

Computers and Control Systems: Pinpoint Tests

Adaptive Fuel DTC's Diagnostic Techniques

Adaptive Fuel DTC's Diagnostic Techniques help isolate the root cause of the adaptive fuel concern. Before proceeding, attempt to verify if any drivability concerns are present. These diagnostic aids are meant as a supplement to the pinpoint test steps in Pinpoint Tests. For a description of fuel trim, refer to Description and Operation, Powertrain Control Software, Fuel Trim. See: Description and Operation/Powertrain Control Software

Obtain Freeze Frame Data

Freeze Frame Data can be helpful in duplicating and diagnosing adaptive fuel concerns. This data (a snapshot of certain PID values, recorded at the time the DTC was stored in Continuous Memory) is helpful to determine how the vehicle was being driven when the fault occurred, and can be especially useful on intermittent concerns. Freeze Frame Data, in many cases, can help to isolate possible areas of concern as well as rule out others. Refer to Freeze Frame Data for a more detailed description of this data. See: Scan Tool Testing and Procedures/Standard Models (Non Bi-Fuel) (Base Gasoline)/Freeze Frame Data

Using the LONGFT1 and LONGFT2 (dual bank engines) PIDs

The LONGFT1/2 PIDs can be useful for diagnosing fuel trim concerns. A negative PID value indicates that fuel is being reduced to compensate for a rich condition, while a positive PID value indicates that fuel is being increased to compensate for a lean condition. It is important to know that there is a separate LONGFT value that is used for each rpm/load point of engine operation. When viewing the LONGFT1/2 PIDs, the values may change a great deal as the engine is operated at different rpm and load points. This is because the fuel system may have learned corrections for fuel delivery concerns that can change as a function of engine rpm and load. The LONGFT1/2 PIDs will display the fuel trim currently being used at that rpm and load point. Observing these changes in LONGFT1/2 can help when diagnosing fuel system concerns. For example:

- ^ A contaminated MAF sensor would result in matching LONGFT1/2 correction values that are negative at idle (reducing fuel), but positive (adding fuel) at higher rpm and loads.
- ^ LONGFT1 values that differ greatly from LONGFT2 values would rule out concerns that are common for both banks (for example, fuel pressure concerns, MAF sensor, etc. could be ruled out).
- ^ Vacuum leaks would result in large rich corrections (positive LONG FT1/2 value) at idle, but little or no correction at higher rpm and loads.
- ^ A plugged fuel filter will result in no correction at idle, but large rich corrections (positive LONGFT1/2 value) at high rpm and load.

Resetting Long Term Fuel Trims

Long term fuel trim corrections can be reset by resetting the PCM Keep Alive Memory (**KAM**). Refer to Resetting Keep Alive Memory to reset KAM. See: Reading and Clearing Diagnostic Trouble Codes/Clearing Diagnostic Trouble Codes/With Scan Tool

After making a fuel system repair, KAM must be reset. For example, if dirty/plugged injectors cause the engine to run lean and generate rich long term corrections, replacing the injectors and not resetting KAM will now make the engine run very rich. The rich correction will eventually be "learned out" during closed loop operation, but the vehicle may have poor drivability and have high CO emissions while it is learning.

P0171/P0174 System Too Lean Diagnostic Aids

NOTE: If the system is lean at certain conditions, then the LONGFT PID would be a positive value at those conditions, indicating that increased fuel is needed.

The ability to identify the type of lean condition causing the concern can be crucial to a correct diagnosis.

Air Measurement System:

With this condition, the engine may actually run rich or lean of stoichiometry (14.7:1 air/fuel ratio) if the Powertrain Control Module (**PCM**) is not able to compensate enough to correct for the condition. One possibility is that the mass of air entering the engine is actually greater than what the MAF sensor is indicating to the PCM. For example, with a contaminated MAF sensor, the engine would run lean at higher rpm because the PCM would deliver fuel for less air than is actually entering the engine.

Examples: MAF sensor measurement inaccurate (corroded connector, contamination/dirty (a contaminated MAF sensor will typically result in a rich system at low airflows (PCM will reduce fuel) and a lean system at high airflows (PCM will increase fuel), etc).

Vacuum Leaks/Unmetered Air:

With this condition, the engine may actually run lean of stoichiometry (14.7:1 air/fuel ratio) if the Powertrain Control Module (PCM) is not able to compensate enough to correct for the condition. This condition can be caused by unmetered air entering the engine, or due to a MAF malfunction. In this situation, the volume of air entering the engine is actually greater than what the MAF sensor is indicating to the PCM. Vacuum leaks will normally be most apparent when high manifold vacuum is present (for example, during idle or light throttle). If freeze frame data indicates that the fault occurred at idle, a check for vacuum leaks/unmetered air might be the best starting point.

Examples: Loose, leaking or disconnected vacuum lines, intake manifold gaskets or O-rings, throttle body gaskets, brake booster, air inlet tube, stuck/frozen/aftermarket PCV valve, unseated engine oil dipstick, etc.

Insufficient Fueling:

With this condition, the engine may actually run lean of stoichiometry (14.7:1 air/fuel ratio) if the PCM is not able to compensate enough to

correct for the condition. This condition can be caused by a fuel delivery system concern that restricts or limits the amount of fuel being delivered to the engine. This condition will normally be most apparent when the engine is under a heavy load and at high rpm, when a higher volume of fuel is required. If freeze frame data indicates that the fault occurred under a heavy load and at higher rpm, a check of the fuel delivery system (checking fuel pressure with engine under a load) might be the best starting point.

Examples: low fuel pressure (fuel pump, fuel filter, fuel leaks, restricted fuel supply lines), fuel injector concerns, etc.

Exhaust System Leaks:

In this type of condition, the engine may actually be running rich of stoichiometry (14.7:1 air / fuel ratio) because the fuel control system is adding fuel to compensate for a perceived (not actual) lean condition. This condition is caused by oxygen (air) entering the exhaust system from an external source. The Heated Oxygen Sensor (**HO2S**) will react to this exhaust leak by increasing fuel delivery. This condition will cause the exhaust gas mixture from the cylinder to be rich.

Examples: Exhaust system leaks upstream or near HO2S, poorly welded/leaking HO2S boss, malfunctioning Secondary Air Injection system, etc.

P0172/P0175 System Too Rich Diagnostic Aids

NOTE: If the system is rich at certain conditions, then the LONGFT PID would be a negative value at that airflow, indicating that decreased fuel is needed.

System rich concerns are usually caused by fuel system concerns, although the MAF sensor, and base engine (for example, engine oil contaminated with fuel) should also be checked.

Air Measurement System:

With this condition, the engine may actually run rich or lean of stoichiometry (14.7:1 air/fuel ratio) if the Powertrain Control Module (PCM) is not able to compensate enough to correct for the condition. One possibility is that the mass of air entering the engine is actually less than what the MAF sensor is indicating to the PCM. For example, with a contaminated MAF sensor, the engine would run rich at idle because the PCM would deliver fuel for more air than is actually entering the engine.

Examples: MAF sensor measurement inaccurate (corroded connector, contamination/dirty (a contaminated MAF sensor will typically result in a rich system at low airflows (PCM will reduce fuel) and a lean system at high airflows (PCM will increase fuel), etc.).

Fuel System:

With this condition, the engine may actually run rich of stoichiometry (14.7:1 air/fuel ratio) if the Powertrain Control Module (PCM) is not able to compensate enough to correct for the condition. This situation can be caused by a fuel delivery system that is delivering excessive fuel to the engine.

Examples:

- ^ Fuel pressure regulator causes excessive fuel pressure (system rich at all airflows) (fuel pressure can be intermittent, going to pump deadhead pressure, then returning to normal after engine is turned off then restarted).
- ^ Fuel pressure regulator vacuum hose off (causes excessive fuel pressure at idle, system rich at idle airflows).
- ^ Fuel pressure regulator diaphragm ruptured (fuel leaking into intake manifold, system rich at lower airflows).
- ^ Fuel return line crimped/damaged (fuel pressure high, system rich at lower airflows).
- ^ Fuel injector leaks (injector delivers extra fuel).
- ^ Evaporative Emission (**EVAP**) canister purge valve leak (if canister is full of vapors, introduces extra fuel).
- ^ Fuel rail pressure sensor (electronic returnless fuel systems) concern causes sensor to indicate lower pressure than actual. PCM commands higher pressure to the Fuel Pump Driver Module (**FPDM**), causing high fuel pressure (system rich at all airflows).

Base Engine

Engine oil contaminated with fuel can contribute to a rich running engine.

Test A: No Start

No Start**A****Note**

This Pinpoint Test is intended to diagnose the following:

- Spark (as related to Electronic Engine Control)
- Powertrain Control Module (PCM) (12A650)

WARNING:

STOP THIS TEST AT THE FIRST SIGN OF A FUEL LEAK AND SERVICE AS REQUIRED.

No open flame — No smoking during fuel delivery checks.

Test Steps		Results →	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 → No →	REFER to Antitheft and Alarm Systems for diagnosis and testing. GO to A2.
A2	ATTEMPT TO CRANK ENGINE		
	Note: Verify inertia fuel shutoff (IFS) switch is set (button pushed in). Refer to Owner Guide for location. • Does engine crank?	Yes → No →	GO to A3. REFER to Starting System.
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 → No →	Vehicle is an intermittent No Start. GO to Z2. KEY OFF. 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. GO to Pinpoint Test DH to refer to the schematic. • Is voltage between 4.0 and 6.0 volts?	Yes → No →	KEY OFF. RECONNECT TP sensor. GO to A5. KEY OFF. GO to C1.

Note, Warning and Test A1 - A4

No Start**A**

Test Steps		Results	Action to Take
A5	CHECK FLASH EPROM POWER SUPPLY (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. (Refer to Vehicle/Diagrams for connector location.) • Is voltage greater than 9.0 volts?	Yes → No →	REPAIR short to power. For coil-on-plug vehicles: KEY OFF. GO to A17. All others: KEY OFF. GO to A6.
A6	CHECK RPM 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. • Access RPM PID. • While viewing the RPM PID, crank engine. • Does the RPM PID indicate cranking speed?	Yes → No →	KEY OFF. GO to JB1. To check ignition. If OK: Natural Gas Vehicles: GO to A9. All others: GO to A7. KEY OFF. GO to JD1.
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 (refer to Diagnostic Methods) and run the fuel pump to obtain maximum fuel pressure. • Is fuel pressure at the specified pressure (use the fuel pressure chart in Pinpoint Test HC)?	Yes → No →	GO to A8. KEY OFF. GO to HC1.
A8	CHECK FUEL PRESSURE LEAKDOWN		
	• GO to Pinpoint Test HC and observe WARNING, CAUTION AND HANDLING. • 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. • Verify fuel pressure remains within 34 kPa (5 psi) of the maximum pressure for 1 minute after turning pump off. • Does fuel pressure remain within 34 kPa (5 psi)?	Yes → No →	KEY OFF. GO to A9. KEY OFF. GO to HC1.

No Start**A**

Test Steps		Results →	Action to Take
A9	CHECK FUEL INJECTORS FOR VPWR		
	Note: Check at least two fuel injectors, one on each bank. A no start condition can exist only if greater than 50% of the fuel injectors are without VPWR. • Disconnect any two fuel injectors. • Key on. • Measure VPWR circuit voltage at fuel injector harness connectors. • Is voltage greater than 10.5 volts?	Yes → No →	KEY OFF. Natural Gas Vehicles: GO to A15. All Others: GO to A10. REPAIR VPWR circuit.
A10	CHECK FUEL INJECTORS ABILITY TO DELIVER FUEL		
	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. • Install fuel pressure tester. • 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. • Is 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. RETURN to Symptom Charts for further diagnosis. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
A15	CHECK FUEL PRESSURE ON NATURAL GAS VEHICLES		
	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. • Connect scan tool to DLC. • Access FRP PID (fuel pressure). • Record fuel pressure. • Install fuel pressure tester. • Key on, engine off. • Record fuel pressure. • Is fuel pressure at the specified pressure (use the fuel pressure chart in Pinpoint Test HC) ?	Yes → No →	KEY OFF. GO to A16. KEY OFF. GO to HB1.

