● Was voltage less than 1.0 volts?	Yes No	GO to X108. REPAIR short circuit. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test.

Test Step		Result	Action to Take
X108	CHECK WAC CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool from DLC. - Measure resistance between PCM test pin 69 and ground. - Is resistance greater than 10,000 ohms?	Yes No	GO to X109 . REPAIR short circuit. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test.
X109	CHECK FOR OPEN WAC CIRCUIT		
	- Measure resistance of WAC circuit between PCM test pin 69 and pin 22 at the CCRM harness connector. - Is resistance less than 5.0 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test. REPAIR open circuit. RESTORE vehicle. START engine. TURN A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test.
X110	NO/LOW VOLTAGE TO A/C CLUTCH (ACCS PID IS ON WITH A/C ON AND NO DTCS, OR DIRECTED HERE FROM PINPOINT TEST DS): CHECK FOR A/C VOLTAGE TO CCRM		
	- Disconnect CCRM. - Key on. - A/C demand switch to A/C on. - Measure voltage to pin 21 of the CCRM harness connector. - Key off, A/C off. - Was voltage greater than 10.5 volts?	Yes No	GO to X111 . REPAIR open in A/C demand circuit between CCRM and ACCS circuit splice to PCM. RESTORE vehicle. VERIFY a symptom no longer exists.
X111	CHECK FOR OPEN A/C CLUTCH PWR AND A/C CLUTCH GROUND CIRCUITS		
	- Disconnect A/C clutch. - Disconnect scan tool from DLC. - Measure resistance of A/C clutch PWR circuit between pin 23 of the CCRM harness connector and the A/C clutch harness connector. - Measure resistance of A/C clutch ground circuit between pin 16 of the CCRM harness connector and the A/C clutch harness connector. - Are both resistances less than 5.0 ohms?	Yes No	REPLACE CCRM. VERIFY A/C Clutch PWR circuit is not shorted to ground. RESTORE vehicle. VERIFY a symptom no longer exists. REPAIR open circuit. RESTORE vehicle. VERIFY a symptom no longer exists.

Test Step		Result	Action to Take
X115	DTC P1469: CHECK FOR CAUSES OF FAST A/C COMPRESSOR CLUTCH CYCLING		
	Continuous Memory Diagnostic Trouble Code (DTC) P1469 indicates frequent A/C compressor clutch cycling. To set DTC P1469, the ACCS input to the powertrain control module (PCM) (pin 41) must be changing states in less than 8.5 second intervals for a calibratable length of time. Possible causes: — Mechanical A/C system concern (such as low refrigerant charge, damaged A/C cycling switch.) — Intermittent open between the cycling pressure switch and pin 41 (ACCS) to the PCM. — Intermittent open in IGN RUN circuit to cycling pressure switch. ● Test A/C compressor clutch cycle times, and check causes of fast A/C compressor clutch cycling. ● Is a fault indicated?	Yes ▶ No ▶	REPAIR as required. COMPLETE PCM Reset to clear DTC(s). START engine and turn A/C on for about 2 minutes. Engine off, A/C off. RERUN Quick Test. GO to X116 to CHECK for intermittent electrical concern.
X116	CHECK FOR INTERMITTENT OPEN BETWEEN CYCLING PRESSURE SWITCH AND PCM		
	● Key on. ● Access ACCS PID. ● A/C on. ● Observe ACCS PID for an indication of a fault while performing the following (the ACCS PID will turn off and on quickly when a fault is detected, indicating an intermittent open): — Shake, wiggle, bend the ACCS circuit between the cycling pressure switch and PCM. — Lightly tap the A/C cycling switch to simulate road shock. ● Disconnect and inspect the A/C cycling switch connector. ● Is a fault indicated?	Yes ▶ No ▶	Key off. ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTC(s). START engine and TURN A/C on for about two minutes. Engine off, A/C off. RERUN Quick Test. UNABLE to duplicate fault at this time. RESTORE vehicle. COMPLETE PCM Reset to clear DTC(s). RETURN to the symptom Chart to service any additional symptoms.

Test Step		Result	Action to Take
X120	DTC P1460: CHECK FOR INTERMITTENT OPEN OR SHORT IN WAC CIRCUIT		
Continuous Memory Diagnostic Trouble Code (DTC) P1460 indicates that a WAC circuit failure has occurred during vehicle operation. NOTE: If vehicle is not equipped with A/C, the WAC circuit is not used and the DTC P1460 can be ignored. Possible causes: — Open or shorted WAC circuit. ● Disconnect A/C cycling switch. ● Install a jumper wire in the A/C cycling switch vehicle harness connector (to complete the circuit). ● Key on, engine off. ● For all except 2.0L (2V), A/C demand switch on. ● For 2.0L 2V: — Access Output Test Mode on scan tool — Turn outputs on (this will engage the A/C clutch). ● Check WAC circuit for open or short to power while performing the following (the A/C clutch will click on (off for 2.0L (2V)) when a fault is detected): — Shake, wiggle, bend the WAC circuit from the CCRM to the PCM. — Lightly tap the CCRM to simulate road shock. ● Access Output Test Mode on the scan tool. ● Turn outputs off. ● Check WAC circuit for short to ground while performing the following (the A/C clutch will click off (on for 2.0L (2V)) when a fault is detected): — Shake, wiggle, bend the WAC circuit from the CCRM to the PCM. — Lightly tap the CCRM to simulate road shock. ● Key off, A/C off. ● Is a fault indicated?		Yes	▶ ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. START engine. TURN AC on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test.
		No	▶ REMOVE jumper wire. GO to Pinpoint Test Step [Z1] with the following data: WACF PID or WACA PID (whichever is available) and list of Possible causes.

Test Step		Result	Action to Take
X124	DTC P1464: CHECK ACCS PID		
	Diagnostic Trouble Code (DTC) P 1464 Indicates the ACCS input to the powertrain control module (PCM) was high during Self-Test. NOTE: Verify A/C and defrost were off during Self-Test. If A/C or defrost were on, turn off and rerun Self-Test. ● Key on, engine off. ● A/C and defrost off. ● Access ACCS PID. ● Is ACCS PID on?	Yes No	GO to X125. The ACCS PID indicates that the ACCS input to the PCM is low. VERIFY test results. With A/C and defrost off, RERUN Self-Test where DTC P 1464 was received.
X125	ACCS PID ON: DISCONNECT A/C CYCLING SWITCH AND CHECK IF ACCS PID TURNS OFF		
	● Disconnect A/C cycling switch. ● Key on, engine off. ● Access ACCS PID. ● Is ACCS PID off?	Yes No	Key off. VERIFY operation of A/C demand switch. If OK, REPAIR short to power in A/C demand circuit to A/C cycling switch. RESTORE vehicle. VERIFY a symptom no longer exists. Key off. For 2.0L (2V): GO to X127. All others: GO to X126.
X126	CHECK A/C CLUTCH PWR CIRCUIT FOR SHORT TO POWER IN HARNESS		
	● Disconnect CCRM. ● Key on. ● Measure voltage between pin 23 of the CCRM harness connector and ground. ● Key off. ● Was voltage less than 1.0 volt?	Yes No	GO to X127. REPAIR short circuit. RESTORE vehicle. VERIFY a symptom no longer exists.
X127	CHECK ACCS CIRCUIT FOR SHORT TO POWER IN HARNESS		
	● Key off. ● A/C cycling switch and CCRM (except 2.0L (2V)) disconnected. ● Install breakout box, leave PCM disconnected. ● Key on. ● Measure voltage between PCM test pin 41 and ground. ● Key off. ● Was voltage less than 1.0 volt?	Yes No	For 2.0L (2V): REPLACE PCM. RESTORE vehicle. VERIFY a symptom no longer exists. All others: GO to X128. REPAIR short circuit. RESTORE vehicle. VERIFY a symptom no longer exists.

Test Step		Result	Action to Take
X128	CHECK ACCS CIRCUIT VOLTAGE TO PCM WITH CCRM CONNECTED		
	- Reconnect CCRM. - Key on. - Again, measure voltage between PCM Test Pin 41 and ground. - Key off. - Was voltage less than 1.0 volt?	Yes No	REPLACE PCM. RESTORE vehicle. VERIFY a symptom no longer exists. REPLACE CCRM. RESTORE vehicle. VERIFY a symptom no longer exists.
X130	NO WOT A/C CUTOFF, NO DTCS PRESENT: CHECK CCRM		
	- Key on, engine off. - Access Output Test Mode on scan tool. - A/C demand switch on. - While listening to the A/C clutch, command the outputs off and on a couple of times. - Does the A/C clutch engage and disengage when the outputs are cycled off and on?	Yes No	Key off. WOT A/C cutoff is operating properly. If symptom is intermittent, GO to Pinpoint Test Step Z1 with the following data: WACF PID. Otherwise, testing is complete. RETURN to Symptoms Charts to service any other symptoms. VERIFY that the A/C clutch was engaged during testing. If not, REPEAT test with clutch engaged. If clutch was engaged, REPLACE CCRM. RESTORE vehicle. VERIFY a symptom no longer exists.
X135	ACPSW PID CLOSED WITH A/C HIGH PRESSURE SWITCH DISCONNECTED: CHECK ACPSW CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- A/C high pressure switch disconnected. - Disconnect scan tool from DLC. - Install breakout box, leave PCM disconnected. - Measure resistance between PCM test pin 86 and ground. - Is resistance greater than 10,000 ohms?	Yes No	REPLACE PCM. RESTORE vehicle. VERIFY a symptom no longer exists. REPAIR short circuit. RESTORE vehicle. VERIFY a symptom no longer exists.

Test Step		Result	Action to Take
X150	DIAGNOSTIC TROUBLE CODE (DTC) P0230: CHECK FUEL PUMP RELAY AND FP CIRCUIT IN CCRM		
	DTC P0230 indicates a fuel pump primary circuit failure. Possible causes: — Open or shorted fuel pump (FP) circuit. — Damaged CCRM. — Damaged PCM. • Disconnect CCRM. • Check fuel pump relay coil resistance: — Measure resistance between pin 18 and pin 24 of the CCRM. — Resistance must be between 50 and 120 ohms. • Check CCRM for internal short circuit: — Measure resistance of CCRM between pin 18 and the following pins: 1 through 11, 13, 15 and 21. — Measure resistance between pin 18 and the CCRM case. — Each resistance must be greater than 1000 ohms. • Are the CCRM checks OK?	Yes No	▶ GO to X151. ▶ REPLACE CCRM. RESTORE vehicle. RERUN Quick Test.
X151	CHECK FUEL PUMP CIRCUIT FOR SHORT TO POWER IN HARNESS		
	• Disconnect PCM. • Key on, engine off. • Measure voltage between pin 18 at the CCRM harness connector and ground. • Key off. • Was voltage less than 1.0 volt?	Yes No	▶ GO to X152. ▶ REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
X152	CHECK FUEL PUMP CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	• Disconnect scan tool from DLC. • Measure resistance between pin 18 at the CCRM harness connector and ground. • Is resistance greater than 10,000 ohms?	Yes No	▶ GO to X153. ▶ REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
X153	CHECK FOR OPEN FUEL PUMP CIRCUIT		
	• Install breakout box, leave PCM disconnected. • Measure resistance of fuel pump circuit between pin 18 at the CCRM harness connector and PCM test pin 80. • Is resistance less than 5.0 ohms?	Yes No	▶ If Key On, Engine Off (KOEO) DTC P0231 or P0232 is also present with the P0230: GO to X154. All others: REPLACE PCM. RESTORE vehicle. RERUN Quick Test. ▶ REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