No Start**A**

Test Steps		Results	→	Action to Take
A16	CHECK INJECTOR SIGNAL FROM NGV MODULE			
	Note: This test requires a standard 12 volt test lamp. A properly operating system will show a dim glow. • Connect test lamp between the injector signal circuit and VPWR circuit pin at the injector harness. • Crank engine. • Does test lamp have a dim glow while cranking?	Yes	→	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). GO to A6 .
		No	→	No light or continuously bright light. GO to HA47 .
A17	CHECK PCM DRIVER TO COILS			
	• Connect incandescent test lamp between B+ and each coil driver circuit at the harness connector. • Crank engine. • Does lamp blink consistently and brightly (one blink per engine revolution)?	Yes	→	KEY OFF. GO to A6 .
		No	→	KEY OFF. GO to JD1 .

A16 - A17

Test B: Powertrain Control Module PCM Power Relay

Powertrain Control Module (PCM) Power Relay

B

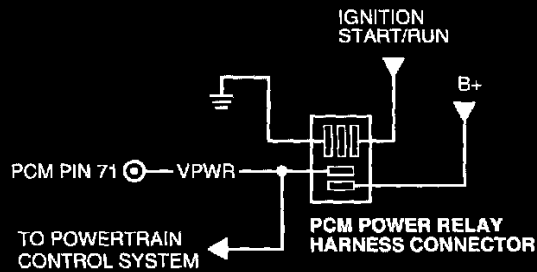
Note

This Pinpoint Test is intended to diagnose the following:

- Harness Circuits: Vehicle Power (VPWR), Ignition Start/Run, PCM Power Relay Ground, Battery Positive Voltage (B+)
- PCM Power Relay (12A646)

Pinpoint Test Schematics and Connectors

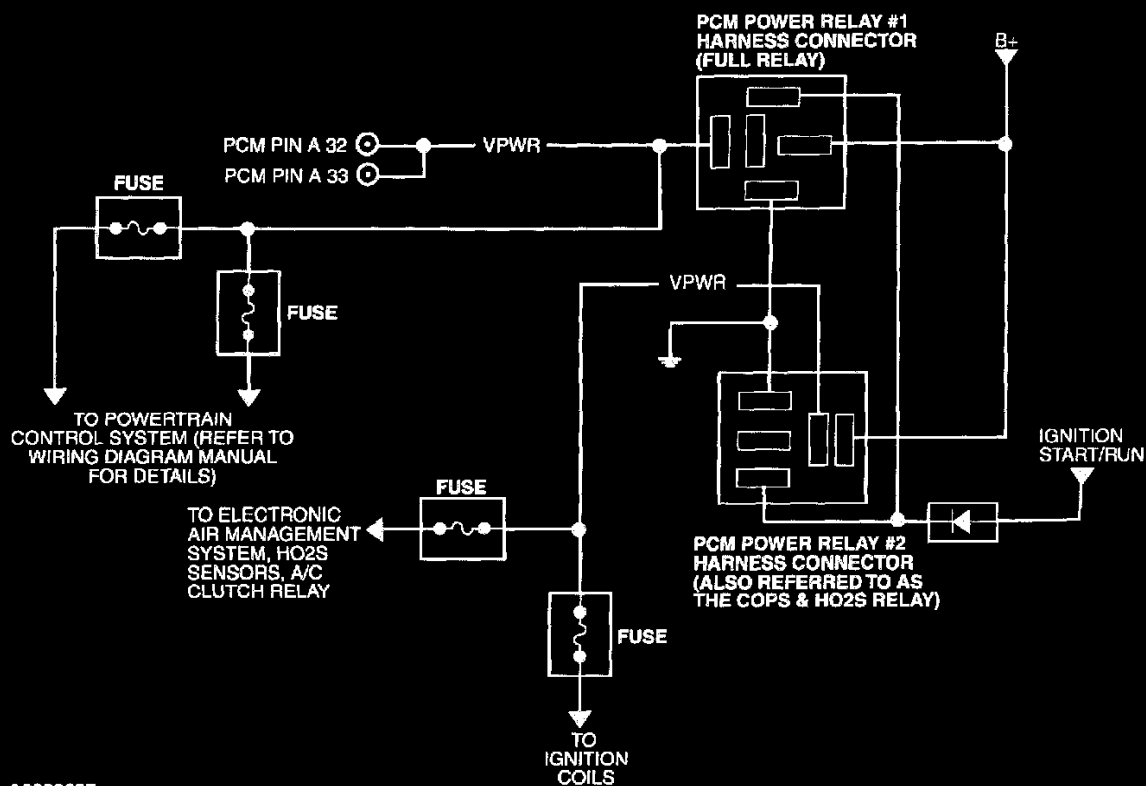
Focus, Cougar, Taurus/Sable, Escape



A0039296

Note, Schematics and Connectors

Powertrain Control Module (PCM) Power Relay

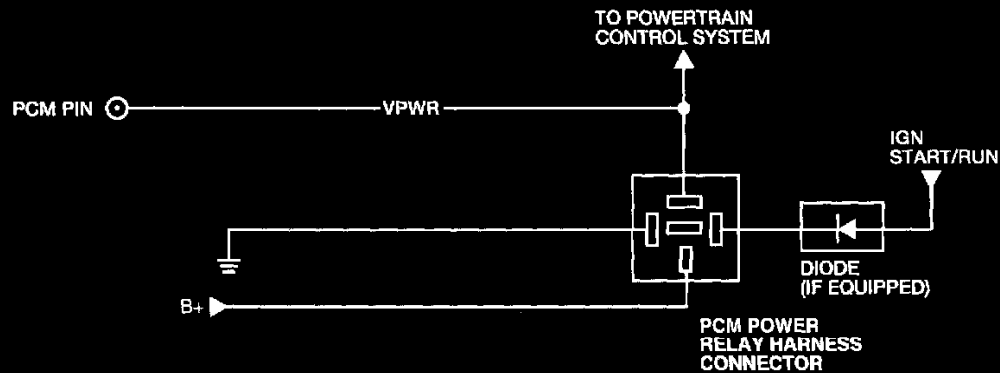
B**LS6/LS8, Thunderbird**

Test Schematic

Powertrain Control Module (PCM) Power Relay

B

All Others



A0039298

Note: The IGN START/RUN and GROUND circuits, and/or the B+ and VPWR circuits may be reversed in the harness connector. Refer to Vehicle/Diagrams for more information.

PCM CONNECTOR PIN NUMBERS

PCM TYPE	VPWR
104 PIN	71
150 PIN	A32, A33

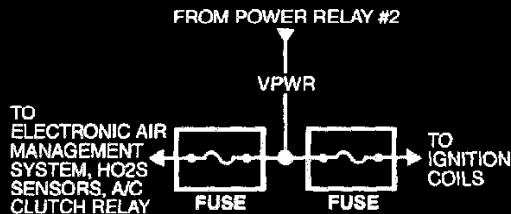
Test Steps		Results	Action to Take
B1	VPWR CHECK AT IAC VALVE FAILED IN PINPOINT TEST C: CHECK FOR OPEN VPWR CIRCUIT		
- Idle air control (IAC) valve disconnected. - Disconnect scan tool from DLC. - Disconnect PCM power relay (For LS6/LS8 and Thunderbird, disconnect PCM power relay #1). - Measure resistance of VPWR circuit between IAC valve harness connector and PCM power relay harness connector. - Is resistance less than 5.0 ohms?		Yes	→ RECONNECT IAC valve. GO to B2.
		No	→ REPAIR open VPWR circuit between the PCM power relay and the splice to the IAC valve.

Schematic, Test B1

Powertrain Control Module (PCM) Power Relay

B

Test Steps		Results	Action to Take
B2	CHECK B+ AND IGN START/RUN VOLTAGE TO PCM POWER RELAY		
	- Measure B+ circuit voltage at the PCM power relay harness connector. - Key on. - Measure IGN START/RUN circuit voltage at PCM 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.
B3	CHECK GROUND CIRCUIT TO PCM POWER RELAY		
	- Measure voltage between B+ and the ground circuits at the PCM power relay harness connector. Is voltage greater than 10.5 volts?	Yes → No →	REPLACE PCM power relay. REPAIR open ground circuit.
B5	LS6/LS8 or THUNDERBIRD VPWR CHECK FAILED: CHECK FUSE		
	Note: The PCM power relay #2 (also referred to as the COPS and HO2S relay) supplies VPWR to two separately fused circuits. Refer to the applicable Vehicle/Diagrams to determine fuse locations. - Remove and inspect VPWR circuit fuse that goes to the component where VPWR check failed. Is the fuse OK?	Yes → No →	GO to B6 . CHECK VPWR circuit for short to ground between fuse and applicable component. REPAIR as necessary. REPLACE fuse.



AA3310-A

**Powertrain Control Module (PCM)
Power Relay****B**

Test Steps		Results	→	Action to Take
B6	CHECK FOR POWER TO OTHER VPWR CIRCUIT FUSE CONNECTED TO PCM POWER RELAY #2			
	- Remove and inspect other VPWR circuit fuse that goes to the components supplied by the PCM power relay #2. Service as necessary. - Key on, engine off. - Measure voltage to both VPWR circuit fuse harness connectors supplied by the PCM power relay #2. - Are both voltages greater than 10.5 volts?	Yes	→	REPAIR open circuit between fuse and component where VPWR check failed.
		No	→	If both voltages were less than 10.5 volts: KEY OFF. GO to B7. If only one voltage was less than 10.5 volts: REPAIR open circuit between fuse and splice.
B7	CHECK VPWR CIRCUIT CONTINUITY BETWEEN FUSE AND PCM POWER RELAY #2			
	- Disconnect PCM power relay #2. - Measure resistance of the VPWR circuit between the PCM power relay #2 harness connector and the harness connector either fuse. - Is resistance less than 5.0 ohms?	Yes	→	GO to B2. Make all indicated checks at PCM power relay #2.
		No	→	REPAIR open VPWR circuit between splice and PCM power relay #2.

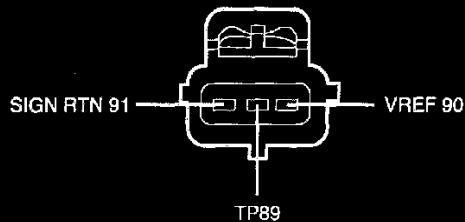
B6 - B7

Test C: Reference Voltage

Reference Voltage**C****Note**

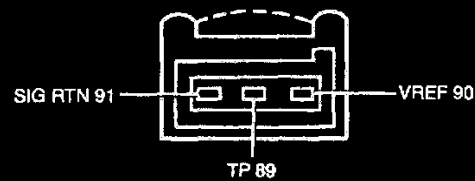
This Pinpoint Test is intended to diagnose the following:

- 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, fuel rail pressure (FRP) sensor and barometric (BARO) pressure sensor.
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematics and Connectors**2.0L 4V Focus****THROTTLE POSITION (TP)
SENSOR HARNESS CONNECTOR**

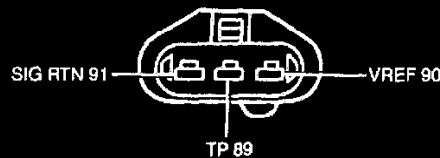
NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

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2.0L 4V Escort , 2.0L Cougar**THROTTLE POSITION (TP)
SENSOR HARNESS CONNECTOR**

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AA4398-A

All Others**THROTTLE POSITION (TP)
SENSOR HARNESS CONNECTOR**

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AA4400-A

Note, Schematics and Connectors

Reference Voltage**C****PCM CONNECTOR PIN NUMBERS**

PCM TYPE	TP	VREF	SIG RTN
104 Pin	89	90	91
150 Pin	C57	C20	C17

SENSORS CONNECTED TO VREF

Applications	TP	EGR	FTP	ACP	PSP	FRP	BARO
Escape	X	D.P.F. EGR	X				
3.0L FFV Taurus	X	D.P.F. EGR					
2.5L Cougar	X	D.P.F. EGR	X				
Mustang, Ranger	X	D.P.F. EGR	X			X	
2.3L Ranger	X	MAP/ EGR	X		X		
Taurus/Sable	X	D.P.F. EGR	X				
Town Car	X	D.P.F. EGR	X				
Explorer/Mountaineer	X	D.P.F. EGR	X				
Focus	X	D.P.F. EGR	X			X	
Crown Victoria (except NGV)	X	D.P.F. EGR	X				
Grand Marquis,	X	D.P.F. EGR	X				
Lightning	X	X	X			X	X
E/F-Series (except NGV),	X	D.P.F. EGR	X				
Expedition/Navigator/ Excursion	X	D.P.F. EGR	X				
LS6/LS8	X	D.P.F. EGR	X	X		X	
Windstar, Continental	X	D.P.F. EGR	X	X			
2.0L 4V Escort	X		X	X	X	X	
2.0L 2V Escort	X	D.P.F. EGR	X		X	X	
2.0L Cougar	X	D.P.F. EGR	X		X		
Crown Victoria w/NGV	X	D.P.F. EGR	X			X	
5.4L E/F Series w/NGV	X	EGR	X			X	