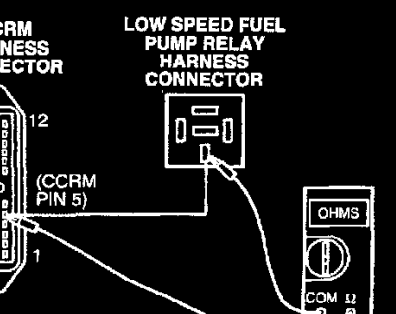
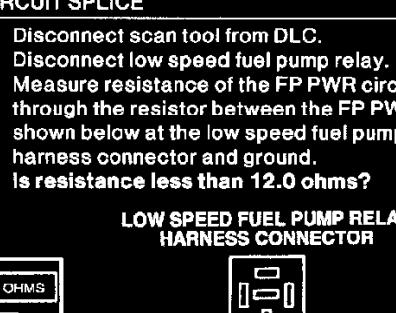
Test Step		Result	Action to Take
X154	CHECK THE FUEL PUMP PRIMARY CIRCUIT INSIDE THE PCM		
	NOTE: The next two test steps will check the FP circuit in the PCM. To do this, the FPF PID will be monitored. The FPF PID can detect faults on the FP circuit, and will indicate NO when no fault is detected and YES when a fault is detected. - Remove breakout box. - Reconnect PCM and CCRM. - Reconnect scan tool to DLC. - Key on, engine off. - Access FPF PID on scan tool. Is the FPF PID indicating YES?	Yes No	Key off. REPLACE PCM. RESTORE vehicle. RERUN Quick Test. GO to X155.
X155	CHECK THE FUEL PUMP PRIMARY CIRCUIT INSIDE THE PCM		
	NOTE: The scan tool must be connected to a reliable power source that is powered with the key in the START position (such as directly to the vehicle battery). Also verify that the vehicle battery is fully charged. - Key on, engine off. - While viewing the FPF PID, crank engine. Is the FPF PID indicating YES during crank?	Yes No	Key off. REPLACE PCM. RESTORE vehicle. RERUN Quick Test. Key off. The fuel pump primary circuit is OK in the harness and PCM. If KOEO DTC P0231 is present: GO to X180. If KOEO DTC P0232 is present: GO to X170.
X160	DIAGNOSTIC TROUBLE CODE (DTC) P 1232. CHECK FOR VPWR TO LOW SPEED FUEL PUMP RELAY		
	DTC P1232 indicates a low speed fuel pump primary circuit failure. Possible causes: - Open or shorted circuit. - Damaged low speed fuel pump relay. - Damaged PCM. - Disconnect low speed fuel pump relay. - Key on, engine off. - Measure VPWR circuit voltage at the low speed fuel pump relay harness connector. Is voltage greater than 10.5 volts?	Yes No	GO to X161. REPAIR open in VPWR circuit between the CCRM and the Low Speed Fuel Pump Relay. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
X161	CHECK LOW SPEED FUEL PUMP RELAY		
- Check low speed fuel pump relay coil resistance: - Measure resistance between pins 85 and 86 of the low speed fuel pump relay (pin numbers moulded on relay). - Resistance must be between 40 and 85 ohms. - Check low speed fuel pump relay for internal shorts. - Measure resistance between pin 85 and both pins 30 and 87 of the low speed fuel pump relay. - Both resistances must be greater than 10,000 ohms. - Are all resistance checks OK?		Yes No	GO to X162 . REPLACE low speed fuel pump relay. RERUN Quick Test.
X162	CHECK LOW FUEL PUMP CIRCUIT FOR SHORT TO POWER IN HARNESS		
- Install breakout box, leave PCM disconnected. - Key on, engine off. - Measure voltage between PCM test pin 43 and ground. - Key off. - Was voltage less than 1.0 volt?		Yes No	GO to X163 . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
X163	CHECK LOW FUEL PUMP CIRCUIT FOR SHORT TO GROUND IN HARNESS		
- Disconnect scan tool from DLC. - Measure resistance between PCM test pin 43 and ground. - Is resistance greater than 10,000 ohms?		Yes No	GO to X164 . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
X164	CHECK FOR OPEN LOW FUEL PUMP CIRCUIT		
- Measure resistance of the Low Fuel Pump circuit between the low speed fuel pump relay harness connector and PCM test pin 43. - Is resistance less than 5.0 ohms?		Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

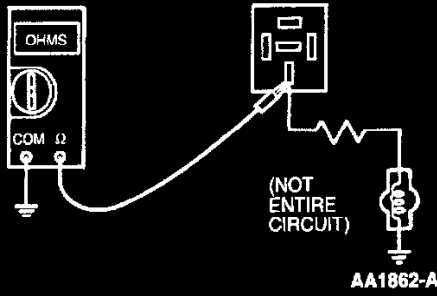
Test Step		Result	Action to Take
X170	DIAGNOSTIC TROUBLE CODE (DTC) P0232: DOES ENGINE START?		
	DTC P0232 indicates that the powertrain control module (PCM) detected the fuel pump monitor (FPM) circuit voltage was high when the fuel pump was commanded off. The FPM circuit is wired to a pull-up voltage inside the PCM. The FPM circuit will go high if, with the key on and the fuel pump commanded off, the FPM/FP PWR circuit loses its path to ground through the fuel pump. The FPM circuit will also be high if the FPM/FP PWR circuit is shorted to power. Possible causes: No Start: — Inertia fuel shutoff (IFS) switch not reset or electrically open. — Open circuit between the fuel pump and FPM circuit connection to FP PWR circuit. — Poor fuel pump ground. — Fuel pump electrically open. Engine Starts: — Fuel pump secondary circuit short to power. — Fuel pump relay contacts always closed. — Open in FPM circuit between PCM and connection to FP PWR circuit. — Damaged PCM. ● Does the engine start?	Yes No	▶ GO to X171. ▶ Key off. GO to X175.
X171	VERIFY THAT FUEL PUMP IS OFF		
	● Key on, wait 5 seconds. ● Listen for motor noise from fuel pump (it may be necessary to listen near the fuel tank). ● Is fuel pump off?	Yes No	▶ Key off. GO to X173. ▶ Key off. GO to X172.
X172	CHECK FOR FUEL PUMP RELAY ALWAYS CLOSED		
	● Disconnect CCRM. ● Key on. ● Does fuel pump shut off when CCRM is disconnected?	Yes No	▶ Key off. REPLACE CCRM. RERUN Quick Test. ▶ Key off. REPAIR short to power in FP PWR/FPM circuit. RESTORE vehicle. RERUN Quick Test.
X173	CHECK FOR OPEN FPM CIRCUIT		
	● Install breakout box, leave PCM disconnected. ● Disconnect CCRM. ● Measure resistance of FPM circuit between PCM test pin 40 and pin 5 at the CCRM harness connector. ● Is resistance less than 7.0 ohms?	Yes No	▶ GO to X174. ▶ REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
X174	CHECK FPM CIRCUIT IN PCM		
	- Remove breakout box. - Reconnect PCM. - Reconnect CCRM. - Key on, engine off. - Access FPM PID on scan tool. Is the FPM PID off?	Yes No	No fault is detected. The FPM circuit is OK in the harness and the PCM. DISREGARD the P0232 at this time. RETURN to Diagnostic Subroutines where DTC P0232 was received and CONTINUE diagnosis as directed. REPLACE PCM. RERUN Quick Test.
X175	CHECK INERTIA FUEL SHUTOFF SWITCH		
	- Locate and disconnect inertia fuel shutoff (IFS) switch (verify that switch is reset). - Measure resistance between the C and NC pins of the IFS switch. Is resistance less than 5.0 ohms?	Yes No	GO to X176. REPLACE or RESET IFS switch. RERUN Quick Test.
X176	CHECK FOR OPEN FP PWR CIRCUIT BETWEEN IFS SWITCH AND CCRM		
	- Disconnect CCRM. - Measure resistance of FP PWR circuit between IFS switch harness connector and Pin 5 of the CCRM harness connector. Is resistance less than 7.0 ohms?	Yes No	RECONNECT CCRM. GO to X177. REPAIR open in FP PWR circuit between IFS switch and FPM connection to circuit.
X177	CHECK FUEL PUMP GROUND CIRCUIT		
	- Disconnect fuel pump. - Measure resistance of fuel pump motor ground circuit between fuel pump harness connector and ground. Is resistance less than 5.0 ohms?	Yes No	GO to X178. REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
X178	CHECK FOR OPEN FP PWR CIRCUIT BETWEEN THE IFS SWITCH AND FUEL PUMP		
	- Measure resistance of FP PWR circuit between IFS switch and fuel pump harness connectors. Is resistance less than 5.0 ohms?	Yes No	GO to X179. REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

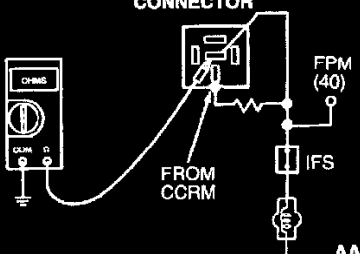
Test Step		Result	Action to Take
X179	CHECK INTERNAL RESISTANCE OF FUEL PUMP		
	- Measure internal resistance of the fuel pump motor between the FP PWR pin and ground pin of the fuel pump connector. - Is resistance less than 10.0 ohms?	Yes No	All fuel pump circuit checks are OK. VERIFY test step results. If all test steps are OK, RECONNECT all components. Disregard the DTC P0232 at this time. RETURN to the Diagnostic Subroutines where DTC was received and CONTINUE diagnosis as directed. REPLACE fuel pump. RESTORE vehicle. RERUN Quick Test.
X180	DIAGNOSTIC TROUBLE CODE DTC P0231: DOES ENGINE START?		
	NOTE: If Key On, Engine Off DTC P0230 is also present and has not been diagnosed, go to X150 (to check the primary fuel pump circuits first). Diagnostic Trouble Code (DTC) P0231 indicates a fuel pump secondary circuit failure between the B+ supply and the FPM connection to the FP PWR circuit. Possible causes: No Starts: - Open circuit between the B+ supply and the FPM connection to the FP PWR circuit. - Fuel pump relay contacts always open. - FP PWR circuit short to ground. Engine Starts: - For 4.6L Mustang, open FP PWR circuit between low speed fuel pump relay and FPM splice. - Damaged PCM. - Does the engine start?	Yes No	Key off. For 4.6L Mustang: GO to X185. For all others: REPLACE PCM. RERUN Quick Test. Key off. GO to X181.
X181	CHECK FOR B+ TO FUEL PUMP RELAY IN CCRM		
	- Disconnect CCRM. - Measure B+ circuit voltage at pin 11 at the CCRM harness connector. - Is voltage greater than 10.5 volts?	Yes No	GO to X182. VERIFY integrity of fuse / fuse link for B+ supply to CCRM (fuel pump relay). If OK, REPAIR open in B+ supply to CCRM. If fuse / fuse link is damaged, check B+ and FP PWR circuits for short to ground before replacing. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
X182	CHECK FOR OPEN FP PWR CIRCUIT - Measure resistance between pin 5 at the CCRM harness connector and the battery negative post. - Is resistance less than 12.0 ohms?	Yes No	REPLACE CCRM and VERIFY FP PWR circuit is not shorted to ground. RERUN Quick Test. For 4.6L Mustang: GO to X183. All others: REPAIR open in FP PWR circuit between FPM splice and CCRM. RESTORE vehicle. RERUN Quick Test.
X183	ISOLATE OPEN IN FP PWR CIRCUIT - Disconnect low speed fuel pump relay. - Measure resistance of FP PWR circuit between low speed fuel pump relay harness connector and pin 5 of the CCRM harness connector. - Is resistance less than 5.0 ohms?  AA1861-A	Yes No	REPAIR open in FP PWR circuit between the low speed fuel pump relay and the FPM splice to the circuit. Also VERIFY continuity of the normally closed contacts of the low speed fuel pump relay (Pins 30 and 87A of the relay). RESTORE vehicle. RERUN Quick Test. REPAIR open FP PWR circuit between CCRM and low speed fuel pump relay. RESTORE vehicle. RERUN Quick Test.
X185	CHECK FOR OPEN FP PWR CIRCUIT BETWEEN LOW SPEED FUEL PUMP RELAY AND FPM CIRCUIT SPLICE - Disconnect scan tool from DLC. - Disconnect low speed fuel pump relay. - Measure resistance of the FP PWR circuit through the resistor between the FP PWR pin shown below at the low speed fuel pump relay harness connector and ground. - Is resistance less than 12.0 ohms?  AA1862-A	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. VERIFY condition of resistor in FP PWR circuit. If OK, REPAIR open FP PWR circuit between the low speed fuel pump relay and the FPM splice to the circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
X190	CONTINUOUS MEMORY DTC P0232: CHECK FUEL PUMP SECONDARY CIRCUITS		
NOTE: If Continuous Memory DTC P0230 is also present and has not been diagnosed, GO to X200 (to check primary circuit first). Continuous Memory Diagnostic Trouble Code (DTC) P0232 indicates that one of the following intermittent conditions has occurred: — Fuel pump circuit activated when PCM expected circuit to be off (i.e. fuel system test or prime procedure). — Inertia fuel shutoff switch was tripped, then reset. — Open circuit in or between the fuel pump and fuel pump monitor (FPM) circuit at the PCM. — Poor fuel pump ground. — FPM or FP PWR circuit short to power. — Fuel pump relay contacts stuck closed. — Engine stall due to excessive load. ● Connect scan tool. ● Key on, engine off. ● Access FPM PID. ● Observe the FPM PID for an indication of a fault while performing the following (the FPM PID will turn ON when an open or short to power is detected): — For 4.6L Mustang: shake, wiggle, bend the FP PWR circuit between the CCRM pin 5 and the low speed fuel pump relay and from the relay to the fuel pump. — For all except the 4.6L Mustang: shake, wiggle, bend the FP PWR circuit between the CCRM pin 5 and the fuel pump. — Shake, wiggle, bend the fuel pump ground circuit from the fuel pump to ground. — Lightly tap the fuel pump, CCRM and inertia fuel shutoff switch to simulate road shock. — Lightly tap the low speed fuel pump relay (4.6L Mustang). — Shake, wiggle, bend the FPM circuit between the PCM and the splice to the FP PWR circuit. ● Key off. ● Inspect the fuel pump vehicle harness connector and the fuel pump ground for corrosion, damaged pins. ● Is a fault indicated / found?		Yes ▶ No ▶	ISOLATE fault and REPAIR as necessary. COMPLETE PCM Reset to clear DTC(s). RERUN Quick Test. GO to Pinpoint Test Step Z1 with the following data: FPM PID and list of Possible causes.

Test Step		Result	Action to Take
X194	CONTINUOUS MEMORY DIAGNOSTIC TROUBLE CODE (DTC) P0231: CHECK FOR OPEN FP PWR CIRCUIT BETWEEN LOW SPEED FUEL PUMP RELAY AND FPM CIRCUIT SPLICE		
Continuous Memory DTC P0231 indicates that sometime while the fuel pump was commanded on, the FPM circuit went low. For the two speed fuel pump system on the 4.6L Mustang, an open in the FP PWR circuit that goes through the resistor could be a possible cause of this DTC, and would only be detected when the normally closed contacts of the low speed fuel pump relay are commanded open. ● Disconnect scan tool from DLC. ● Disconnect low speed fuel pump relay. ● Measure resistance of the FP PWR circuit through the resistor from the FP PWR pin shown below at the low speed fuel pump relay harness connector and chassis ground. ● Is resistance less than 12.0 ohms?		Yes	▶ RECONNECT low speed fuel pump relay. GO to X195 .
		No	▶ VERIFY condition of resistor in FP PWR circuit. If OK, REPAIR open FP PWR circuit between the low speed fuel pump relay and the FPM splice to the circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
LOW SPEED FUEL PUMP RELAY HARNESS CONNECTOR  (NOT ENTIRE CIRCUIT) AA1862-A			

Test Step		Result	Action to Take
X195	CONTINUOUS MEMORY DTC P0231: CHECK HARNESS		
	Continuous Memory Diagnostic Trouble Code (DTC) P0231 indicates that sometime during vehicle operation when the fuel pump was commanded on, the FPM circuit voltage went low. Possible causes: — Open in B+ circuit to the fuel pump relay. — Fuel pump relay contacts open. — Open in FP PWR circuit between the CCRM and FPM splice. • Disconnect PCM. Install breakout box. Leave PCM disconnected. • Install a jumper wire between PCM test pin 80 (FP) and PCM test pin 77 (PWR GND). • Connect a digital multimeter between PCM test pins 40 and 51. • Key on. The fuel pump will turn on and voltage will be greater than 10.0 volts. • Observe voltage for an indication of a fault while performing the following (voltage will change suddenly when a fault is detected, indicating an open): — Shake, wiggle, bend the fuel pump relay B+ circuit to the CCRM (pin 11). — Lightly tap the CCRM (to simulate road shock). — For 4.6L Mustang: shake, wiggle, bend the FP PWR circuit between the CCRM pin 5 and the low speed fuel pump relay, and from the relay to the FPM splice. — For all except the 4.6L Mustang: shake, wiggle, bend the FP PWR circuit between the CCRM and the FPM splice. — Lightly tap the low speed fuel pump relay (4.6L Mustang). • Key off. • Inspect the PCM and CCRM connectors for corrosion or damaged pins. • Is a fault indicated?	Yes ▶ No ▶	ISOLATE fault and REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. GO to Pinpoint Test Step Z1 with the following data: FPM PID and list of Possible causes.
X200	CONTINUOUS MEMORY DTC P0230: CHECK FUEL PUMP PRIMARY CIRCUITS		
	Continuous Memory Diagnostic Trouble Code (DTC) P0230 indicates a fuel pump primary circuit failure has occurred during vehicle operation. Possible causes: — Open coil in fuel pump relay. — Open in fuel pump (FP) circuit. • Key on, engine off. Wait 5 seconds. • Access FPF PID. The FPF PID will be NO, indicating that the PCM detects VPWR voltage through the fuel pump relay coil and FP circuit (pin 80) to the PCM. • Observe the FPF PID for an indication of a fault while performing the following (the FPF PID will be YES, when an open is detected (because the PCM will not detect VPWR voltage on pin 80 (FP))): — Shake, wiggle, bend the FP circuit between the PCM (pin 80) and CCRM (pin 18). — Lightly tap the CCRM (to simulate road shock). • Key off. • Inspect the PCM and CCRM connectors for corrosion or damaged pins. • Is a fault indicated?	Yes ▶ No ▶	ISOLATE fault and REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. If P0231 or P0232 is also present with P0230: An intermittent fuel pump secondary circuit fault can exist. For P0231: GO to X195. For P0232: GO to X190. All others: GO to Pinpoint Test Step Z1 with the following data: FPF PID and list of Possible causes. For testing the FP circuit with the engine running, also monitor the FPM PID. This is because an open harness circuit using the FPF PID cannot always be detected.

Test Step		Result	Action to Take
X205	CONTINUOUS MEMORY DIAGNOSTIC TROUBLE CODE (DTC) P1232: CHECK LOW SPEED FUEL PUMP PRIMARY CIRCUITS		
	A Continuous Memory DTC P1232 indicates a low speed fuel pump primary circuit failure has occurred during vehicle operation. Possible causes: — Open in VPWR to low speed fuel pump relay. — Open coil in low speed fuel pump relay. — Open in low fuel pump (LFP) circuit (PCM pin 43). • Key on, engine off. Wait 5 seconds. • Access LFPF PID. The LFPF PID will be NO, indicating that the PCM detects VPWR voltage through the low speed fuel pump relay coil and LFP circuit (pin 43) to the PCM. • Observe the LFPF PID for an indication of a fault while performing the following (the LFPF PID will be YES if a fault is detected). — Shake, wiggle, bend the LFP circuit between the PCM pin 43 and the low speed fuel pump relay. — Shake, wiggle, bend the VPWR circuit between the CCRM and the low speed fuel pump relay. — Lightly tap the low speed fuel pump relay (to simulate road shock). • Key off. • Inspect the PCM and low speed fuel pump relay connector for corrosion or damaged pins. • Is a fault indicated?	Yes No	▶ ISOLATE fault and REPAIR as necessary. COMPLETE PCM reset to clear DTCs. RERUN Quick Test. ▶ Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: LFPF PID and list of Possible causes.
X210	HARD START/LACK OF POWER: CHECK LOW SPEED FUEL PUMP RELAY NORMALLY CLOSED CONTACTS		
	The purpose of the next two test steps is to verify that the secondary circuits used for high speed fuel pump operation are OK. • Disconnect low speed fuel pump relay. • Measure resistance between Pin 30 and Pin 87A of the relay (pin numbers moulded on relay). • Is resistance less than 5.0 ohms?	Yes No	▶ Normally closed contacts of the relay are OK. GO to X211. ▶ REPLACE low speed fuel pump relay. VERIFY a symptom no longer exists.
X211	CHECK FP PWR CIRCUIT (HIGH SPEED PORTION) FROM LOW SPEED FUEL PUMP RELAY		
	• Measure resistance between the FP PWR circuit pin of the low speed fuel pump relay harness connector shown below and chassis ground. • Is resistance less than 10.0 ohms? LOW SPEED FUEL PUMP RELAY HARNESS CONNECTOR  AA1863-A	Yes No	▶ The secondary circuits for high speed fuel pump operation are OK. RECONNECT low speed fuel pump relay. RETURN to Symptom Charts. ▶ REPAIR open in FP PWR circuit between the low speed fuel pump relay and the splice where the circuit through the resistor connects (REFER to the schematic at the beginning of this pinpoint test). RESTORE vehicle. VERIFY a symptom no longer exists.

Test Notes

Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:

- Harness circuits: All associated with VLCM
- Variable Load Control Module (**VLCM**)
- Powertrain control module

Test Step		Result	Action to Take
XB1	DTC P1484: CLEAR AND ATTEMPT TO REGENERATE DTC		
	Diagnostic Trouble Code (DTC) P1484 indicates the VLCM PWR GND (Pin 1) is open. This can be due to a hard fault or an intermittent condition. Possible causes: — Open VLCM PWR GND circuit. — Damaged VLCM. NOTE: If DTC P1484 is present in Key On Engine Off (KOEO) or Key On Engine Running (KOER) Self-Test, GO to XB2. • Complete PCM Reset to clear DTC(s). • Start engine. • Turn A/C on, wait 15 seconds. • A/C off. • Engine off. • Retrieve Continuous Memory DTCs. • Is Continuous Memory DTC P1484 present?	Yes No	▶ DTC P1484 is a hard fault. GO to XB2. ▶ DTC P1484 is intermittent. GO to XB4.
XB2	CHECK FOR OPEN VLCM PWR GND CIRCUIT		
	• Disconnect VLCM. • Measure resistance between Pin 1 of the VLCM harness connector and the battery negative post. • Is resistance less than 5.0 ohms?	Yes No	▶ REPLACE VLCM. RECONNECT all components. COMPLETE PCM Reset to clear Continuous Memory DTC(s). START engine. A/C on, WAIT 15 seconds. Key off, A/C off. RERUN Quick Test. ▶ REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear Continuous Memory DTC(s). START engine. A/C on, WAIT 15 seconds. Key off, A/C off. RERUN Quick Test.
XB4	CHECK VLCM PWR GND CIRCUIT FOR INTERMITTENT OPENS		
	• Visually check the VLCM PWR GND circuit (VLCM Pin 1) from the VLCM to the circuit's ground point. • Disconnect VLCM. • Connect a test lamp between the battery positive post and Pin 1 of the VLCM vehicle harness connector. • Observe test lamp for an indication of a fault while performing the following (the lamp will go out when a fault is found, indicating an open): — Shake, wiggle, bend the VLCM PWR GND circuit between the VLCM harness connector and the circuit's ground point. • Is a fault indicated?	Yes No	▶ ISOLATE fault and REPAIR as necessary. RESTORE vehicle. START engine. A/C on, WAIT 15 seconds. A/C off, key off. RERUN Quick Test. ▶ Unable to duplicate or identify fault at this time. RECONNECT all components. GO to Pinpoint Test Step Z1 with the list of Possible causes.