Test Chart

Reference Voltage

C

Test Steps		Results	→	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 circuits at the TP sensor harness connector. Is VREF greater than 6.0 volts?	Yes	→	KEY OFF. GO to C35 (to check VREF for short to power).
		No	→	GO to C2 .
C2	CHECK VOLTAGE ON BATTERY			
	- Measure voltage across battery terminals. Is voltage greater than 10.5 volts?	Yes	→	GO to C3 .
		No	→	Key off. REFER to Charging System to service discharged battery.
C3	CHECK VOLTAGE BETWEEN B+ AND SIG RTN			
	- Disconnect sensor where VREF check failed.(DTC indicates which sensor) - Measure voltage between SIG RTN at the sensor harness connector where V-REF failed and battery positive post. Is voltage greater than 10.5 volts and within 1.0 volt of battery voltage?	Yes	→	GO to C4 .
		No	→	SIG RTN/PWR GND fault present. GO to C25 .
C4	CHECK VREF VOLTAGE THROUGH PCM ON TP PID			
	Note: Vehicles with 150 pin processor and multiple DTCs output, GO to C5 for VREF concerns.	Yes	→	KEY OFF. GO to C20 (to check VREF for opens).
	- Attempt to access the TP PID. Can the PID be accessed?	No	→	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. Is voltage greater than 10.5 volts?	Yes	→	RECONNECT IAC valve. For 2.0L Escort,Cougar, 5.4L E/F-Series with NGV: GO to C7 . All Others: GO to C6 .
		No	→	VPWR is not present. RECONNECT TP sensor. For application with Power Relay inside CCRM: GO to X1 . All others: GO to B1 .

Reference Voltage**C**

Test Steps		Results	Action to Take
C6	CHECK VREF CIRCUIT SHORT TO SIG RTN IN THE D.P.F. EGR (2.3L Ranger has an EGR System Module or ESM)		
	- TP sensor disconnected. - Disconnect D.P.F. EGR sensor. (note: for ESM applications disconnect the 6 pin ESM connector) - Key on. - Measure voltage between VREF and SIG RTN circuits at the TP sensor harness connector. Is voltage between 4.0 and 6.0 volts?	Yes → No →	KEY OFF. REPLACE D.P.F. EGR sensor. (for ESM applications replace the ESM assembly) For 3.0L FFV Taurus: GO to C12. 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. (note: VREF for 150 Pin PCM is on PCM pin A20 for FTP) Is voltage between 4.0 and 6.0 volts?	Yes → No →	KEY OFF. REPLACE the FTP sensor. For applications with an A/C Pressure (ACP) sensor: GO to C8. For applications with PSP: GO to C9. For applications with FRP only: GO to C10. All Others: GO to C12.
C8	CHECK VREF CIRCUIT SHORT TO SIG RTN IN ACP SENSOR		
	- TP (FTP, MAP 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. (note: VREF for 150 Pin PCM is on A20 for ACP) - Key off. Is voltage between 4.0 and 6.0 volts?	Yes → No →	KEY OFF. REPLACE the ACP sensor. For application with FRP: GO to C10. All others: GO to C12.
C9	CHECK VREF CIRCUIT SHORT TO SIG RTN IN PSP SENSOR		
	- TP, FTP, ACP, MAP 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. Is voltage between 4.0 and 6.0 volts?	Yes → No →	KEY OFF. REPLACE the PSP sensor. For applications with FRP: GO to C10. All others: GO to C12.

Reference Voltage

C

Test Steps		Results	Action to Take
C10	CHECK VREF CIRCUIT SHORT TO SIG RTN IN FRP SENSOR		
	- TP, FTP, ACP, MAP and PSP where applicable 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. Is voltage between 4.0 and 6.0 volts?	Yes → No →	KEY OFF. REPLACE the FRP sensor. KEY OFF. For applications with BARO or MAP: GO to C11. All others: GO to C12.
C11	CHECK VREF CIRCUIT SHORT TO SIG RTN IN BARO OR MAP SENSOR IF APPLICABLE		
	- TP, D.P.F. EGR, FTP, and FRP disconnected. - Disconnect barometric (BARO) pressure sensor or MAP if Applicable. - Measure voltage between VREF and SIG RTN circuits at the TP sensor harness connector. Is voltage between 4.0 and 6.0 volts?	Yes → No →	KEY OFF. REPLACE BARO sensor or MAP if Applicable. KEY OFF. GO to C12.
C12	CHECK VPWR VOLTAGE TO PCM		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - 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). - PCM disconnected. - Key on. - Measure voltage between VPWR and PWR GND circuits at the PCM harness connector. Is voltage greater than 10.5 volts?	Yes → No →	GO to C13. KEY OFF. REPAIR open VPWR circuit between PCM and splice to IAC valve.
C13	CHECK VREF VOLTAGE FOR SHORT TO GROUND OR SIG RTN		
	- TP sensor disconnected. - All other sensors wired to VREF disconnected. - Disconnect PCM. - Disconnect Scan Tool from DLC. - Measure resistance between VREF and SIG RTN, PWR GND circuits at the PCM harness connector. (Vehicles with 150 pin processor, measure to both VREF pins.) Is each resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR VREF short to ground.

Reference Voltage

C

Test Steps		Results	→	Action to Take
C20	CHECK VREF CIRCUIT FOR OPEN IN HARNESS			
	• Sensor where VREF check failed disconnected. • Disconnect PCM. • Measure resistance of VREF circuit between PCM harness connector pin and appropriate sensor harness connector. • Is resistance less than 5.0 ohms?	Yes	→	KEY OFF. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
		No	→	REPAIR open VREF circuit. REFER to Vehicle/Diagrams and DTCs received to help pinpoint the location of the open.
C25	CHECK SIG RTN/PWR GND THROUGH PCM ON TP PID			
	• Key on. • Attempt to access the TP PID. • Can the PID be accessed?	Yes	→	GO to C26 .
		No	→	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? (Refer to the Vehicle/Diagrams, Engine Controls.)	Yes	→	KEY OFF. GO to C27 .
		No	→	KEY OFF. REPAIR open SIG RTN circuit to the sensor where the VREF check failed.
C27	CHECK SIG RTN CIRCUIT FOR OPEN IN HARNESS			
	• Scan Tool disconnected. • Sensor where VREF check failed disconnected. • Disconnect PCM. • Measure resistance of SIG RTN circuit between PCM harness connector pin and the sensor harness connector where VREF check failed. • Is resistance less than 5.0 ohms?	Yes	→	RECONNECT sensor. GO to C28 .
		No	→	REPAIR open SIG RTN circuit. REFER to Vehicle/Diagrams and DTCs received to help pinpoint the location of the open.
C28	CHECK PWR GND CIRCUITS FOR OPEN IN HARNESS			
	• Disconnect scan tool from DLC. • Measure resistance of PWR GND circuits between the PCM harness connector pin and the battery negative post. • Is each resistance less than 5.0 ohms?	Yes	→	GO to C29 .
		No	→	REPAIR open circuit.

Reference Voltage**C**

Test Steps		Results	→	Action to Take
C29	CHECK GROUND CIRCUITS FOR OPEN IN PCM			
	- Measure resistance of ground circuits between SIG RTN and PWR GND circuits at the PCM connector. (internal PCM circuits) Is each resistance less than 5.0 ohms?	Yes	→	SIG RTN/PWR GND circuits are OK in the PCM. Verify results of previous test steps. RERUN Quick Test to verify DTC/symptom.
		No	→	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
C35	CHECK VREF CIRCUIT FOR SHORT TO PWR			
	- 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. Is voltage less than 0.5 volts?	Yes	→	KEY OFF. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
		No	→	KEY OFF. REPAIR VREF short to power in harness.

C29 - C35

Test DA: Intake Air Temp. (IAT)/Engine Coolant Temp. (ECT) Sensors

**Intake Air Temperature (IAT)/Engine
Coolant Temperature (ECT)/Engine
Oil Temperature (EOT) Sensors****DA****Note**

This Pinpoint Test is intended to diagnose the following:

- Intake air temperature (IAT) sensor (12A697)
- Integrated intake air temperature (IAT) sensor (12B579)
- Engine coolant temperature (ECT) sensor (12A648)
- Engine oil temperature (EOT) sensor (12A648)
- Harness circuits: IAT, ECT, EOT and SIG RTN
- Powertrain control module (PCM) (12A650)

The term "applicable" is used in this pinpoint test and refers to the temperature sensor indicated by the DTC.
Example: ECTV, IATV, EOTV.

Tables and Graphs

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.

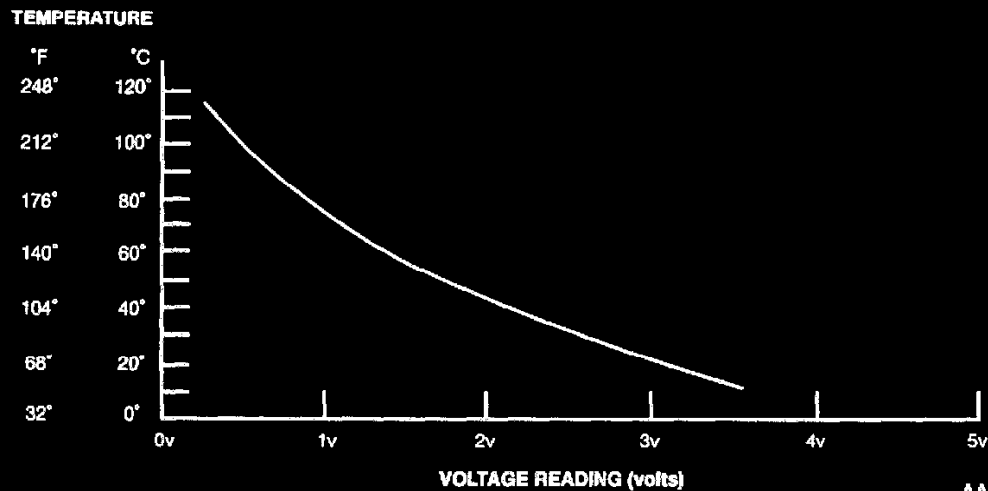
Engine oil temperature must be greater than 10°C (50°F) to pass the KOEO Self-Test and greater than 66°C (150°F) to pass the KOER Self-Test.

Note, Description

Intake Air Temperature (IAT)/Engine Coolant Temperature (ECT)/Engine Oil Temperature (EOT) Sensors

DA

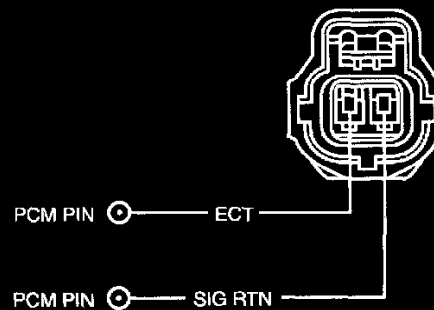
Voltage values were calculated for VREF = 5.0 volts. These values can vary 15 percent due to sensor and VREF variations.



AA4397-A

TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS

Temperature		Temperature Sensor Values		
°C	°F	Voltage (volts)		Resistance
		Focus	All Others	Kohms
120	248	0.28	0.27	1.18
110	230	0.36	0.35	1.55
100	212	0.47	0.46	2.07
90	194	0.61	0.60	2.80
80	176	0.80	0.78	3.84
70	158	1.05	1.02	5.37
60	140	1.37	1.33	7.70
50	122	1.77	1.70	10.97
40	104	2.23	2.13	16.15
30	86	2.74	2.60	24.27
20	68	3.26	3.07	37.30
10	50	3.73	3.51	58.75
0	32	4.14	3.91	95.85
-10	14	4.45	4.15	160.31

**Intake Air Temperature (IAT)/Engine
Coolant Temperature (ECT)/Engine
Oil Temperature (EOT) Sensors****DA****Pinpoint Test Schematics and Connectors****ENGINE COOLANT
TEMPERATURE (ECT)
HARNESS
CONNECTOR**

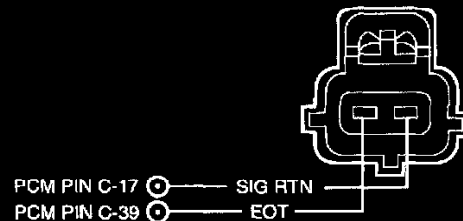
**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

A0038850

PCM CONNECTOR PIN NUMBERS

PCM TYPE	ECT	SIG RTN
104 PIN	38	91
150 PIN	A46	C17

LS6/LS8 (If equipped)

**ENGINE OIL
TEMPERATURE (EOT)
HARNESS
CONNECTOR**

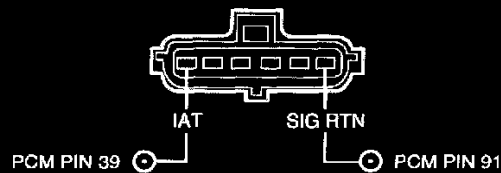
**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

A0015120

**Intake Air Temperature (IAT)/Engine
Coolant Temperature (ECT)/Engine
Oil Temperature (EOT) Sensors****DA****Focus, 2.0L Cougar**

Note: On some applications the integrated IAT/MAF sensor connector is located inside the air cleaner assembly.