Test Step		Result	Action to Take
XB10	DTC P1483: CLEAR AND ATTEMPT TO REGENERATE DTC		
	Diagnostic Trouble Code (DTC) P1483 indicates that when the cooling fan was activated, the FAN PWR circuit exceeded the normal current draw. This can be due to a hard fault or an intermittent condition. Possible causes: — FAN PWR circuit short to ground. — Damaged cooling fan motor. — Damaged VLCM. NOTE: If DTC P1483 was present in Key On Engine Off (KOEO) or Key On Engine Running (KOER) Self-Test, GO to XB11. • Complete PCM Reset to clear DTC(s). • Start engine. • Turn A/C on, wait 15 seconds. • A/C off. • Engine off. • Retrieve Continuous Memory DTCs. • Is Continuous Memory DTC P1483 present?	Yes No	DTC P1483 is a hard fault. GO to XB11. DTC P1483 is intermittent. GO to XB14.
XB11	CHECK COOLING FAN MOTOR		
	• Complete PCM Reset to clear Continuous Memory DTCs. • Disconnect cooling fan motor. • Start engine. • Turn A/C on, wait 15 seconds (but no more than 20 seconds). • A/C off. • Engine off. • Again, retrieve Continuous Memory DTCs. • Is Continuous Memory DTC P1483 present (disregard any other DTCs)?	Yes No	GO to XB12. REPLACE cooling fan motor. RESTORE vehicle. RERUN Quick Test.
XB12	CHECK FAN PWR CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	• Disconnect VLCM. • Measure resistance between FAN PWR circuit and ground. • Is resistance greater than 10,000 ohms?	Yes No	REPLACE VLCM. RESTORE vehicle. COMPLETE PCM Reset to clear DTC(s). START engine. TURN A/C on, wait 15 seconds. A/C off, key off. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTC(s). START engine. TURN A/C on, WAIT 15 seconds. A/C off, key off. RERUN Quick Test.

Test Step		Result	Action to Take
XB14	CHECK VLCM CONNECTOR AND FAN PWR CIRCUIT FOR INTERMITTENT SHORT TO GROUND IN HARNESS		
	- Visually check the FAN PWR circuit from the VLCM to the cooling fan. - Disconnect VLCM. - Connect a test lamp between Pin 2 and Pin 4 of the VLCM harness connector. - Observe test lamp for an indication of a fault while performing the following (The lamp will be on, but not to full brightness. A short to ground will be indicated by the lamp getting brighter.): - Shake, wiggle, bend the FAN PWR circuit near the cooling fan. - Disconnect cooling fan. - Test lamp still connected between Pin 2 and Pin 4 of the VLCM harness connector. - Observe test lamp for an indication of a fault while performing the following (the lamp will turn on, indicating a short to ground): - Again, shake, wiggle, bend the FAN PWR circuit from the VLCM harness connector to the cooling fan harness connector. - Is a fault indicated?	Yes No	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. START engine. A/C on, WAIT 15 seconds. A/C off, key off. RERUN Quick Test. Unable to duplicate or identify fault at this time. RECONNECT all components. GO to Pinpoint Test Step Z1 with the list of Possible causes.
XB20	KEY ON ENGINE OFF DTC P1473: VERIFY COOLING FAN IS NOT ALWAYS ON		
	Key On Engine Off (KOEO) Diagnostic Trouble Code (DTC) P1473 indicates an open or short to power in the FAN PWR circuit. Possible causes: - Open or short to power in the FAN PWR circuit (harness). - Open cooling fan motor ground circuit. - Open circuit in cooling fan. - Damaged VLCM. NOTE: Verify that the cooling fan was not turning during KOEO Self-Test. If the fan is turning, back voltage can be sent to the VLCM through the FAN PWR circuit resulting in an invalid P1473 DTC. - Engine cooled down (so cooling fan would normally be off). - A/C and defroster off. - Key on, engine off. - Is cooling fan on?	Yes No	Key off. GO to XB25 (to check for short to power). Key off. GO to XB21 (to check for opens).

Test Step		Result	Action to Take
XB21	CHECK FOR OPEN COOLING FAN GROUND CIRCUIT		
	- Disconnect cooling fan. - Measure resistance of cooling fan ground circuit between cooling fan harness connector and chassis ground. Is resistance less than 5.0 ohms?	Yes No	GO to XB22 . REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
XB22	CHECK FOR OPEN FAN PWR CIRCUIT		
	- Disconnect VLCM. - Measure resistance of FAN PWR circuit between the cooling fan harness connector and Pins 2 and 3 of the VLCM harness connector. Is resistance less than 5.0 ohms?	Yes No	GO to XB23 . REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
XB23	CHECK COOLING FAN FOR INTERNAL OPEN		
	- Measure resistance of the cooling fan between the FAN PWR pin and ground pin of the cooling fan connector. Is resistance less than 10.0 ohms?	Yes No	REPLACE VLCM. RESTORE vehicle. RERUN Quick Test. REPLACE cooling fan. RESTORE vehicle. RERUN Quick Test.
XB25	CHECK FAN PWR CIRCUIT FOR SHORT TO POWER		
	- Disconnect cooling fan. - Disconnect VLCM. - Key on, engine off. - Measure voltage between FAN PWR circuit in harness and ground. - Key off. Was voltage less than 1.0 volt?	Yes No	REPLACE VLCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
XB40	DTC P1539: CLEAR AND ATTEMPT TO REGENERATE DTC		
	Diagnostic Trouble Code (DTC) P1539 indicates that when the A/C was turned on, the A/C Clutch PWR circuit exceeded the normal current draw. This can be due to a hard fault or an intermittent condition. Possible causes: — A/C Clutch PWR circuit short to ground. — Damaged A/C clutch. — Damaged VLCM. NOTE: If DTC P1539 was present in Key On Engine Off (KOEO) or Key On Engine Running (KOER) Self-Test, GO to XB41. ● Complete PCM Reset to clear DTC(s). ● Start engine. ● Turn A/C on, wait 15 seconds. ● A/C off. ● Engine off. ● Retrieve Continuous Memory DTC(s). ● Is DTC P1539 present?	Yes No	DTC P1539 is a hard fault. GO to XB41. DTC P1539 is intermittent. GO to XB44.
XB41	CHECK A/C CLUTCH		
	● Again, complete PCM Reset to clear DTC(s). ● Disconnect A/C clutch. ● Start engine. ● Turn A/C on, wait 15 seconds. ● A/C off. ● Engine off. ● Retrieve Continuous Memory DTC(s) again. ● Is DTC P1539 present (ignore DTC P1530 if received)?	Yes No	GO to XB42. CHECK any A/C clutch external wiring for shorts to ground. If OK, REPLACE A/C clutch. RESTORE vehicle. COMPLETE PCM Reset to clear DTC(s) (if necessary). RERUN Quick Test.
XB42	CHECK A/C CLUTCH PWR CIRCUIT FOR SHORT TO GROUND		
	● Disconnect VLCM. ● Measure resistance between A/C Clutch PWR circuit in harness and ground. ● Is resistance greater than 10,000 ohms?	Yes No	REPLACE VLCM. RESTORE vehicle. COMPLETE PCM Reset to clear DTC(s). START engine. TURN A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTC(s). START engine. TURN A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test.

Test Step		Result	Action to Take
XB44	CHECK A/C CLUTCH PWR CIRCUIT FOR INTERMITTENT SHORT TO GROUND		
	- Visually check the A/C Clutch PWR circuit from the VLCM to the A/C clutch. - Disconnect VLCM. - Disconnect A/C clutch. - Connect a test lamp between Pin 4 and Pin 18 of the VLCM harness connector. - Observe test lamp for an indication of a fault while performing the following (the lamp will turn on when a fault is detected, indicating a short to ground): - Shake, wiggle, bend the A/C Clutch PWR circuit from the A/C clutch harness connector to the VLCM harness connector. Is a fault indicated?	Yes No	► ISOLATE fault and REPAIR as necessary. RESTORE vehicle. START engine. A/C on, WAIT 15 seconds. A/C off, key off. RERUN Quick Test. ► Unable to duplicate or identify fault at this time. RECONNECT all components. GO to Pinpoint Test Step [21] with the list of Possible causes.
XB50	DTC P1530: CLEAR AND ATTEMPT TO REGENERATE DTC		
	Diagnostic Trouble Code (DTC) P1530 indicates an open or short to power in the A/C Clutch PWR circuit. This could be due to a hard fault or an intermittent condition. Possible causes: - Open or short to power in the A/C Clutch PWR circuit (harness). - Open A/C clutch ground circuit. - Open circuit in A/C clutch. - Damaged VLCM. NOTE: If DTC P1530 was present in Key On Engine Off (KOEO) or Key On Engine Running (KOER) Self-Test, GO to [XB51]. - Complete PCM Reset to clear DTC(s). - A/C off, defroster off (the VLCM tests for DTC P1530 only with the A/C off). - Start engine, wait 15 seconds. - Engine off. - Retrieve Continuous Memory DTC(s). Is DTC P1530 present?	Yes No	► DTC P1530 is a hard fault. GO to [XB51]. ► DTC P1530 is intermittent. GO to [XB55].
XB51	CHECK A/C CLUTCH PWR CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Disconnect A/C clutch. - Disconnect VLCM. - Key on. - Measure voltage between A/C Clutch PWR circuit in harness and ground. - Key off. Was the voltage less than 1.0 volt?	Yes No	► GO to [XB52]. ► REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTC(s). A/C off, defroster off. START engine. WAIT 15 seconds. Key off. RERUN Quick Test.

Test Step		Result	Action to Take
XB52	CHECK FOR OPEN A/C CLUTCH PWR AND A/C CLUTCH GROUND CIRCUITS		
	● Measure resistance of A/C Clutch PWR circuit between Pin 18 of the VLCM harness connector and the A/C clutch harness connector. ● Measure resistance of the A/C clutch ground circuit between the A/C clutch harness connector and ground. ● Are both resistances less than 5.0 ohms?	Yes No	GO to XB53. REPAIR open in applicable circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTC(s). A/C off, defroster off. START engine, WAIT 15 seconds. Key off. RERUN Quick Test.
XB53	CHECK RESISTANCE OF A/C CLUTCH		
	● Measure resistance of the A/C clutch coil (between the A/C Clutch PWR and A/C clutch ground pins of the A/C clutch connector). ● Is resistance less than 10.0 ohms?	Yes No	REPLACE VLCM. RESTORE vehicle. COMPLETE PCM Reset to clear DTC(s). A/C off, defroster off. START engine, WAIT 15 seconds. Key off. RERUN Quick Test. REPLACE A/C clutch. RESTORE vehicle. COMPLETE PCM Reset to clear DTC(s). A/C off, defroster off. START engine, WAIT 15 seconds. Key off. RERUN Quick Test.
XB55	CHECK A/C CLUTCH PWR CIRCUIT FOR INTERMITTENT SHORT TO POWER		
	NOTE: Be aware that DTCP 1530 can be set if the A/C clutch is disconnected and the engine is started during testing. ● Visually check the A/C Clutch PWR circuit from the VLCM to the A/C clutch. Also check the A/C clutch ground circuit from the A/C clutch to its ground point. ● A/C off. ● Key on, engine off. ● Shake, wiggle, bend the A/C Clutch PWR circuit between the VLCM and A/C clutch (especially in the vicinity of power circuits). A short to power will be indicated by the A/C clutch engaging. ● Key off. ● Is a fault indicated?	Yes No	ISOLATE fault and REPAIR as necessary. RERUN Quick Test. GO to XB56.

Test Step		Result	Action to Take
XB56	CHECK A/C CLUTCH PWR AND A/C CLUTCH GROUND CIRCUITS FOR INTERMITTENT OPENS		
	● Disconnect A/C clutch. ● Connect a test lamp between the A/C Clutch PWR and A/C clutch ground circuits at the A/C clutch harness connector. ● Disconnect VLCM. ● Connect a jumper wire between the battery positive (B+) post and Pin 18 (A/C Clutch PWR) of the VLCM harness connector. CAUTION: To avoid damage, be careful not to short the jumper to any other pins. ● Observe test lamp for an indication of a fault while performing the following (the lamp will go out when a fault is detected, indicating an open circuit): — Shake, wiggle, bend the A/C Clutch PWR and A/C clutch ground circuits. ● Is a fault indicated?	Yes No	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. RERUN Quick Test. Unable to duplicate or identify fault at this time. RESTORE vehicle. GO to Pinpoint Test Step [Z1] with the list of Possible causes.
XB60	KOEO/KOER DTC P 1625 AND/OR P 1626: CHECK FOR B+ TO VLCM PINS 4 AND 5		
	Diagnostic Trouble Code (DTC) P 1625 indicates that the B+ supply to the VLCM fan circuit is not detected. Diagnostic Trouble Code (DTC) P 1626 indicates that the B+ supply to the VLCM A/C circuit is not detected. NOTE: Since B+ to the VLCM fan and A/C circuits is supplied on the same VLCM pins (4 and 5), the diagnostics for DTCs P 1625 and P 1626 are the same. Possible causes: — Open B+ circuit to VLCM pins 4 and 5. — Damaged VLCM. ● Disconnect VLCM. ● Measure voltage at Pin 4 and Pin 5 of the VLCM harness connector. ● Are both voltages greater than 10.5 volts?	Yes No	REPLACE VLCM. RERUN Quick Test. VERIFY condition of related fuses. If fuse is damaged, verify B+ circuit is not short to ground. If fuse is OK, REPAIR open B+ circuit to VLCM. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
XB65	CONTINUOUS MEMORY DTC P1625 AND/OR P1626: CHECK FOR INTERMITTENT OPEN IN B+ CIRCUIT TO VLCM PINS 4 AND 5		
	Continuous Memory Diagnostic Trouble Code (DTC) P1625 indicates that an open B+ supply to the VLCM fan circuit has been detected. Continuous Memory Diagnostic Trouble Code (DTC) P1626 indicates that an open B+ supply to the VLCM A/C circuit has been detected. NOTE: Since B+ to the VLCM fan and A/C circuits is supplied on the same VLCM pins (4 and 5), the diagnostics for P1625 and P1626 are the same. Possible causes: — Intermittent open in B+ circuit to VLCM (pins 4 and 5). ● Disconnect VLCM. ● Connect a test lamp between Pin 5 (B+) of the VLCM vehicle harness connector and chassis ground. ● Observe test lamp for an indication of a fault while performing the following (the lamp will go out when a fault is detected, indicating an open circuit): — Shake, wiggle, bend the B+ circuit to VLCM Pins 4 and 5. — Lightly tap related fuses. ● Remove related fuse(s). Inspect for corrosion or damage. Reconnect fuse(s) after checking. ● Is a fault indicated?	Yes No	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. RERUN Quick Test. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with list of Possible causes.
XB75	DTC P1464: CHECK ACCS PID		
	Diagnostic Trouble Code (DTC) P1464 indicates the A/C is requested on by the EATC module during Self-Test. NOTE: Verify A/C and defrost were off during Self-Test. If A/C or defrost were on, turn off and rerun Self-Test. ● Key on, engine off. ● Scan Tool connected to DLC. ● A/C and defrost off. ● Access ACCS PID. ● Is ACCS PID on?	Yes No	The PCM is receiving a request from the EATC module to turn the A/C on. This request is coming through the BUS+ and BUS- circuits. GO to the Heating and Air Conditioning for A/C system diagnosis. The ACCS PID indicates that the A/C is requested off by the EATC module. VERIFY test results. With A/C and defrost off, RERUN Self-Test where DTC P1464 was received.

Test Step		Result	Action to Take
XB80	DTC U1021, U1073: ARE ANY OTHER DTC(S) PRESENT IN KOEO, KOER OR CONTINUOUS MEMORY SELF-TEST?		
	The following U Diagnostic Trouble Codes (DTCs) indicate a failure in the two-way communication between the powertrain control module (PCM) and the VLCM. For the two-way communication, the PCM and VLCM use the BUS+ and BUS- circuits. DTC U1021 indicates a lack of A/C status response. DTC U1073 indicates a lack of engine cooling fan status response. Possible causes without any other DTCs: — Vehicle operated, or attempted to be started, with low or dead battery. — Open or shorted BUS+ or BUS- circuit. — BUS+ / BUS- circuit(s) too close to high current / voltage circuits (such as secondary ignition wires, cellular phone or C.B. antennas). — Damaged VLCM (possible only if U DTCs are present in KOEO or KOER Self-Test). • Are any other DTC(s) present in Key On Engine Off (KOEO), Key On Engine Running (KOER) or Continuous Memory Self-Test?	Yes No	▶ REFER to Diagnostic Subroutine for direction to diagnose the other DTC(s). ADDRESS the first DTC output in the following Self-Test order: 1) KOEO 2) KOER 3) Continuous Memory ▶ No other DTC(s) present. GO to XB81.
XB81	IS DTC U1021 OR U1073 PRESENT IN KOEO OR KOER SELF-TEST?		
	• Is DTC U1021 or U1073 present in KOEO or KOER Self-Test?	Yes No	▶ A fault is now present. However, the PCM is able to communicate with the Scan Tool, and the BUS+ and BUS- circuits to the DLC are OK. GO to XB82. ▶ GO to XB87 to check for an intermittent fault.
XB82	CHECK FOR OPEN BUS+ AND BUS- CIRCUIT BETWEEN PCM AND VLCM		
	• Disconnect Scan Tool from DLC. • Disconnect VLCM. • Disconnect PCM. Install breakout box, leave PCM disconnected. • Measure resistance of BUS- circuit between PCM test pin 15 and Pin 23 of the VLCM harness connector. • Measure resistance of BUS+ circuit between PCM test pin 16 and Pin 21 of the VLCM harness connector. • Are both resistances less than 5.0 ohms?	Yes No	▶ GO to XB83. ▶ REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
XB83	CHECK BUS+ AND BUS- CIRCUITS FOR SHORT TO POWER IN HARNESS		
	● Key on. ● Measure voltage of BUS- circuit between PCM test pin 15 and ground. ● Measure voltage of BUS+ circuit between PCM test pin 16 and ground. ● Key off. ● Were both voltages less than 8.0 volts?	Yes No	GO to XB84 . REPAIR short to power. RESTORE vehicle. RERUN Quick Test.
XB84	CHECK BUS+ AND BUS- CIRCUITS FOR SHORT TO GROUND OR EACH OTHER IN HARNESS		
	● Measure resistance between PCM test pin 15 and ground. ● Measure resistance between PCM test pin 16 and ground. ● Measure resistance between PCM test pins 15 and 16. ● Are all resistances greater than 500 ohms?	Yes No	INSPECT BUS+ and BUS- circuits for proper routing. VERIFY that the circuits are not mis-routed by any high current/voltage circuits (such as secondary ignition wiring, cellular phone or C.B. radio antennas). Also VERIFY that the battery is properly charged. REPAIR as necessary. RERUN KOEO/KOER Self-Test to VERIFY that the U DTC will repeat. If all other checks are OK and the KOEO/KOER DTC will repeat, REPLACE VLM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
XB87	PRELIMINARY CHECKS		
	● Inspect BUS+ and BUS- circuits for proper routing. Verify that the circuits are not mis-routed by any high current/voltage circuits (such as secondary ignition wiring, cellular phone or C.B. radio antennas). ● If the vehicle is operated, or attempted to be started, with a low or dead battery, U DTC(s) can be set. If possible, check to see if this situation has occurred. ● If an off-board diagnostic tool (such as SBDS®) was being used to control the PCM, and the function was suddenly stopped, (for example tool unplugged) without a normal exit, a U DTC can be set. If possible, check if this situation has occurred. ● Are the preliminary checks OK?	Yes No	GO to XB88 . REPAIR as necessary. COMPLETE PCM Reset to clear DTC(s). RERUN Quick Test.

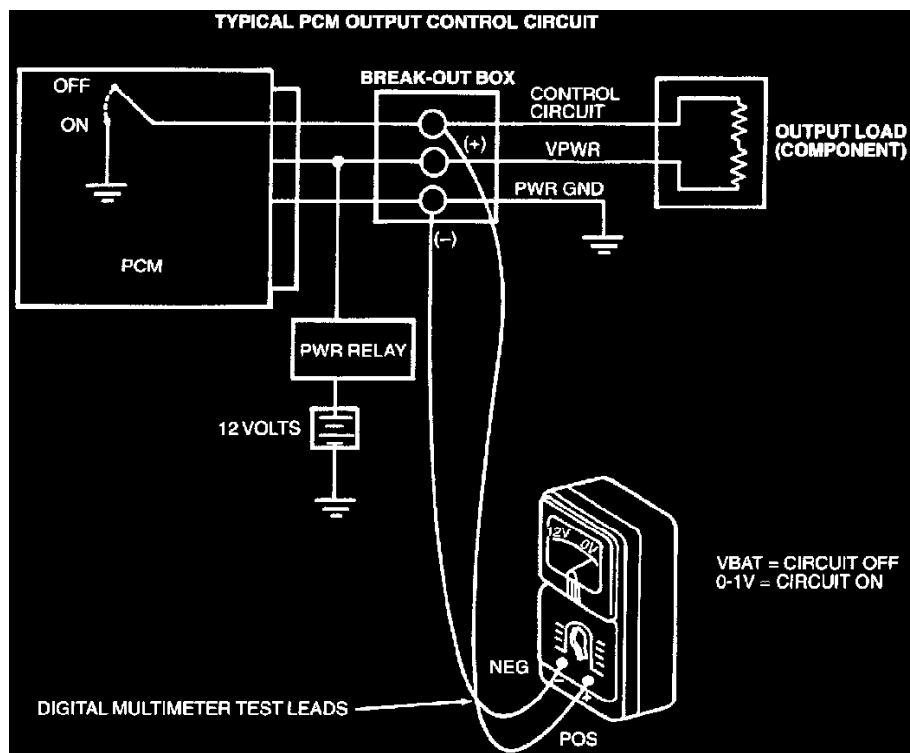
Test Step		Result	Action to Take
XB88	CHECK BUS+ AND BUS- CIRCUITS FOR INTERMITTENT SHORT TO POWER		
● Disconnect Scan Tool from DLC. ● Disconnect VLCM. ● Disconnect PCM. ● Install breakout box, leave PCM disconnected. ● Connect a jumper wire between Pin 21 (BUS+) and Pin 23 (BUS-) of the VLCM harness connector. This will connect the two circuits so they can be tested together. ● Check the BUS+ and BUS- circuits for intermittent short to power by performing the following: — Connect digital multimeter to measure voltage between PCM test pin 15 (BUS-) and PCM test pin 77 (PWR GND). — Key on. — Observe voltage reading for an indication of a fault while performing the following (voltage will suddenly increase when a short to power is detected): — Shake, wiggle, bend the BUS+ and BUS- circuits. ● Key off. ● Is a fault indicated?		Yes	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. RERUN Quick Test. GO to XB89 .
		No	
XB89	CHECK BUS+ AND BUS- CIRCUITS FOR INTERMITTENT OPEN		
● Jumper wire installed between Pin 21 and Pin 23 of the VLCM harness connector. ● Check for intermittent opens by performing the following: — Connect digital multimeter to measure resistance between PCM test pins 15 and 16. — Observe resistance reading for an indication of a fault while performing the following (resistance will increase to greater than 5.0 ohms when an open is detected). — Shake, wiggle, bend the BUS+ and BUS- circuits from the PCM to the VLCM. ● Is a fault detected?		Yes	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. RERUN Quick Test. GO to XB90 .
		No	

Test Step		Result	Action to Take
XB90	CHECK BUS+ AND BUS- CIRCUITS FOR INTERMITTENT SHORT TO GROUND OR SHORT TO EACH OTHER		
● Jumper wire installed between Pin 21 and Pin 23 of VLCM harness connector. ● Check the BUS+ and BUS- circuits for intermittent short to ground by performing the following: — Connect digital multimeter to measure resistance between PCM test pins 15 and 77. — Observe resistance reading for an indication of a fault while performing the following (resistance will suddenly drop from a stable reading if a short to ground is detected): — Shake, wiggle, bend the BUS+ and BUS- circuits. ● Check the BUS+ and BUS- circuits for intermittent short to each other by performing the following: — Remove jumper wire at VLCM vehicle harness connector. — Connect digital multimeter to measure resistance between PCM test pin 15 and PCM 16. — Observe resistance reading for an indication of a fault while performing the following (resistance will drop if a short is detected). — Again shake, wiggle, bend the BUS+ and BUS- circuits. ● Is a fault detected?		Yes	▶ ISOLATE fault and REPAIR as necessary. RESTORE vehicle. RERUN Quick Test. ▶ No fault is identified at this time. RESTORE vehicle. RETURN to Symptom Charts to continue diagnosis of vehicle symptoms.
		No	