MASS AIR FLOW SENSOR
(W/ INTEGRATED IAT)
HARNESS CONNECTOR

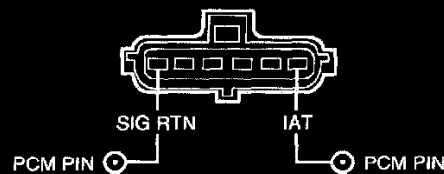


NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE A0013932

Escort 4V, Taurus/Sable, FF Taurus, 3.8L/4.6L
2V Mustang, Windstar, Ranger, Escape,
Explorer/Mountaineer, Explorer Sport/Sport
Trac, Econoline, Excursion, 5.4L/6.8L
F250/F350/F450/F550

Note: On some applications the integrated IAT/MAF sensor connector is located inside the air cleaner assembly.

MASS AIR FLOW SENSOR
(W/ INTEGRATED IAT)
HARNESS CONNECTOR



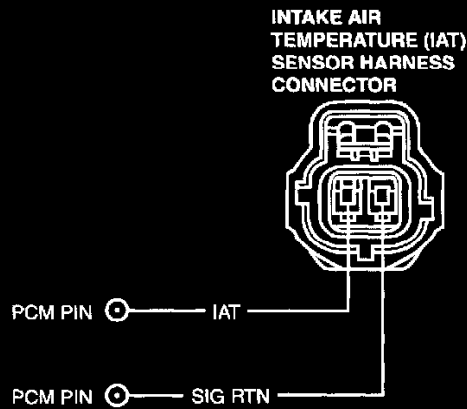
NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

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PCM CONNECTOR PIN NUMBERS

APPLICATION	IAT	SIG RTN
104 PIN	39	91
EXPLORER/MOUNTAINEER 150 PIN PCM	A51	A17

Test Schematic

**Intake Air Temperature (IAT)/Engine
Coolant Temperature (ECT)/Engine
Oil Temperature (EOT) Sensors****DA****All Others**

**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

A0038851

PCM CONNECTOR PIN NUMBERS

PCM TYPE	IAT	SIG RTN
104 PIN	39	91
150 PIN	A51	A17

Test Steps		Results →	Action to Take
DA1	DTC P1116: CHECK OPERATION OF ECT SENSOR		
- 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. Is DTC P1116 present?		Yes → No →	KEY OFF. GO to DA2. Engine was not at closed loop operating conditions. REPAIR any other DTCs as necessary.

Schematic, Test DA1

Intake Air Temperature (IAT)/Engine Coolant Temperature (ECT)/Engine Oil Temperature (EOT) Sensors

DA

Test Steps		Results	Action to Take
DA2	CHECK VREF VOLTAGE TO TP SENSOR		
	- Disconnect throttle position (TP) sensor. - Note: GO to Pinpoint Test DH and refer to Pinpoint Test Schematics and Connectors for TP harness connector pin-out information. - Key on, engine off. - Measure the voltage between VREF and SIG RTN circuits at the TP sensor harness connector. Is voltage between 4.0 volts and 6.0 volts?	Yes → No →	There is sufficient VREF voltage. RECONNECT TP sensor. GO to DA3 . GO to C1 .
DA3	CHECK TEMPERATURE SENSOR RESISTANCE WITH ENGINE OFF		
	- Disconnect ECT sensor. - Measure ECT 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.
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 (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). RESTORE vehicle. REPLACE suspect sensor.
DA10	DTC P0118 OR P0113: CHECK VOLTAGE BETWEEN VREF AND SIG RTN		
	- Disconnect throttle position (TP) sensor. - Note: GO to Pinpoint Test DH and refer to Pinpoint Test Schematics and Connectors for TP harness connector pin-out information. - Key on, engine off. - Measure the voltage between VREF and SIG RTN circuits at the TP sensor harness connector. Is voltage between 4.0 volts and 6.0 volts?	Yes → No →	GO to DA11 . GO to C1 .

DA2 - DA10

Intake Air Temperature (IAT)/Engine Coolant Temperature (ECT)/Engine Oil Temperature (EOT) Sensors

DA

Test Steps		Results	→	Action to Take
DA11	SIMULATE OPPOSITE SIGNAL TO PCM			
	- With applicable temperature sensor disconnected, connect a jumper wire between the sensor signal and SIG RTN circuits at the temperature sensor harness connector. - Key on. Note: If a scan tool communication concern exists, remove jumper wire immediately and GO to DA13. - Access applicable temperature sensor voltage PID. Is the applicable temperature sensor voltage PID less than 0.2 volts (greater than 120°C/248°F)?	Yes No	→ →	REPLACE suspect sensor. REMOVE jumper wire. GO to DA12. KEY OFF.
DA12	CHECK TEMPERATURE SENSOR SIGNAL AND SIG RTN CIRCUITS FOR OPEN IN HARNESS			
	Note: Refer to the PCM connector pin numbers at the beginning of this pinpoint test. - Disconnect PCM. - Measure resistance of sensor signal circuit between PCM harness connector pin and applicable sensor harness connector. - Measure resistance of SIG RTN circuit between PCM harness connector pin and applicable temperature sensor harness connector. Is each resistance less than 5.0 ohms?	Yes No	→ →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuits.
DA13	CHECK TEMPERATURE SENSOR SIGNAL FOR SHORT TO VREF IN HARNESS			
	- Key off. - Disconnect PCM. - Measure resistance between applicable temperature sensor signal and VREF circuits at the PCM harness connector. Is resistance greater than 10,000 ohms?	Yes No	→ →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short to VREF.
DA20	DTCP0112 OR P0117: SIMULATE OPPOSITE SIGNAL TO PCM			
	- Disconnect harness from applicable temperature sensor. - Connect scan tool. - Key on. - Access applicable temperature sensor voltage PID. Is the applicable temperature sensor voltage PID greater than 4.2 volts (less than -40°C/-40°F)?	Yes No	→ →	REPLACE sensor. GO to DA21.

DA11 - DA20

Intake Air Temperature (IAT)/Engine Coolant Temperature (ECT)/Engine Oil Temperature (EOT) Sensors

DA

Test Steps		Results	Action to Take
DA21	CHECK VREF VOLTAGE TO TP SENSOR		
	- Disconnect throttle position (TP) sensor. - Note: GO to Pinpoint Test DH and refer to Pinpoint Test Schematics and Connectors for TP harness connector pin-out information. - Key on, engine off. - Measure the voltage between VREF and SIG RTN circuits at the TP sensor harness connector. Is voltage between 4.0 and 6.0 volts?	Yes → No →	There is sufficient VREF voltage. RECONNECT TP sensor. GO to DA22 . KEY OFF. GO to C1 .
DA22	CHECK TEMPERATURE SIGNAL CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	Note: Refer to the PCM connector pin numbers at the beginning of this pinpoint test. - Disconnect PCM. - Measure resistance between sensor signal and SIG RTN circuits and then between sensor signal and PWR GND circuits at the PCM harness connector. Is each resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
DA80	P0116: CHECK TEMPERATURE SENSOR RESISTANCE WITH ENGINE OFF		
	Note: Verify that engine temperature is at ambient room temperature before continuing with this test. A soak period of 6 hours may be required. Refer to Diagnostic Trouble Code (DTC) Descriptions in Subroutines for information concerning P0116. - Key on, engine off. - Disconnect ECT sensor. - Measure ECT sensor resistance. Refer to the chart at the beginning of this Pinpoint Test for resistance specifications. Is resistance within specification?	Yes → No →	GO to DA81 . REPLACE suspect sensor.
DA81	P0116: 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 →	Fault is not present at this time. COMPLETE OBDII Drive Cycle to determine if Fuel, HEGO, Catalyst and Misfire monitors can be executed (REFER to Diagnostic Methods, Drive Cycles). Retest if necessary. REPLACE suspect sensor.

DA21 - DA81

Intake Air Temperature (IAT)/Engine Coolant Temperature (ECT)/Engine Oil Temperature (EOT) Sensors

DA

Test Steps		Results	→	Action to Take
DA90	DTCs P0112, P1112, P0113, P0117, P1117 OR P0118: INTERMITTENT CHECK			
	• Connect scan tool. • Key on. • Monitor the applicable temperature sensor voltage PID. • While observing the PID, complete the following: — Tap on the sensor to simulate road shock. — Wiggle the sensor connector. • Is there any large change in the voltage reading?	Yes	→	Key OFF. DISCONNECT and INSPECT connectors. If OK, REPLACE the sensor. For Continuous DTCs P1112 and P1117, COMPLETE OBDII Drive Cycle to verify repair (REFER to Diagnostic Methods, Drive Cycles).
		No	→	GO to DA91 .
DA91	CHECK ELECTRONIC ENGINE CONTROL (EC) WIRING HARNESS			
	• Again access applicable temperature sensor PID. • While observing the appropriate PID, complete the following: — Hold the sensor harness close to the sensor connector. Wiggle, shake and bend small sections of wiring harness while working toward the PCM. • Is there any change in the voltage reading?	Yes	→	ISOLATE fault. REPAIR as necessary. For Continuous DTCs P1112 and P1117, COMPLETE OBDII Drive Cycle to verify repair (REFER to Diagnostic Methods, Drive Cycles).
		No	→	GO to DA92 .
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. For Continuous Memory DTCs P1112 and P1117, COMPLETE OBDII Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
		No	→	REPAIR as necessary. For Continuous Memory DTCs P1112 or P1117, COMPLETE OBDII Drive Cycle to verify repair (REFER to Diagnostic Methods, Drive Cycles).

DA90 - DA92

Intake Air Temperature (IAT)/Engine Coolant Temperature (ECT)/Engine Oil Temperature (EOT) Sensors

DA

Test Steps		Results	→	Action to Take
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. • Incorrect temperature thermostat installed. • Low engine coolant level. • Malfunctioning ECT sensor. WARNING: TO AVOID PERSONAL INJURY, DO NOT UNSCREW THE COOLANT PRESSURE RELIEF CAP WHILE THE ENGINE IS OPERATING OR HOT. THE COOLING SYSTEM IS UNDER PRESSURE; STREAM AND HOT LIQUID CAN COME OUT FORCEFULLY WHEN THE CAP IS LOOSENED SLIGHTLY. • Check engine coolant level. • Is the engine coolant level fill correct?	Yes	→	REFER to Cooling System for further diagnostics.
		No	→	FILL engine coolant to proper level. COMPLETE OBDII Drive Cycle to verify repair (REFER to Diagnostic Methods, Drive Cycles).
DA110	DTC P1184: CHECK OPERATION OF EOT TEMP SENSOR			
	• Connect scan tool. • Run engine at 2000 rpm until engine temperature becomes stabilized. • Run Key On Engine Running (KOER) Self-Test. • Is DTC P1184 present?	Yes	→	GO to DA111 .
		No	→	Engine oil temperature was not at operating temperature. REPAIR any other DTCs as necessary.
DA111	DTC P1183, P1184 OR P0298: CHECK TEMPERATURE SENSOR SIGNAL			
	• Connect scan tool. • Key on. • Access EOTV PID. • Is EOTV PID less than 0.3 volts?	Yes	→	GO to DA112 .
		No	→	GO to DA115 .
DA112	SIMULATE OPPOSITE EOT SIGNAL TO PCM			
	• Again access EOTV PID. • Disconnect EOT sensor. • Is EOTV PID greater than 4.2 volts?	Yes	→	REPLACE suspect sensor.
		No	→	GO to DA113 .