Priority Is From 1 (High) to 4 (Low)					
Circuit	Input Test	Output Test	Water Soak	Road Test	Ignition Test
4X4L	1	N/A	3	2	N/A
A/C ON	1	N/A	3	2	N/A
A/CCS	1	N/A	3	2	N/A
A/CD	1	N/A	3	2	N/A
A/CP	1	N/A	3	2	N/A
AIRB	N/A	1	3	2	N/A
AIRD	N/A	1	3	2	N/A
BPP	1	N/A	N/A	2	N/A
Case GND	1	N/A	N/A	2	N/A
CD-1	N/A	1	3	4	2 (NON COP)
CD-2	N/A	1	3	4	2 (NON COP)
CD-3	N/A	1	3	4	2 (NON COP)
CD-4	N/A	1	3	4	2 (NON-COP)
CD-5	N/A	1	N/A	2	N/A
CD-6	N/A	1	N/A	2	N/A
CD-7	N/A	1	N/A	2	N/A
CD-8	N/A	1	N/A	2	N/A
CD-9	N/A	1	N/A	2	N/A
CD-10	N/A	1	N/A	2	N/A
CHT	1	N/A	3	2	N/A
CHTIL	1	N/A	N/A	2	N/A
CKP+	1	N/A	3	4	2
CMP	1	N/A	2	3	N/A
CPP	1	N/A	N/A	2	N/A
CTO	N/A	1	N/A	2	N/A
DOL	N/A	1	N/A	2	N/A
DPFEGR	1	N/A	2	3	N/A
EAIR	N/A	1	3	2	N/A
EAIRM	1	N/A	3	2	N/A
ECT	1	N/A	2	3	N/A
EFT-A	1	N/A	2	3	N/A
EFT-B	1	N/A	2	3	N/A
EGRVR	N/A	1	3	2	N/A
EVAPCP	N/A	1	3	2	N/A
EVAPCV	N/A	1	3	2	N/A
EVAPPF	N/A	1	3	2	N/A
FC	N/A	1	3	2	N/A
FLI	1	N/A	3	2	N/A
FP	N/A	1	3	2	N/A
FPM	1	N/A	N/A	2	N/A
FRP	1	N/A	2	3	N/A
FSV	N/A	1	3	2	N/A
FSVM	1	N/A	N/A	2	N/A
FTP	1	N/A	3	2	N/A

Priority Is From 1 (High) to 4 (Low)					
Circuit	Input Test	Output Test	Water Soak	Road Test	Ignition Test
HFC	N/A	1	3	2	N/A
HO2S-11	1	N/A	3	2	N/A
HO2S-12	1	N/A	3	2	N/A
HO2S-21	1	N/A	3	2	N/A
HO2S-22	1	N/A	3	2	N/A
HTR-11	N/A	1	3	2	N/A
HTR-12	N/A	1	3	2	N/A
HTR-21	N/A	1	3	2	N/A
HTR-22	N/A	1	3	2	N/A
IAC	N/A	1	3	2	N/A
IAT	1	N/A	2	3	N/A
IMRC	N/A	1	3	2	N/A
IMRCM	1	N/A	3	2	N/A
IMRCM-2	1	N/A	3	2	N/A
IMT Valve	N/A	1	3	2	N/A
INJ-1	N/A	1	3	2	N/A
INJ-2	N/A	1	3	2	N/A
INJ-3	N/A	1	3	2	N/A
INJ-4	N/A	1	3	2	N/A
INJ-5	N/A	1	3	2	N/A
INJ-6	N/A	1	3	2	N/A
INJ-7	N/A	1	3	2	N/A
INJ-8	N/A	1	3	2	N/A
INJ-9	N/A	1	3	2	N/A
INJ-10	N/A	1	3	2	N/A
KS	1	N/A	3	2	N/A
LFC	N/A	1	3	2	N/A
LFP	N/A	1	3	2	N/A
MAF	1	N/A	3	2	N/A
MIL	N/A	1	N/A	2	N/A
OCT ADJ	1	N/A	3	2	N/A
PNP	1	N/A	N/A	2	N/A
PSP	1	N/A	3	2	N/A
PTO	1	N/A	N/A	2	N/A
SIL	N/A	1	N/A	2	N/A
TCIL	N/A	1	N/A	2	N/A
TCS	1	N/A	N/A	2	N/A
TP	1	N/A	3	2	N/A
VCT	N/A	1	3	2	N/A
VSS+	1	N/A	3	2	N/A
WAC	N/A	1	3	2	N/A

N/A = Not Applicable



Test Notes

Enter this pinpoint test only when directed here.

Preliminary checks must be performed before continuing this pinpoint test:

- Electrical connections
- Vacuum leaks
- Fuel level and quality
- Ignition wiring connections
- Intake air filters, tubes and gaskets
- Aftermarket alterations
- Basic engine (valves, timing, etc.)

This pinpoint test contains instructions for isolating an intermittent fault. It combines the use of a scan tool with a breakout box, a fuel pressure gauge, vacuum gauge and ignition tester. If available, the Service Bay Diagnostic System can be used for intermittent diagnostics. Actual values can be compared to typical values listed in Reference Values to aid in finding the fault.

Also refer to Intermittent Diagnostic Techniques, for further help in isolating and repairing the fault.

Worksheet For Road Test Procedure

PID Values	KOEO Actual Values	KOEO Typical Values	Hot Idle Actual Values	Hot Idle Typical Values	30 MPH Actual Values	30 MPH Typical Values	55 MPH Actual Values	55 MPH Typical Values
-								
-								
-								
-								
-								
-								
-								
-								
-								
MEASURED VALUES								
-								
-								
-								
-								
-								
-								
-								
OTHER VALUES								
-								
-								
-								
-								
-								
-								
WEATHER CONDITIONS:				DRIVING ROUTE:				
-								
-								
-								
-								

Worksheet For Road Test Procedure

NOTE: Use the Worksheet for Road Test Procedure to list the typical values from the Diagnostic Reference Values at the end of this pinpoint test. The typical values can be compared to the actual values obtained during the road test procedure.

Test Step		Result	Action to Take
Z1	INTERMITTENT TEST PROCEDURE		
NOTE: All Intermittent procedures are used in conjunction with the Symptom Chart and the Typical Diagnostic Reference Values. ● If directed here from another pinpoint test use the PIDs given in that test or refer to the Reference Value Symptom Chart. ● Based on the Intermittent Prioritization Chart at the beginning of this section, choose an Intermittent Diagnostic Procedure below: — Input Test - This test is used on sensing devices such as temperature, position or oxygen. — Output Test - This test is used on output devices such as relays, coils or solenoids. — Water Soak Test - This test is used on both input and output devices. Especially useful on spark plug wires, relays and hall effect sensors. — Road Test - This test is used on both input and output devices. Four modes of engine operation are monitored for intermittent. — NOTE: The electronic ignition (EI) system tester is not capable of diagnosing coil on plug (COP) systems. Ignition Test - This test is for non coil on plug only and used to diagnose the ignition system using the Electronic Ignition (EI) System Tester. Coil on plug applications will use the input, output, water soak and road test only. Select the next priority from the intermittent prioritization chart. ● Have you chosen an Intermittent Diagnostic Test procedure?		Yes	► For the Input Test: GO Z10. For Output Test: GO to Z20. For Water Soak Test: GO to Z30. For Road Test: GO to Z40. For Ignition Test: GO to Z50.
		No	► To diagnose other driveability symptoms, GO to Symptom Charts.

Test Step		Result	Action to Take
Z10	INTERMITTENT KOEO SENSOR WIGGLE PROCEDURE		
WARNING: WHEN PERFORMING ANY OF THE TEST STEPS, ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS, ENGINE DRIVE BELTS OR HOT SURFACES. ● Connect scan tool to DLC or breakout box with digital multimeter if necessary. ● Access PIDs or measured values based on information from the pinpoint test or Reference Value Symptom Chart. ● Go to the area of the suspected wiring or component fault. ● Key on, engine off. ● If input is a switch-type component, turn on manually. ● Lightly tap on component while monitoring values. Wiggle and pull each component wire (Signal, Signal Return and VREF, if applicable) at the component. ● Look for abrupt changes in values. Compare the actual values to the KOEO Typical Diagnostic Reference PID Values. ● Are any values out of range or suddenly drop out and back into range?		Yes	► Possible wiring or component condition. CHECK each wire for corrosion, bent or loose terminals and poor wire terminal crimps. REPAIR as necessary. Otherwise, REPLACE component. VERIFY repair. COMPLETE PCM Reset to clear DTCs. If unable to verify, REINSTALL original part and GO to Z11.
		No	► GO to Z11 for PCM wiring check.
Z11	INTERMITTENT KOEO HARNESS WIGGLE PROCEDURE		
● Continue to monitor the information from the previous step. ● Go to the area of the suspected wiring or component fault. ● Wiggle and pull each sensor wire (Signal, Signal Return and VREF, if applicable) from the component back to the PCM connector. ● Look for abrupt changes in values. Compare the actual values to the KOEO Typical Diagnostic Reference Values. ● Are any values out of range or suddenly drop out and back into range?		Yes	► Possible wiring or component condition. CHECK each wire for corrosion, bent or loose terminals and poor wire terminal crimps. REPAIR as necessary. Otherwise, if the value dropped out while checking the PCM harness connector and there is no evidence of a fault, REPLACE PCM. If unable to verify, REINSTALL original PCM. Return to Z1 and choose another procedure to follow.
		No	► Unable to verify fault. GO to Z12.

Test Step		Result	Action to Take
Z12	INTERMITTENT KOER INPUT SENSOR WIGGLE PROCEDURE		
WARNING: WHEN PERFORMING ANY OF THE TEST STEPS, ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS, ENGINE DRIVE BELTS OR HOT SURFACES. ● Access PIDs or measured values based on information from the pinpoint test or from the Reference Value Symptom Charts. ● Go to the area of the suspected wiring or component fault. ● Key on, engine running. ● Lightly tap on component while monitoring values. Also wiggle and pull each component wire (Signal, Signal Return and VREF, if applicable) at the component. ● Look for abrupt changes in values. Compare the actual values to the HOT IDLE Typical Diagnostic Reference Values. ● Are any values out of range or suddenly drop out and back into range?		Yes	► Possible wiring or component condition. CHECK each wire for corrosion, bent or loose terminals and poor wire terminal crimps. REPAIR as necessary. Otherwise, REPLACE component. VERIFY repair. COMPLETE PCM Reset to clear DTCs. If unable to verify, REINSTALL original part, and GO to Z13 .
		No	► GO to Z13 for PCM wiring check.
Z13	INTERMITTENT KOER INPUT HARNESS WIGGLE PROCEDURE		
● Continue to monitor the information from the previous step. ● Go to the area of the suspected wiring or component fault. ● Wiggle and pull each component wire (Signal, Signal Return and VREF, if applicable) from the component back to the PCM connector. ● Look for abrupt changes in values. Compare the actual values to the HOT IDLE Typical Diagnostic Reference Values. ● Key off. ● Were any values out of range or suddenly drop out and back into range?		Yes	► Possible wiring or component condition. CHECK each wire for corrosion, bent or loose terminals and poor wire terminal crimps. REPAIR as necessary. Otherwise if the value dropped out while checking the PCM harness connector and there is no evidence of a wiring fault, REPLACE PCM. If unable to verify repair, REINSTALL original PCM and RETURN to Z1 and choose another procedure to follow.
		No	► Unable to verify fault. RETURN to Z1 and choose another procedure to follow.