DA100 - DA112

Intake Air Temperature (IAT)/Engine Coolant Temperature (ECT)/Engine Oil Temperature (EOT) Sensors

DA

Test Steps		Results	Action to Take
DA113	CHECK EOT SIGNAL CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	Note: Refer to the PCM connector pin numbers at the beginning of this pinpoint test.		
	- Disconnect PCM. - Measure resistance between EOT and SIG RTN circuits and then between EOT and PWR GND circuits at the PCM harness connector. - Is each resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
DA115	CHECK FOR HIGH EOT SIGNAL		
	- Again access EOTV PID. - Is EOTV PID greater than 4.2 volts?	Yes → No →	GO to DA116. GO to DA120.
DA116	SIMULATE LOW SIGNAL TO PCM		
	- Disconnect EOT temperature sensor. - Connect a jumper wire between the sensor signal and SIG RTN circuits at the temperature sensor harness connector. - Key on. - Access EOTV PID. - Is EOTV PID less than 0.3 volts?	Yes → No →	REPLACE suspect sensor. KEY OFF. GO to DA117.
DA117	CHECK TEMPERATURE SENSOR SIGNAL AND SIG RTN CIRCUIT FOR OPEN IN HARNESS		
	Note: Refer to the PCM connector pin numbers at the beginning of this pinpoint test.		
	- Disconnect PCM. - Measure resistance of EOT circuit between PCM harness connector pin and EOT sensor harness connector. - Measure resistance of SIG RTN circuit between PCM harness connector pin and EOT sensor harness connector. - Is each resistance less than 5.0 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuits.
DA120	INTERMITTENT EOT SENSOR CHECK		
	- Again access EOTV PID and complete the following: - Tap on sensor to simulate road shock. - Wiggle the sensor connector. - Is there any large change in the PID reading?	Yes → No →	KEY OFF. DISCONNECT and INSPECT connector. If OK, REPLACE the sensor. GO to DA121.

DA113 - DA120

Intake Air Temperature (IAT)/Engine Coolant Temperature (ECT)/Engine Oil Temperature (EOT) Sensors

DA

Test Steps		Results →	Action to Take
DA121	CHECK EOT ELECTRONIC ENGINE CONTROL (EC) WIRING HARNESS		
	- Again access EOTV PID and complete the following: - Wiggle, shake and bend small sections of wiring harness while working from the sensor to the PCM. - Is there any large change in the PID reading?	Yes → No →	ISOLATE fault. REPAIR as necessary. Fault is not present at this time. For Continuous Memory DTCs, COMPLETE OBDII Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
DA130	DTC P0298: ENGINE OIL OVER TEMPERATURE CONDITION		
	- Engine oil temperature protection strategy in the PCM has been activated. - Check for overheating condition and base engine concerns. - Is there any overheating or base engine concerns?	Yes → No →	ISOLATE fault. REPAIR as necessary. GO to DA131.
DA131	CHECK FOR EOT SENSOR HARDWARE		
	- Engine oil temperature protection strategy in the PCM can be activated with or without an EOT sensor. - Does vehicle have an EOT sensor?	Yes → No →	GO to DA111. IDENTIFY customer driving habits. Advise customer improper transmission gear selection and high rpm for extended period will initialize engine protection strategy.

DA121 - DA131

Test DB: Engine Fuel Temperature (EFT) Sensor

Engine Fuel Temperature (EFT) Sensor

DB

Note

This Pinpoint Test is intended to diagnose the following:

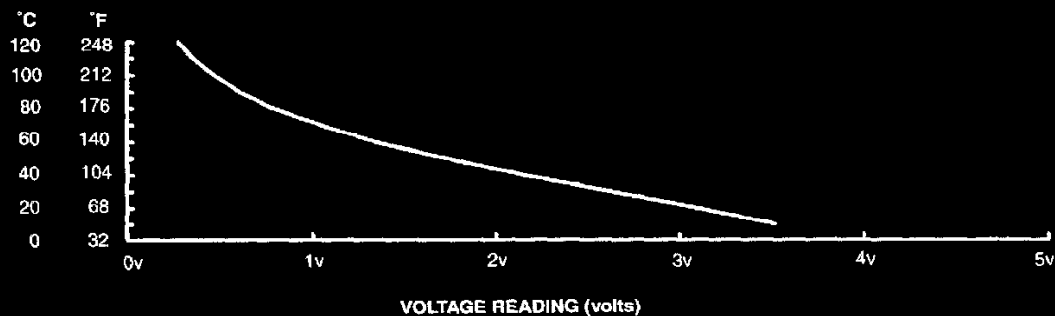
- Engine Fuel Temperature (EFT) Sensor (9F951)
- Harness Circuits: EFT and SIG RTN
- Powertrain Control Module (PCM) (12A650)

Tables and Graphs

Note: The engine fuel temperature (EFT) sensor will operate within the range of -40°C to 135°C (-40°F to 275°F).

Table and Graph voltage values are calculated for VREF= 5.0 volts. These values may vary up to 15% due to sensor and VREF variations.

TEMPERATURE



AA0483-A

ENGINE FUEL TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS

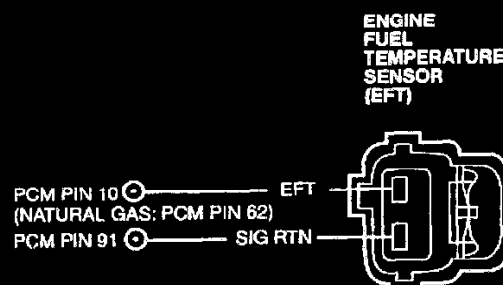
Temperature		Engine Fuel Temperature (EFT) Sensor Values	
°C	°F	Voltage (volts)	Resistance (K ohms)
150	302	0.13	0.56
135	275	0.19	0.81
120	248	0.27	1.18
110	230	0.35	1.55
100	212	0.46	2.07
90	194	0.60	2.80

(Continued)

Note, Tables and Graphs

**Engine Fuel Temperature (EFT)
Sensor****DB****ENGINE FUEL TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS**

Temperature		Engine Fuel Temperature (EFT) Sensor Values	
°C	°F	Voltage (volts)	Resistance (K ohms)
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
-40	-40	4.54	92.5

Pinpoint Test Schematics and Connectors

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE AA1865-D

Table, Schematics and Connectors

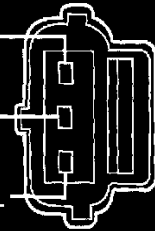
Engine Fuel Temperature (EFT) Sensor

DB
Gasoline Vehicles
Natural Gas Vehicles
FUEL RAIL PRESSURE (FRP) SENSOR HARNESS CONNECTOR

PCM PIN 90 (LS6/LS8 C20) — VREF

PCM PIN 91 (LS6/LS8 C17) — SIG RTN

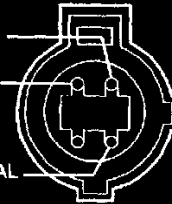
PCM PIN 63 (LS6/LS8 C49) — FRP SIGNAL


FUEL RAIL PRESSURE (FRP) SENSOR HARNESS CONNECTOR

PCM PIN 91 — SIG RTN

PCM PIN 90 — VREF

PCM PIN 63 — FRP SIGNAL



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NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

AA4808-A

Test Steps		Results	Action to Take
DB1	DTC P0181 CHECK FOR KOER DTCS		
	- Start engine and bring up to operating temperature. - Check for KOER DTCS. Is DTC P0182 or P0183 present during KOER?	Yes → No →	For DTC P0181 with DTC P0182 or P0183. GO to DB2 . For DTC P0181 only. COMPLETE an OBD-II Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). GO to DB2 .
DB2	DTC P0180, P0181, P0182 and P0183: VERIFY ELECTRICAL FAULT CONDITION BY SIMULATING OPPOSITE SIGNAL TO PCM		
	- Disconnect engine fuel temperature sensor. - Access EFTA-V PID. - Install jumper across terminals at the vehicle harness connector. - Note: If a scan tool communication concern exists, remove jumper wire immediately and GO to DB5. Record new reading.	Yes → No →	KEY OFF. REPLACE EFTA sensor. KEY OFF. FOR EFTA-V reading less than 4.54 volts with harness disconnected and jumper removed: GO to DB3 . FOR DTC P0182: GO to DB3 . FOR EFTA-V reading greater than 0.2 volt with harness disconnected and jumper installed: GO to DB5 . FOR DTC P0183: GO to DB5 .

Schematic, Test DB1 - DB2

Engine Fuel Temperature (EFT) Sensor

DB

Test Steps		Results	Action to Take
DB3	CHECK VREF VOLTAGE TO FRP SENSOR		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Disconnect fuel rail pressure (FRP) sensor. • Key on, engine off. • Measure voltage between VREF and SIG RTN at the fuel rail pressure (FRP) sensor harness connector. • Is voltage between 4.0 and 6.0 volts?	Yes → No →	GO to DB4 . GO to C1 .
DB4	CHECK EFT CIRCUIT FOR SHORT TO SIG RTN IN HARNESS		
	• Disconnect PCM. • Measure resistance between EFT and SIG RTN circuits at the PCM harness connector. • Is each resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
DB5	CHECK EFT SIGNAL FOR SHORT TO VREF		
	• Temperature sensor disconnected. • PCM disconnected. • Measure resistance between EFT and VREF circuits at the PCM harness connector. • Is each resistance greater than 10,000 ohms?	Yes → No →	GO to DB6 . LOCATE and REPAIR short to VREF.
DB6	CHECK EFT SIGNAL AND SIG RTN CIRCUITS FOR OPEN IN HARNESS		
	• Measure resistance of EFT circuit between PCM harness connector pin and EFT sensor harness connector. • Measure resistance of SIG RTN circuit between PCM harness connector pin and EFT sensor harness connector. • Is each resistance less than 5.0 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuits.
DB7	DTCS P0180, P0181, P0182 and P0183: INTERMITTENT CHECK		
	• Key on. • Access EFT-A PID. • While monitoring EFT-A PID, perform the following: Tap on the sensor to simulate road shock. Wiggle the sensor connector. • Was there any change in the temperature reading?	Yes → No →	DISCONNECT and INSPECT connectors. If OK, REPLACE the sensor. GO to DB8 .

DB3 - DB7

**Engine Fuel Temperature (EFT)
Sensor****DB**

Test Steps		Results	→	Action to Take
DB8	WIGGLE TEST OF SENSOR WIRING HARNESS			
• Again access EFT-A PID. • Hold the vehicle harness close to the sensor connector. Wiggle, shake and bend small sections of wiring harness while working toward the PCM. • Was there any change in the temperature reading?		Yes	→	REPAIR as necessary.
		No	→	Fault is not present at this time.