Test Step		Result	Action to Take
Z20	INTERMITTENT KOEO OUTPUT DEVICE PROCEDURE		
	Some outputs / switches may need to be driven in order to be checked (such as fuel injectors and idle air controllers). GO to Z40 for the Intermittent Road Test Procedure to check outputs that are not controlled in the Output Test Mode. ● Connect scan tool to DLC. ● Select the PIDs / circuits to monitor based on the information from the pinpoint test or Reference Value Symptom Chart. ● Go to the area of the suspected wiring or component fault. ● Record any Continuous DTCs before proceeding to the next step. A DTC P1000 will be generated when the PCM is disconnected. Caution must be used for the next steps. Cooling fans or fuel pump may turn on. ● Install breakout box, leave PCM disconnected. ● Connect a digital multimeter (refer to beginning of Pinpoint Test for illustration): — Red lead to output control circuit. — Black lead to battery ground. ● Key on, engine off. ● Access Output Test Mode. ● Turn the output on. Observe the volt reading and PID display. ● While outputs are on, lightly tap on component and look for the voltage change. ● Did the voltage remain steady and less than 1 volt?	Yes No	▶ Unable to verify fault, GO to Z21. ▶ Fault area is identified. If fault occurred while tapping on component, REPLACE part. RESTORE vehicle. VERIFY repair. COMPLETE PCM Reset to clear DTCs. If unable to verify, REINSTALL original part and GO to Z21.
Z21	INTERMITTENT OUTPUT DEVICE HARNESS WIGGLE TEST		
	● Continue to monitor PIDs / circuits. ● Turn outputs on. ● Wiggle, push and pull on the component wire (VPWR and control circuit) from the component back to the PCM connector. ● Key off. ● Was the voltage steady and less than 1 volt?	Yes No	▶ Unable to verify fault. RESTORE vehicle. RETURN to Z1 and choose another procedure. ▶ Possible wiring conditions. CHECK each wire for corrosion, bent or loose terminals. REPAIR as necessary. VERIFY repair. COMPLETE PCM Reset to clear DTCs.

Test Step		Result	Action to Take
Z30	INTERMITTENT WATER SOAK PROCEDURE		
	● Connect scan tool to DLC. ● Access PIDs or measured value based on information from the pinpoint test or from the Reference Value Symptom Chart. ● Go to the area of the suspected wiring fault (based on the PIDs or measured value attached to the Symptom Chart). ● Key on, engine running. ● Accurately spray water on each component circuit wire, component or vacuum line related to the possible fault area. Include any relays or relay modules (such as CCRM). ● Continue to individually water soak any relays or relay modules (such as CCRM) associated with fault. ● Look for abrupt changes in values or engine running conditions. ● Compare the actual values to the HOT IDLE Typical Diagnostic Reference PID Values. ● Are any values out of range or suddenly drop out and back into range or was there a noticeable engine misfire/stumble?	Yes No	Fault area is identified. If fault occurred while spraying on component, REPLACE part and VERIFY repair. If unable to verify, REINSTALL original part. If fault occurred while spraying the circuit wiring, CHECK each wire for corrosion, bent or loose terminals and poor wire terminal crimps. REPAIR as necessary. If fault occurred while spraying the vacuum line, REPAIR as necessary. VERIFY repair. COMPLETE PCM Reset to clear DTCs. If unable to verify any repair. REPEAT test. Unable to verify fault. RETURN to Z31 and choose another procedure.
Z31	INTERMITTENT IGNITION COMPONENT WATER SOAK PROCEDURE		
	● With the engine still running, continue to individually water soak the ignition control module, spark plugs, wires, CKP and CMP sensors. ● Look for abrupt changes in values or engine running conditions. ● Compare the actual values to the HOT IDLE Typical Diagnostic Reference Values. ● Key off. ● Are any values out of range or suddenly drop out and back into range or was there a noticeable engine misfire/stumble?	Yes No	Fault area is identified. If fault occurred while spraying on component, REPLACE part and VERIFY repair. If unable to verify, REINSTALL original part. If fault occurred while spraying the wiring, CHECK each circuit wire for corrosion, bent or loose terminals and poor wire terminal crimps. REPAIR as necessary. VERIFY repair. COMPLETE PCM Reset to clear DTCs. If unable to verify any repair, REPEAT test. Unable to verify fault. RETURN to Z1 and choose another procedure.

Test Step		Result	Action to Take
Z40	INTERMITTENT ROAD TEST PROCEDURE FOR KOEO		
The Intermittent Road Test Procedure is a set of instructions for monitoring the PIDs or measured values with a scan tool or breakout box with digital multimeter during a road test. This is done under four different conditions - KOEO, HOT IDLE, 48 and 88 kmh (30 and 55 mph). The Typical Diagnostic Reference Value Charts are used to compare the data from the vehicle to data on the charts. Use worksheet at the beginning of the Pinpoint Test. For 48 and 88 kmh (30 and 55 mph) procedures, a passenger is required and a route is also recommended. To perform an OBD II Drive Cycle, refer to Drive Cycles to help plan a route. ● Copy the list of PIDs or measured signals in the Reference Value Symptom Chart. These will be monitored during the Road Test Procedure. If sent from a pinpoint test, the recommended PIDs should also be selected. ● Connect scan tool to DLC. ● Connect other diagnostic aids if available to help find fault (such as breakout box, fuel pressure gauge, vacuum gauge or Intermittent Ignition Analyzer). ● Key on, engine off. ● Access the PIDs or breakout box values with digital multimeter. ● Compare the actual values from the vehicle to the KOEO values from the Typical Diagnostic Reference Value Chart. ● Key off. ● Were any values out of range?		Yes	Fault identified. For input type fault: GO to Z10 . For output type fault: GO to Z20 .
		No	Unable to verify fault. GO to Z41 .

Test Step		Result	Action to Take
Z41	INTERMITTENT ROAD TEST PROCEDURE FOR HOT IDLE		
- Continue to monitor the PIDs / signals listed in the previous step. - Key on, engine running. - Warm engine to operating temperature (approximately 87° (195°F)). - Continue to monitor based on the information from the pinpoint test or from the Reference Value Symptom Chart. - Compare the actual values from the vehicle to the HOT IDLE values in the Typical Diagnostic Reference Value Chart. - Key off. Are any values out of range or suddenly drop out and back into range?		Yes	Fault identified. For input type fault: GO to Z10 .
		No	Unable to verify fault. GO to Z42 .
Z42	INTERMITTENT ROAD TEST PROCEDURE FOR SLOW CRUISE		
NOTE: Look for certain conditions that cause an intermittent fault to occur. - Key on, engine running. - Continue to monitor the PIDs or measured values listed in Z40. - Instrument the vehicle as in the previous steps. - Select a person to assist in performing the 48 kmh (30 mph) road test. - Make sure engine is at operating temperature before comparing or recording diagnostic values. - Drive the vehicle in a steady 48 kmh (30 mph) range with accessories off. - Access the PIDs or measured values based on the information from the pinpoint test or from the Reference Value Symptom Chart. - Compare the actual values from the vehicle to the 48 kmh (30 mph) values in the Typical Diagnostic Reference Value Chart. - Key off. Are any values out of range or suddenly drop out and back into range?		Yes	Fault identified. For input type fault: GO to Z10 .
		No	Unable to verify fault. GO to Z43 .

Test Step		Result	Action to Take
Z43	INTERMITTENT ROAD TEST PROCEDURE FOR HIGH CRUISE		
NOTE: Look for certain conditions that cause the intermittent fault to occur. ● Key on, engine running. ● Continue to monitor the PIDs or measured values listed from Z40. ● Instrument the vehicle as in the previous steps. ● Select person to assist in performing the 88 kmh (55 mph) test. ● Make sure engine is at operating temperature before comparing or recording diagnostic values. ● Drive the vehicle in a steady 88 kmh (55 mph) range with accessories off. ● Access the PIDs or measured values based on information from the pinpoint test or from the Reference Value Symptom Chart. ● Compare the actual values from the vehicle to the 88 kmh (55 mph) values from the Typical Diagnostic Reference Value Chart. ● Key off. ● Are any values out of range or suddenly drop out and back into range?		Yes ► Fault identified. For input type fault: GO to Z10. For output type fault: GO to Z20. No ► Unable to verify fault. RETURN to Z1 and choose another procedure.	
Z50	INTERMITTENT IGNITION PROCEDURE		
PRELIMINARY CHECKS NOTE: This pinpoint test must be used with the Rotunda DIST Distributor / Less Ignition System Tester 418-F024 (007-00075) or equivalent for non coil on plug applications only. If this tester is not available, return to Z1 and choose another procedure. Quick Test must be performed and instructions in Pinpoint Test steps completed before starting the intermittent ignition procedure. When making resistance checks, make sure the key is in the off position and the scan tool is disconnected from the DLC. ● Check sensor shield connector. ● Be certain the battery is fully charged. ● All accessories must be off during diagnosis. ● Is vehicle prepared for equipment set-up?		Yes ► GO to Z51. No ► REPEAT Z50.	

Test Step		Result	Action to Take
Z51	INSTALL DIST TESTER		
● All accessories must be off during testing. ● Select proper Overlay and Program Cartridge to match the ignition system to be tested. ● Install overlay on front panel of tester. ● Insert Program Cartridge into the cartridge slot (marked on the RH side of the front panel). Make sure the cartridge is fully inserted. ● Select and install the proper harness adapter to the Rotunda DIST Distributor/Less Ignition System Tester 104-Pin PCM Adapter 007-00110. Set the rotary knob to position I. ● Verify that the WIGGLE TEST switch is in the OFF position. For 2.5L Ranger, verify that the SYSTEM TYPE switch is set to DUAL PLUG; all other four cylinders set to NON DUAL PLUG. ● WIGGLE TEST can only be used during key on, engine off. — WIGGLE TEST monitors circuits for intermittent faults. — WIGGLE TEST MODES A, B, and C check for short to power, open, and short to ground respectively. — Simulate fault conditions by wiggling the wiring harness and tapping on connectors and components. — The DIST will beep and turn on the LED for the circuit on which a fault is detected. ● Disconnect the vehicle wiring harness from PCM. ● Hook Tester to PCM and vehicle wiring harness. ● Key on, engine off. Press Tester RESET button. The tester performs Self-Test when it is reset or powered up. During the Self-Test, all LEDs will light and a beep will be heard. ● If the CASE GND (CKP SHIELD) FAULT MEMORY LED (EI only) stays on, run a ground line from the PCM Case to GND and continue with test. ● Key off. ● Did the tester perform Self-Test and is the VPWR LED on?		Yes No	GO to Z220 . GO to tester check in Z52 .

Test Step		Result	Action to Take
Z52	TESTER CHECK		
	- Disconnect tester from vehicle. - Connect a jumper wire from VPWR jack to vehicle battery POS (+) terminal. - Connect a jumper wire from PWR GND jack to vehicle battery NEG (-) terminal. - If tester performs Self-Test, reconnect tester to vehicle and Go to Z190. - If tester does not perform Self-Test, refer to tester manual. - If LEDs do not light or beep is not heard during Self-Test, refer to tester manual. - Did tester pass Self-Test?	Yes No	GO to Z220 . DIST tester does not pass Self-Test. REFER to Warranty supplied with DIST tester.
Z190	CHECK VPWR CIRCUIT FOR OPEN		
	- Key on, engine off. - Measure the voltage from VPWR jack to the battery GND(-) terminal. - Key off. - Was the reading greater than 6 volts?	Yes No	GO to Z191 . REPAIR open in VPWR circuit harness to PCM. RETURN to Z51 .
Z191	CHECK PWR GND CIRCUIT FOR OPEN BETWEEN PCM AND B-		
	- Measure the resistance between PWR GND jack and B-. - Is resistance less than 5 ohms?	Yes No	GO to Z192 . REPAIR open circuit. RETURN to Z51 .
Z192	WIGGLE TEST MODE B - POWER CIRCUIT		
	- Connect a jumper wire from PWR GND jack to the battery GND(-) terminal. - Key on, engine off. - WIGGLE TEST switch ON. - Place MODE switch to B. - Wiggle Test. - Key off. - Did the tester Reset?	Yes No	REPAIR open in VPWR circuit harness to PCM. RETURN to Z51 . REPAIR open in PWR GND circuit harness to PCM. RETURN to Z51 .
Z220	CHECK FOR COIL FAULTS		
	- Key on, engine off. - Press RESET button and wait for tester to initialize. - Are any COIL FAULT MEMORY LEDs on or flashing?	Yes No	GO to Z229 . GO to Z221 .
Z221	CHECK CASE GND / CKP SHIELD		
	Is the CASE GND / CKP SHD FAULT MEMORY LED on or flashing?	Yes No	GO to Z253 . GO to Z222 .
Z222	CKP BIAS CHECK		
	Is the CKP BIAS SYSTEM STATUS LED on?	Yes No	GO to Z223 . GO to Z243 .