DB8

Test DC: Mass Air Flow (MAF) Sensor

DC: Mass Air Flow (MAF) Sensor Introduction

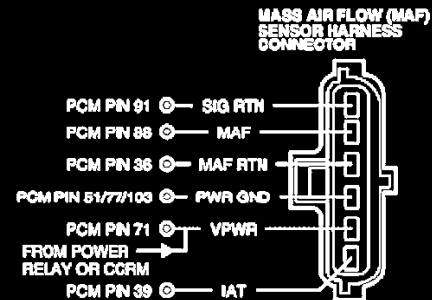
Note

This Pinpoint Test is intended to diagnose the following:

- Mass Air Flow (MAF) Sensor (12B579)
- Harness Circuits: MAF SIG, MAF RTN, Vehicle Power (VPWR), Power Ground (PWR GND), IAT and SIG RTN
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematics and Connectors

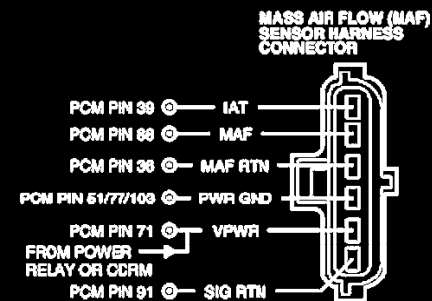
Focus, 2.0L Cougar



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

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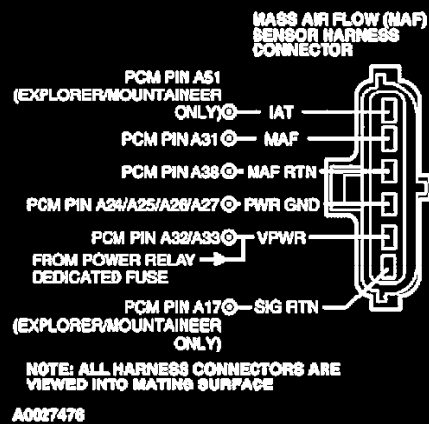
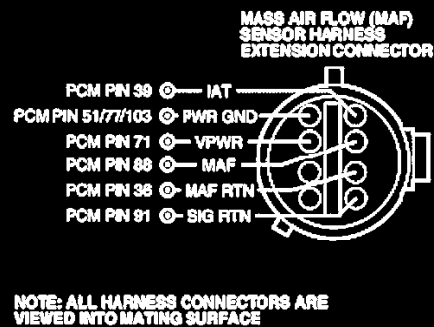
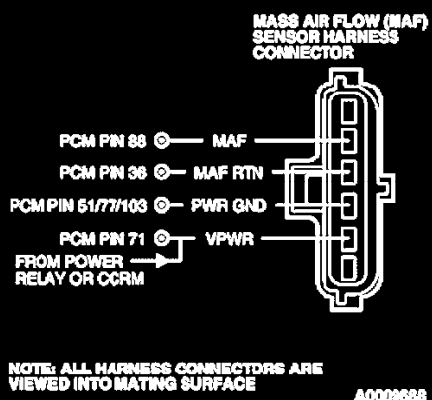
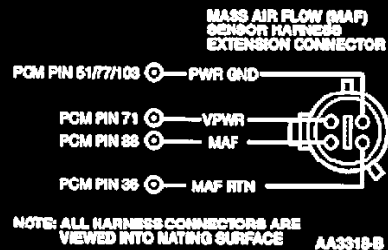
Mustang, Taurus/Sable, Windstar, Ranger, Escape, Explorer Sport/Sport Trac, Econoline, Excursion, 5.4L/6.8L F250/F350/450 (NOTE: For Mustang, PCM PWR GND Pin 76 replaces Pin 77.)



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0002816

Note, Schematics, And Connectors

LS6/LS8, Thunderbird, Explorer/Mountaineer**Escort (4V)****All Others****Escort (2V)****Schematics, And Connectors****Tables and Chart**

BAROMETRIC PRESSURE REFERENCE CHART			
Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAF PID (Hz)	Altitude Above Sea Level (ft)
3.5	11	89.3	
20	69	130	10,000
21	71	132	9,000
22	75	136	8,000
23	78	138	7,000
24	82	142	6,000
25	84	144	5,000
26	89	147	4,000
27	93	151	2,000
29	98	155	1,000
30	102	159	0 (sea level)
31.875	105	162	-500

Barometric Pressure Chart

DC: Mass Air Flow (MAF) Sensor**DC1 DTC P1101: CHECK FOR MAF SENSOR CONTINUOUS MEMORY DTCs**

- Drive vehicle for 6 to 10 minutes.
- Rerun KOER, 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 DC2 .	KEY OFF. GO to DC3 .
For Continuous Memory DTC P0103: GO to DC20 .	
All other Continuous Memory DTCs: GO to Diagnostic Trouble Code (DTC) Charts .	

DC2 DTC P0102: CHECK MAF SENSOR SIGNAL LOW INPUT TO PCM

- Check for 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.
- Verify MAF sensor is connected. If not, repair as necessary.
- Start engine and bring to idle.
- If a KOER DTC P0505 is present, go to [Diagnostic Trouble Code \(DTC\) Charts](#). For A/T vehicles, if the engine stalls and cannot maintain an idle, GO to [DC7](#) .
- Run engine up 1500 rpm for 5 seconds, then bring it back to idle.
- Access MAF V PID.

Is MAF V PID less than 0.23 volt?

Yes	No
KEY OFF. GO to DC4 .	KEY OFF. GO to DC3 .

DC3 DTC P1101: CHECK MAF SIGNAL SENT TO PCM

Note: DTC P1101 can be generated by a low charged vehicle battery or the garage exhaust ventilation system. Repair battery as necessary. Then remove ventilation system and properly vent to outside atmosphere. Check air inlet system (air cleaner, housing, ductwork, etc.) for obstructions or blockage. Rerun KOEO Self-Test.

- Verify MAF sensor is connected. If not, repair as necessary.
- Key on, engine off.
- Access MAF V PID using scan tool.

Is voltage less than 0.2 volts?

Yes	No
GO to DC4 .	KEY OFF. GO to DC5 .

DC4 CHECK FOR MAF SENSOR SIGNAL OUT OF SELF-TEST RANGE

- Key on , engine running.
- Access MAF V PID.

Is MAF V PID between 0.46-2.44 volts?

Yes	No
Unable to identify fault at this time. GO to <u>Z1</u> .	KEY OFF. GO to <u>DC5</u> .

DC5 CHECK VPWR VOLTAGE TO MAF SENSOR

Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.

- Disconnect MAF sensor.
- Key on , engine off.
- Measure voltage between VPWR circuit at the MAF sensor harness connector and battery negative post.

Is voltage greater than 10.5 volts?

Yes	No
GO to <u>DC6</u> .	REPAIR open circuit. RESET the keep alive memory (KAM). REFER to <u>Resetting The Keep Alive Memory (KAM)</u> .

DC6 CHECK PWR GND CIRCUIT BETWEEN MAF SENSOR AND POWER RELAY

- Measure voltage between PWR GND circuit at the MAF sensor harness connector and battery positive post.

Is voltage greater than 10.0 volts?

Yes	No
KEY OFF. GO to <u>DC7</u> .	REPAIR open circuit. RESET the keep alive memory (KAM). REFER to <u>Resetting The Keep Alive Memory (KAM)</u> .

DC4 - DC6

DC7 CHECK FOR SHORTS BETWEEN CIRCUITS IN MAF HARNESS

- PCM disconnected.
- Disconnect scan tool from DLC.
- For non-integrated MAF sensor, measure the resistance between the MAF signal circuit harness side and the following MAF sensor circuits, harness side:
 - PWR GND
 - MAF RTN
- For integrated MAF sensor, measure the resistance between the MAF signal circuit harness side and the following MAF sensor circuits, harness side:
 - PWR GND
 - MAF RTN
 - SIG RTN
 - IAT

Are the resistances greater than 10,000 ohms?

Yes	No
GO to DC8 .	REPAIR the circuit in question. RESET the keep alive memory (KAM). REFER to <u>Resetting The Keep Alive Memory (KAM)</u> .

DC8 CHECK MAF RTN CIRCUIT SHORT TO PWR GND IN THE HARNESS

- Measure resistance between MAF RTN and PWR GND circuits at the MAF sensor harness connector.

Is the resistance greater than 10,000 ohms?

Yes	No
RECONNECT scan tool to DLC. GO to <u>DC9</u> .	REPAIR short circuit. RESET the keep alive memory (KAM). REFER to <u>Resetting The Keep Alive Memory (KAM)</u> .

DC9 CHECK MAF CIRCUIT VOLTAGE CYCLING INTEGRITY

- Reconnect PCM.
- Key on, engine off.
- Access MAF V PID.
- Record the MAF V PID reading.
- Jumper MAF RTN and PWR GND circuits at the MAF sensor harness connector.
- Jumper MAF and VPWR circuits at the MAF sensor harness connector.

Does the MAF V PID change from less than 0.23 volt (closer to zero volts) to greater than 4.50 volts?

Yes	No
REPLACE MAF sensor. RESET the keep alive memory (KAM). REFER to <u>Resetting The Keep Alive Memory (KAM)</u> .	For DTC P1101 without P0102 present: KEY OFF. GO to <u>DC11</u> . For DTC P0102: KEY OFF. GO to <u>DC10</u> .

DC10 CHECK MAF CIRCUIT FOR OPEN IN HARNESS

Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.

- Disconnect PCM.
- Measure resistance of MAF circuit between PCM harness connector pin and MAF sensor harness connector.

Is resistance less than 5.0 ohms?

Yes	No
GO to DC11 .	REPAIR open circuit. RESET the keep alive memory (KAM). REFER to Resetting The Keep Alive Memory (KAM) .

DC11 CHECK PWR GND CIRCUIT FOR OPEN IN HARNESS

- PCM disconnected.
- Disconnect scan tool from DLC.
- Measure resistance of PWR GND circuit between MAF sensor harness connector and battery negative post.

Is resistance less than 10 ohms?

Yes	No
RECONNECT scan tool. GO to DC12 .	REPAIR open circuit. RESET the keep alive memory (KAM). REFER to Resetting The Keep Alive Memory (KAM) .

DC12 CHECK MAF RTN FOR OPEN IN HARNESS

Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.

- Measure resistance of MAF RTN circuit between PCM harness connector pin and MAF sensor harness connector.

Is resistance less than 5.0 ohms?

Yes	No
REPLACE PCM (refer to Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit. RESET the keep alive memory (KAM). REFER to Resetting The Keep Alive Memory (KAM) .

DC16 DTC P1100: CHECK MAF CIRCUIT FOR INTERMITTENT VOLTAGE TO PCM

- Start engine and bring it to idle.
- If a stable idle is not at least 700 rpm, GO to Symptom Charts.
- Run throttle up to 1500 rpm for 5 seconds, and bring back to idle.
- Access MAF V PID.
- Lightly tap on MAF sensor and wiggle harness connector to simulate road shock.

Is MAF V PID changing below the minimum 0.23 volt or above a maximum 4.60 volts?

Yes	No
INSPECT MAF sensor connector. If OK, REPLACE the MAF sensor. RESET the keep alive memory (KAM). REFER to <u>Resetting The Keep Alive Memory (KAM)</u> .	GO to <u>DC17</u> .

DC17 CHECK FOR MAF SENSOR CIRCUIT FOR INTERMITTENT OPENS OR SHORTS

- Again access the MAF V PID.
- Key on, engine off.
- Complete 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.

Is the MAF V PID reading changing below the minimum 0.23 volt or above the maximum 4.60 volts?

Yes	No
REPAIR as necessary. RESET the keep alive memory (KAM). REFER to <u>Resetting The Keep Alive Memory (KAM)</u> .	Unable to duplicate or identify fault at this time. GO to <u>Z1</u> .

DC16 - DC17

DC20 DTC P0103: CHECK MAF SENSOR SIGNAL HIGH INPUT TO PCM

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.

- Start engine and bring to idle.
- If a KOER DTC P0505 is present, GO to [Diagnostic Trouble Code \(DTC\) Charts](#).
- Run throttle up to 1500 rpm for 5 seconds, and bring it back to idle.

Note: MAF V PID is greater than 4.60 volts.

- Access MAF V PID.
- Key off.
- Disconnect MAF sensor.
- Jumper PWR GND and MAF RTN circuits at the MAF sensor harness connector.
- Key on, engine running.
- Again access MAF V PID.

Did MAF V PID drop from the previous reading to below 0.23 volt?

Yes	No
REMOVE jumper. REPLACE MAF sensor. RESET the keep alive memory (KAM). REFER to Resetting The Keep Alive Memory (KAM) .	KEY OFF. REMOVE jumper. GO to DC21 .

DC21 CHECK MAF CIRCUIT FOR SHORT TO VPWR IN HARNESS

Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.

- Disconnect PCM.
- Key on, engine off.
- Measure voltage between MAF and PWR GND circuits at the PCM harness connector.

Is voltage less than 1.0 volt?

Yes	No
If an idle concern is not present: REPLACE PCM (refer to Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). If a fault was not detected and an idle concern is still present: Disregard DTC P0102 at this time. RETURN to Symptom Charts.	REPAIR short circuit.

DC25 DTC P0171, P0172, P0174, P0175, P1131, P1132, P1151, P1152, P1130, P1150 OR LEAN DRIVEABILITY CONCERNS: CHECK CONDITIONS RELATED TO MAF SENSOR

Note: Most weather service reports are a local barometric pressure that has been corrected to sea level. However, the BARO PID reports the actual barometric pressure for the altitude the vehicle is being diagnosed in. Local weather conditions (high or low pressure areas) will change the local barometric pressure by several inches of mercury (± 3 Hz. (± 1 in.Hg.)).

Note: The BARO PID values in Keep Alive Memory require updating at high throttle openings. If vehicle is driven down from higher altitudes for diagnosing, complete three or four heavy accelerations at greater than half-throttle to allow BARO PID to update. Make BARO PID comparisons to Barometric Pressure Reference Chart or hourly airport barometric pressure or altimeter reports, if available. The BARO PID must be within ± 6 Hz (± 2 in.Hg.) of the altitude value in Barometric Pressure Reference Chart (at the beginning of this pinpoint test).

Note: A MAF V PID value of less than 0.6 volt may indicate a misassembled air cleaner or a leak in the air inlet system.

- Verify the MAF sensor is connected. If not, repair as necessary.
- Key on, engine running.
- Access the BARO, LONGFT1, LONGFT2 and MAF V PIDs on fully warmed-up engine.
- Carry out the following diagnostic checks:
 - Check that the BARO PID is approximately the same as the barometric pressure reading for the location, day and altitude the vehicle is being diagnosed at.
 - Check that the MAF V PID at idle and neutral is not greater than 30 % of the normal MAF V listed in Reference Values (or not greater than 1.3 volts).

Are the PID values within the expected ranges?

Yes	No
For DTC P0171, P0172, P0174, P0175, P1131, P1132, P1151, P1152, P1130 or P1150 : Unable to duplicate or identify the fault at this time, GO to <u>Z1</u> (or GO to <u>HA42</u> for natural gas vehicles only). For driveability symptoms without DTCs : RETURN to Symptom Charts for further diagnosis.	KEY OFF. GO to <u>DC26</u> .

DC25

DC26 CHECK TO ISOLATE MAF SENSOR FROM LEAN DRIVEABILITY OCCURRENCE

Note: Due to increasingly stringent emission/OBD II requirements, a fuel system DTC on some vehicles will be generated without a noticeable driveability concern with or without the MAF sensor disconnected. Under these conditions, if the BARO, LONGFT1, LONGFT2 and MAF V PID indicates a MAF sensor concern, replace the MAF sensor.

- Disconnect the MAF sensor.
- Key on, engine running.
- Drive the vehicle.

Is the lean driveability symptom (lack of power, spark knock/detonation, buck/jerk or hesitation/surge on acceleration) gone?

Yes	No
REPLACE MAF sensor. RESET the keep alive memory (KAM). REFER to <u>Resetting The Keep Alive Memory (KAM)</u> . VERIFY a symptom no longer exists.	For DTC P0171, P0172, P0174, P0175, P1131, P1132, P1151, P1152, P1130 or P1150 : Unable to duplicate or identify the fault at this time, GO to <u>Z1</u> (or GO to <u>HA42</u> for natural gas vehicles only). For lean driveability symptoms listed without DTCs : RETURN to Symptom Charts for further diagnosis.

DC26

Test DD: Fuel Rail Pressure (FRP) Sensor

Fuel Rail Pressure (FRP) Sensor**DD****Note**

This Pinpoint Test is intended to diagnose the following:

- Fuel Rail Pressure (FRP) Sensor (9F972)
- Harness Circuits: FRP and SIG RTN
- Powertrain Control Module (PCM) (12A650)

Tables and Graphs**Fuel Rail Pressure Sensor Test Information Chart**

Part Number (9F972)	FRP pin to VREF pin Resistance (Ohms)	FRP pin to SIG RTN pin Resistance (Ohms)	VREF pin to SIG RTN pin Resistance (Ohms)	Part Supplier	Application
F6AF - BA	3.5M	3.5M	3.7K	H	Natural Gas
F6AF - BB	3.5M	3.5M	3.7K	H	Natural Gas
F6AZ - BA	3.5M	3.5M	3.7K	H	Natural Gas
F8AF - AA	3.5M	3.5M	3.7K	H	Natural Gas
F8AF - AB	3.5M	3.5M	3.7K	H	Natural Gas
F8AZ - AB	3.5M	3.5M	3.7K	H	Natural Gas
F8CF - BF	22K - 30K	22K - 30K	.8 - 1.4K	M	Gasoline
F8CF - BH	22K - 30K	22K - 30K	.8 - 1.4K	M	Gasoline
XW4F - BB	22K - 30K	22K - 30K	.8 - 1.4K	M	Gasoline
XW4F - AD	22K - 30K	22K - 30K	.8 - 1.4K	M	Gasoline
XS2F - DD	N/A	3.2K - 5.5K	5.3K - 6.6K	V	Gasoline
XS2F - EA	N/A	3.2K - 5.5K	5.3K - 6.6K	V	Gasoline
XS2F - FA	N/A	3.2K - 5.5K	5.3K - 6.6K	V	Gasoline

Fuel Rail Pressure Sensor Supplier Key:

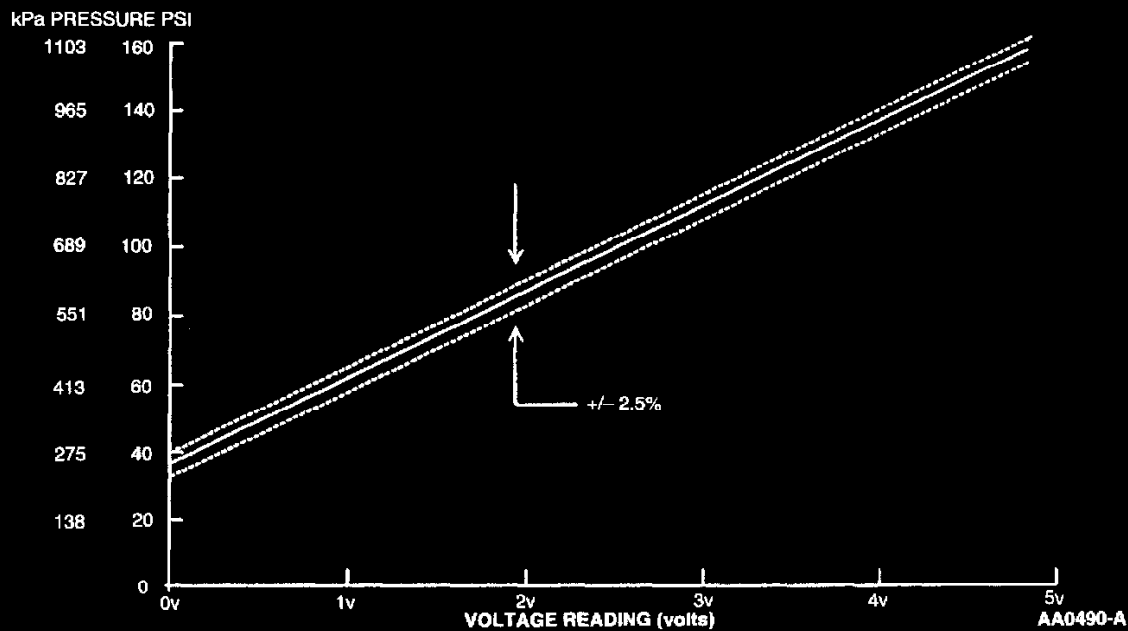
H= Hi Stat

M= Motorola

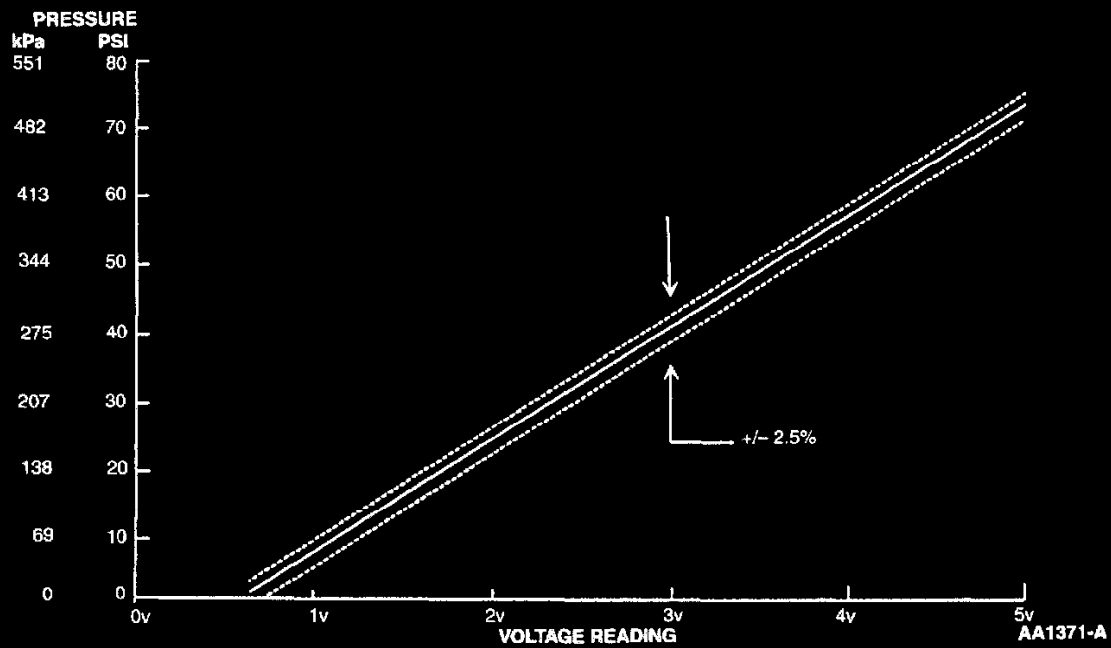
V= Visteon

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

Note, Table and Description

Fuel Rail Pressure (FRP) Sensor**DD****Natural Gas Vehicles****Natural Gas Vehicles — FUEL RAIL PRESSURE SENSOR VOLTAGE AND PRESSURE SPECIFICATIONS**

Fuel Rail Pressure (FRP) Sensor		
Voltage (dcv)	Pressure (psi)	Pressure (kPa)
4.5	150	1034
4.1	140	965
3.7	130	896
3.3	120	827
2.9	110	758
2.5	100	689
2.1	90	620
1.7	80	551
1.3	70	482
0.9	60	413
0.5	50	344
0.1	40	275
0	37.6	259

Fuel Rail Pressure (FRP) Sensor**DD****Gasoline Vehicles****Gasoline Vehicles — FUEL RAIL PRESSURE SENSOR EXPECTED VOLTAGE**

Voltage (dcv)	Pressure (kPa)	Pressure (psi)
4.5	482	70
3.9	413	60
3.4	344	50
2.8	275	40
2.2	207	30
1.6	138	20
1.1	69	10
0.5	0	0

Fuel Rail Pressure (FRP) Sensor

DD

Pinpoint Test Schematics and Connectors

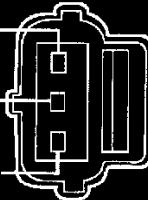
Gasoline Vehicles

FUEL RAIL PRESSURE (FRP) SENSOR HARNESS CONNECTOR

PCM PIN 90 Ⓢ VREF
(THUNDERBIRD/LS6/LS8-C20)

PCM PIN 91 Ⓢ SIG RTN
(THUNDERBIRD/LS6/LS8-C17)

PCM PIN 63 Ⓢ FRP SIGNAL
(THUNDERBIRD/LS6/LS8-C49)



**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

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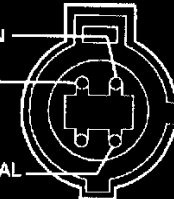
NG Vehicles

FUEL RAIL PRESSURE (FRP) SENSOR HARNESS CONNECTOR

PCM PIN 91 Ⓢ SIG RTN

PCM PIN 90 Ⓢ VREF

PCM PIN 63 Ⓢ FRP SIGNAL



**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

AA4808-A

Test Steps		Results	Action to Take
DD1	DTC P0192: VERIFY DTC WITH FRP PID		
	- 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 →	KEY OFF. For NG vehicles: GO to DD2. All others: Fault is present, GO to DD3. Fault is intermittent. GO to DD13.
DD2	CHECK FUEL PRESSURE (NATURAL GAS)		
	- Install fuel pressure gauge. - Key on engine running. - Obtain a pressure reading. Is the fuel pressure reading greater than 345 kPa (50 psi)?	Yes → No →	KEY OFF. GO to DD3. GO to HB1.
DD3	GENERATE OPPOSITE SIGNAL		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Disconnect FRP harness connector. - Natural Gas Vehicles: 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 DD24. - Key on, engine off. - Access FRP V PID. Is the FRP V PID voltage greater than 4.6 volts?	Yes → No →	REPLACE FRP sensor. GO to DD4.