Test Step		Result	Action to Take
Z223	CHECK FOR COIL FAULT		
	- With the DIST connected to the vehicle, try to recreate the fault by test driving the vehicle. If the vehicle is a No Start, crank engine for 5 to 10 seconds. - Key off. - Were any COIL FAULT MEMORY LEDs on during crank or engine run?	Yes No	GO to Z229 . GO to Z224 .
Z224	CASE GND / CKP SHIELD FAULT		
	- Key on, engine running or key on, engine cranking as described in Z223. - Is the CASE GND / CKP SHIELD FAULT MEMORY LED on during crank or engine run?	Yes No	GO to Z253 . GO to Z225 .
Z225	CHECK CKP STATUS		
	- Key on, engine running or key on, engine cranking as described in Z223. - Is the CKP SYSTEM STATUS SIGNAL LED on during crank or engine run?	Yes No	GO to Z226 . GO to Z247 .
Z226	CHECK FOR CTO FAULT		
	- Key on, engine running or key on, engine cranking as described in Z223. - Key off. - Is the CTO FAULT MEMORY LED on during crank or engine run?	Yes No	GO to Z239 . GO to Z227 .
Z227	CHECK FOR CKP SIGNAL		
	- Key on, engine running or key on, engine cranking as described in Z223. - Key off. - Is the CKP SIGNAL SYSTEM STATUS LED on during crank or engine run?	Yes No	Fault is not related to ignition system. RETURN to Z1 and choose another procedure. GO to Z247 .
Z229	CHECK COIL IGN START/RUN CIRCUIT FOR OPEN		
	- Disconnect coil pack(s). - Key on, engine off. - Measure voltage from IGN Start/Run at coil pack connector(s) to PWR GND jack. - Key off. - Is the voltage greater than 10.5 volts?	Yes No	GO to Z230 . SERVICE VPWR harness(es) to coil pack(s). RETEST. COMPLETE PCM Reset to clear DTCs.
Z230	CHECK COIL DRIVER CIRCUITS FOR SHORT TO VPWR AND PWR GND		
	- Measure resistance from COIL jacks to PWR GND jack. - Measure resistance from COIL jacks to VWPR jack. - Is any resistance less than 5K ohms?	Yes No	GO to Z236 . GO to Z231 .

Test Step		Result	Action to Take
Z231	CHECK COIL CIRCUIT FOR OPEN IN HARNESS		
	- Measure resistance from each COIL jack to its pin in the coil harness connector. - Is each resistance less than 5 ohms?	Yes No	GO to Z232 . REPAIR coil harness. RETEST. COMPLETE PCM Reset to clear DTCs.
Z232	CHECK COIL LINES FOR SHORT TOGETHER		
	- Measure resistance from every COIL jack to all other COIL jacks. - Is any resistance less than 10K ohms?	Yes No	GO to Z237 . GO to Z233 .
Z233	CHECK COIL CIRCUIT(S) FOR HARD FAULT		
	- Reconnect coil pack(s). - Key on, engine off. - Press RESET button. - Wait for tester initialization. - Wait for coil test to run. - Are any COIL FAULT MEMORY LEDs on or flashing?	Yes No	GO to Z238 . GO to Z234 .
Z234	WIGGLE TEST MODE B - COIL CIRCUIT(S)		
	- Place WIGGLE TEST switch to ON. - Place MODE switch to B. - Press RESET button. - Wait for WIGGLE TEST ACTIVE LED to light. - Wiggle Test. - Key off. - Are any FAULT MEMORY LEDs on?	Yes No	PRESS RESET and WAIT for WIGGLE TEST ACTIVE LED to light. CONTINUE to test until intermittent is isolated. REPAIR as necessary. RETEST. COMPLETE PCM Reset to clear DTCs. GO to Z235 .
Z235	COIL DISCONNECTED WIGGLE TEST MODE B		
	- Disconnect coil pack(s). - Key on, engine off. - Wait for WIGGLE TEST ACTIVE LED to light. - Wiggle test. - Are any FAULT MEMORY LEDs on?	Yes No	PRESS RESET and WAIT for WIGGLE TEST ACTIVE LED light. CONTINUE to test until intermittent is isolated. REPAIR as necessary. RETEST. REPLACE PCM. RETEST.
Z236	ISOLATE COIL LINE SHORTS FOR VPWR AND PWR GND		
	- Disconnect PCM, leave DIST connected. - Measure resistance from each COIL jack to PWR GND jack. - Measure resistance from each COIL jack to VPWR jack. - Is any resistance less than 10K ohms?	Yes No	REPAIR coil harness. RETEST. COMPLETE PCM Reset to clear DTCs. REPLACE PCM. RETEST.
Z237	ISOLATE COIL LINE SHORTS BETWEEN COILS		
	- Disconnect PCM. - Reconnect DIST between coils harness. - Measure resistance from every COIL jack to all other COIL jacks. - Is any resistance less than 10K ohms?	Yes No	REPAIR coil harness. RETEST. COMPLETE PCM Reset to clear DTCs. REPLACE PCM. RETEST.

Test Step		Result	Action to Take
Z238	CHECK FOR CORROSION		
- Key off. - Check ignition system connectors for corrosion. Is any corrosion present?		Yes	REPAIR connectors. RETEST. COMPLETE PCM Reset to clear DTCs.
		No	REPLACE damaged coil pack(s). RETEST. COMPLETE PCM Reset to clear DTCs.
Z239	CHECK CTO CIRCUIT FOR SHORTS TO VPWR AND PWR GND		
- Measure resistance from CTO to VPWR jack. - Measure resistance from CTO to PWR GND jack. Is any resistance less than 1K ohm?		Yes	GO to Z240 .
		No	GO to Z241 .
Z240	ISOLATE CTO SHORTS		
- Disconnect PCM. - Reconnect DIST to harness. - Measure resistance from CTO to VPWR jack. - Measure resistance from CTO to PWR GND jack. Is any resistance less than 1K ohm?		Yes	REPAIR CTO harness / tachometer. RETEST. COMPLETE PCM Reset to clear DTCs.
		No	REPLACE PCM. RETEST.
Z241	WIGGLE TEST MODE B - CTO CIRCUIT		
- Key on, engine off. - Place WIGGLE TEST switch to ON. - Place MODE switch to B. - Press RESET button. - Wait for WIGGLE TEST ACTIVE LED to light. - Wiggle test. Are any FAULT MEMORY LEDs on?		Yes	PRESS RESET and WAIT for WIGGLE TEST ACTIVE LED to light. CONTINUE to test until intermittent is isolated. REPAIR as necessary. RETEST. COMPLETE PCM Reset to clear DTCs.
		No	GO to Z242 .
Z242	WIGGLE TEST - CHECK FOR FAULT		
6 or 4 cylinder: Set MODE switch to A. 8 cylinder: Set MODE switch to C. - Press RESET button. - Wait for WIGGLE TEST ACTIVE LED to light. - Wiggle Test. Are any FAULT MEMORY LEDs on?		Yes	PRESS RESET and WAIT for WIGGLE TEST ACTIVE LED to light. CONTINUE to test until intermittent is isolated. REPAIR as necessary. RETEST. COMPLETE PCM Reset to clear DTCs.
		No	REPLACE PCM. RETEST.
Z243	CHECK CKP BIAS		
- Key off. - Disconnect harness from CKP sensor. - Key on, engine off. - Press RESET button and wait for tester to initialize. - Key off. Is the CKP BIAS SYSTEM STATUS LED on?		Yes	GO to Z245 .
		No	GO to Z244 .

Test Step		Result	Action to Take
Z244	ISOLATE SHORT TO VPWR AND PWR GND FOR CKP+ CIRCUIT		
	- Disconnect PCM. - Reconnect DIST to harness. - Measure resistance from CKP+ jack to VPWR jack. - Measure resistance from CKP+ jack to PWR GND jack. - Are both resistances greater than 10K ohms?	Yes No	REPLACE PCM. RETEST. REPAIR CKP harness. RETEST. COMPLETE PCM Reset to clear DTCs.
Z245	CHECK CKP- CIRCUIT FOR SHORTS TO VPWR AND PWR GND		
	- Measure resistance from CKP- jack to PWR GND jack. - Measure resistance from CKP- jack to VPWR jack. - Are both resistances greater than 10K ohms?	Yes No	REPLACE CKP sensor. RETEST. COMPLETE PCM Reset to clear DTCs. GO to Z246 .
Z246	ISOLATE SHORTS TO VPWR AND PWR GND FOR CKP- CIRCUIT		
	- Disconnect PCM. - Reconnect DIST to harness. - Measure resistance from CKP- jack to PWR GND jack. - Measure resistance from CKP- jack to VPWR jack. - Are both resistances greater than 10K ohms?	Yes No	REPLACE PCM. RETEST. REPAIR CKP harness. RETEST. COMPLETE PCM Reset to clear DTCs.
Z247	CHECK FOR CKP SIGNAL		
	- Press RESET button and wait for tester to initialize. - Crank or start engine. - Is the CKP SIGNAL SYSTEM STATUS LED on during crank or engine run?	Yes No	GO to Z252 . GO to Z248 .
Z248	CHECK FOR CKP CIRCUIT RESISTANCE		
	- Disconnect CKP sensor. - Measure resistance from CKP+ jack to CKP+ pin in harness sensor connector. - Measure resistance from CKP- jack to CKP- pin in harness sensor connector. - Are both resistances less than 5 ohms?	Yes No	GO to Z249 . REPAIR CKP harness. RETEST. COMPLETE PCM Reset to clear DTCs.
Z249	CHECK FOR CKP+ SHORT		
	- Measure resistance from CKP+ jack to CKP- jack, PWR GND jack and VPWR jack. - Are all resistances greater than 10K ohms?	Yes No	GO to Z251 . GO to Z250 .

Test Step		Result	Action to Take
Z250	ISOLATE SHORT FOR CKP+		
	- Disconnect PCM. - Reconnect DIST to harness. - Measure resistance from CKP+ jack to CKP-jack, PWR GND jack and VPWR jack. - Are all resistances greater than 10K ohms?	Yes No	REPLACE PCM. RETEST. REPAIR harness as needed. RETEST. COMPLETE PCM Reset to clear DTCs.
Z251	CHECK FOR PHYSICAL DAMAGE		
	- Inspect CKP sensor and pulse wheel for misalignment, incorrect air gap and physical damage. - Are the sensor and data wheel OK?	Yes No	REPLACE CKP sensor. RETEST. COMPLETE PCM Reset to clear DTCs. REPAIR as needed. RETEST. COMPLETE PCM Reset to clear DTCs.
Z252	WIGGLE TEST - CKP CIRCUIT		
	- Key on, engine off. - Place WIGGLE TEST switch to ON. - Place MODE switch to B. - Press RESET button. - Wait for WIGGLE TEST ACTIVATED LED to light. - Wiggle Test. - Are any FAULT MEMORY LEDs on?	Yes No	PRESS RESET and WAIT for WIGGLE TEST ACTIVE LED to light. CONTINUE to test until intermittent is isolated. REPAIR as necessary. RETEST. COMPLETE PCM Reset to clear DTCs. REPLACE PCM. RETEST.
Z253	CHECK CKP SHD FOR SHORT TO PWR		
	- Key off. - Measure resistance from CASE GND / CKP SHD jack to VPWR jack. - Is the resistance greater than 10K ohms?	Yes No	GO to Z255 . GO to Z254 .
Z254	ISOLATE SHORT FROM SHD TO PWR		
	- Disconnect PCM. - Reconnect DIST to harness. - Measure resistance from CASE GND / CKP SHD jack to VPWR jack. - Is the resistance greater than 10K ohms?	Yes No	REPLACE PCM. RETEST. REPAIR CASE GND / CKP SHIELD harness. RETEST. COMPLETE PCM Reset to clear DTCs.
Z255	WIGGLE TEST MODE B - CKP CIRCUIT		
	- Key on, engine off. - Place WIGGLE TEST switch to ON. - Place MODE switch to B. - Press RESET button. - Wait for WIGGLE TEST ACTIVE LED to light. - Wiggle Test. - Are any FAULT MEMORY LEDs on?	Yes No	PRESS RESET and WAIT for WIGGLE TEST ACTIVE LED to light. CONTINUE to test until intermittent is isolated. REPAIR as necessary. RETEST. COMPLETE PCM Reset to clear DTCs. REPAIR CASE GND / CKP shield harness. RETEST. COMPLETE PCM Reset to clear DTCs.