Schematics and Connectors, Test DD1 - DD3

Fuel Rail Pressure (FRP) Sensor**DD**

Test Steps		Results	→	Action to Take
DD4	CHECK VREF VOLTAGE TO FRP SENSOR	Yes No	→ →	KEY OFF. GO to DD5. GO to C1.
	- Measure voltage between VREF and SIG RTN circuits at the FRP sensor harness connector. Is the voltage between 4.0 and 6.0 volts?			
DD5	CHECK FRP CIRCUIT FOR OPEN IN HARNESS	Yes No	→ →	GO to DD6. REPAIR open circuit.
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Disconnect PCM. - Measure resistance of FRP circuit between PCM harness connector pin and FRP sensor harness connector. Is the resistance less than 5.0 ohms?			
DD6	CHECK FRP CIRCUIT FOR SHORTS TO SIG RTN AND PWR GND IN HARNESS	Yes No	→ →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
	- Measure resistance between FRP and SIG RTN circuits at the PCM harness connector. - Measure resistance of FRP circuit at the PCM harness connector and battery negative post. Are both resistances greater than 10,000 ohms?			
DD7	DTC P0193: CHECK FUEL PRESSURE PID VALUE	Yes No	→ →	KEY OFF. For gasoline vehicles: GO to DD8. For NG vehicles: GO to DD9. Fault is intermittent. GO to DD14.
	- Key on. - Access FRP V PID. Is the FRP V PID voltage greater than 4.5 for NG and 4.8 for all others?			
DD8	CHECK FUEL RAIL PRESSURE SENSOR FOR FUEL LEAKS	Yes No	→ →	REPLACE fuel rail pressure sensor. GO to DD10.
	- Remove vacuum hose from fuel rail pressure sensor. - Inspect sensor and hose for fuel. Is fuel present?			
DD9	CHECK FUEL PRESSURE (NATURAL GAS)	Yes No	→ →	KEY OFF. GO to HB1. KEY OFF. GO to DD10.
	- Install fuel pressure gauge. Note: If vehicle is not equipped with a Schrader Valve, refer to the latest Electronic Publication update for the most current diagnostic information. - Key on, engine running. - Obtain a pressure reading. Is the fuel pressure reading greater than 1034 kPa (150 psi)?			

Fuel Rail Pressure (FRP) Sensor**DD**

Test Steps		Results	→	Action to Take
DD10	ATTEMPT TO INDUCE OPPOSITE FRP SIGNAL			
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Disconnect FRP sensor. • Jumper FRP pin 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 DD24. • Is the FRP V PID voltage less than 0.2 volt?	Yes	→	KEY OFF. REPLACE fuel rail pressure (FRP) sensor.
		No	→	KEY OFF. GO to DD12 .
DD11	DTC P0190: CHECK VREF TO FRP SENSOR			
	Note: Before proceeding to the following test step, a complete inspection of the fuel system for external leaks must be completed. Repair any leaks before continuing. Verify fuel level before beginning test steps. • 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	→	KEY OFF. GO to DD13 .
		No	→	KEY OFF. GO to DD12 .
DD12	CHECK FRP, SIG RTN AND VREF CIRCUITS FOR OPEN IN HARNESS			
	• Disconnect PCM. • Measure resistance of FRP circuit between PCM pin and FRP sensor harness connector. • Measure resistance of SIG RTN circuit between PCM harness connector pin and FRP sensor harness connector. • Measure resistance of VREF circuit between PCM harness connector pin and FRP sensor harness connector. • Is each resistance less than 5.0 ohms?	Yes	→	GO to DD13 .
		No	→	REPAIR open circuit.
DD13	CHECK FRP SENSOR RESISTANCE			
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Measure resistance between FRP pin and VREF pin at the FRP sensor. • Measure resistance between FRP pin and SIG RTN pin at the FRP sensor. • Measure resistance between VREF pin and SIG RTN pin at the FRP sensor • Is each applicable resistance value within the specified resistance range as stated in the Fuel Rail Pressure Sensor Test Information Chart?	Yes	→	For continuous memory DTC P0190 only: GO to DD15. For DTC P0192: REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). DTC P0193: GO to DD14.
		No	→	REPLACE FRP sensor.

DD10 - DD13

Fuel Rail Pressure (FRP) Sensor

DD

Test Steps		Results	Action to Take
DD14	CHECK FRP CIRCUIT FOR SHORT TO VREF AND VPWR IN HARNESS		
	- Disconnect PCM. - Measure resistance between FRP and VPWR circuits at the PCM harness connector. - Measure resistance between FRP and VREF circuits at the PCM harness connector. Are both resistances greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
DD15	WIGGLE TEST THE FRP SENSOR CIRCUIT WHILE MONITORING FRP PID FOR SUDDEN VALUE CHANGE		
	- Access FRP V PID. - While monitoring FRP V PID, tap on the FRP sensor; then wiggle the wiring while looking for sudden changes in the PID voltage as an indication of an intermittent fault. Is a fault indicated?	Yes → No →	REPAIR as necessary. Unable to duplicate/identify fault at this time. GO to Z1 .
DD16	KOEO, KOER DTC P0191 AND CONTINUOUS DTCS P0191 P1168 P1169: CHECK FUEL PRESSURE		
	Note: If DTC(s) P0230, P0231 or P0232 are received along with P0191, it is necessary to address the P0230, P0231 or P0232 before addressing the P0191 DTC. If P0230, P0231 or P0232 are received, refer to Powertrain DTC Charts/Diagnostic Subroutines. Note: For Natural Gas Vehicles, if vehicle is a no-start, GO to HB1. - Key on. - Verify there is sufficient fuel (one eighth tank or greater). - Key off. - Fuel pressure gauge connected. - Key on engine off. Note: for fuel pressure specifications, refer to the Fuel Delivery System Test Information Chart in the beginning of HC. Is the fuel pressure within range for the vehicle being diagnosed?	Yes → No →	GO to DD17 . REMOVE pressure gauge. GO to HC1 for gasoline or GO to HB1 for NG vehicles.

DD

[illegible]

Fuel Rail Pressure (FRP) Sensor**DD**

Test Steps		Results	Action to Take
DD21	MONITOR FRP V PID WITH SCAN TOOL		
	• Key on, engine off. • Access FRP V PID. • Is the FRP V PID value less than 0.2 volt for NG, and greater than 4.8 volts for all others?	Yes → No →	REPLACE FRP sensor. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
DD22	CHECK FSV PWR VOLTAGE TO FUEL RAIL SOLENOID SHUT-OFF VALVE HARNESS CONNECTOR		
	• Disconnect the fuel rail solenoid shut-off valve at the harness connector. • Key on. • 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 voltage between the FSV PWR circuit at the fuel rail solenoid shut-off valve harness connector and battery negative post. • Is the voltage reading greater than 10.5 volts?	Yes → No →	GO to DD23. KEY OFF. REPAIR open circuit.
DD23	CHECK GROUND CIRCUIT FOR OPEN IN HARNESS		
	• Measure resistance between the ground circuit at the fuel rail solenoid shut-off valve harness connector and battery negative post. • Is resistance less than 5.0 ohms?	Yes → No →	REPLACE fuel rail solenoid shut-off valve. REPAIR open circuit.
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 → No →	KEY OFF. GO to DD25. VREF is out of range. GO to C1.

Fuel Rail Pressure (FRP) Sensor**DD**

Test Steps		Results	Action to Take
DD25	CHECK FRP CIRCUIT FOR SHORT TO SIG RTN, VREF, OR PWR GND IN HARNESS		
Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.			
• Disconnect PCM. • Disconnect scan tool from DLC. • FRP disconnected. • Measure resistance between FRP and SIG RTN circuits at the PCM harness connector. • Measure resistance between FRP and VREF circuits at the PCM harness connector. • Measure resistance between FRP circuit at the PCM harness connector and battery negative post. • Is the resistance greater than 10,000 ohms?		Yes →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
		No →	REPAIR short.

DD25**Test DF: Vehicle Speed Circuit Check**

Vehicle Speed Circuit Check

DF

Note

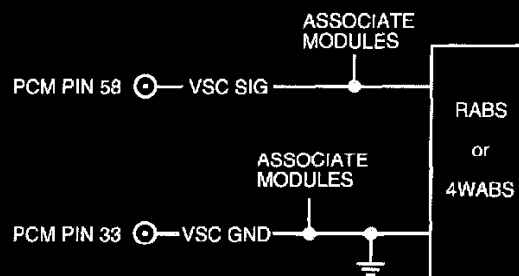
This Pinpoint Test is intended to diagnose the following:

- Harness circuits: vehicle speed circuit signal (VSC SIG), vehicle speed circuit ground (VSC GND)
- Powertrain control module (PCM) (12A650)

For additional information on the Anti-Lock Brake System and its circuits, refer to Anti-Lock Brake System and Vehicle/Diagrams.

Pinpoint Test Schematic and Connectors

5.4L, 6.8L Excursion, 5.4L, 6.8L F-Series
0/8500 GVW



A0013681

Note, Schematic and Connectors

Vehicle Speed Circuit Check

DF

Test Steps		Results	Action to Take					
DF1	DTC P0500/P0501/P1502: CHECK VEHICLE SPEED PID							
- Powertrain control module (PCM) detected an error in the vehicle speed information received from the anti-lock brake system (ABS) control module. Note: When diagnosing the VSC signal to the PCM refer to the chart below to determine which module sends the VSC signal to the PCM. <table><tr><th>Vehicle Applications</th><th>Module Application(s)</th></tr><tr><td>5.4L/6.8L F-Series</td><td>4WABS (w/ 4 wheel Anti-Lock Brake System) or RABS (w/ rear wheel only Anti-Lock Brake System)</td></tr><tr><td>5.4L/6.8L Excursion</td><td>4WABS (w/ 4 wheel Anti-Lock Brake System)</td></tr></table> - Key on. - Connect scan tool. - Access VSS PID. - Obeying all local traffic laws, complete the following: - Take the vehicle to a suitable location and gradually increase the vehicle speed to 80 km/h (50 mph), while observing the VSS PID mph values. - Did the VSS PID value match the speed at which you were traveling?		Vehicle Applications	Module Application(s)	5.4L/6.8L F-Series	4WABS (w/ 4 wheel Anti-Lock Brake System) or RABS (w/ rear wheel only Anti-Lock Brake System)	5.4L/6.8L Excursion	4WABS (w/ 4 wheel Anti-Lock Brake System)	Yes
Vehicle Applications	Module Application(s)							
5.4L/6.8L F-Series	4WABS (w/ 4 wheel Anti-Lock Brake System) or RABS (w/ rear wheel only Anti-Lock Brake System)							
5.4L/6.8L Excursion	4WABS (w/ 4 wheel Anti-Lock Brake System)							

DF1 - DF2

Vehicle Speed Circuit Check

DF

Test Steps		Results	Action to Take
DF3	CHECK FOR OPEN VSC BETWEEN PCM AND ABS CONTROL MODULE		
	- Measure resistance of VSC circuit between PCM harness connector pin and the appropriate control module (4WABS or RABS) connector. - Measure resistance of VSC GND circuit between PCM harness connector pin and ground. Is (each) resistance less than 5.0 ohms?	Yes → No →	GO to DF4 . REPAIR open circuit(s). GO to DF7 and COMPLETE VSC Repair Verification Drive Cycle.
DF4	CHECK VSC FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool from DLC. - Measure resistance between ground and VSC SIG circuit at the PCM harness connector. - Measure resistance between VSC SIG and VSC GND circuits at the PCM harness connector. Is (each) resistance greater than 10,000 ohms?	Yes → No →	RESTORE vehicle. REFER to Anti-Lock Brake System, for further diagnosis of the ABS control module, its speed sensors and its wheel speed sensor harness circuits. If those components are working properly, REPLACE the PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). GO to DF7 and COMPLETE VSC Repair Verification Drive Cycle. GO to DF6 .
DF5	VISUAL INSPECTION		
	- Visually inspect the vehicle speed circuit harness circuits for any potential failures. Use the following check list for reference: - Loose harness connection of vehicle speed circuits at the appropriate control module. - Loose harness connection of vehicle speed circuits at the PCM. - Incorrect harness routing of vehicle speed circuits. - Note: Refer to Vehicle/Diagrams for harness, module and connector location. Did the visual inspection reveal any potential failure?	Yes → No →	REPAIR fault as necessary. GO to DF7 and COMPLETE VSC Repair Verification Drive Cycle. Unable to duplicate or identify fault at this time. REFER to Anti-Lock Brake System, for further diagnosis of intermittent control module and wheel speed sensor concern.

DF3 - DF5

Vehicle Speed Circuit Check

DF

Test Steps		Results	Action to Take
DF6	VERIFY IF VSC IS SHORTED IN HARNESS OR ANOTHER MODULE		
	- Determine which, if any, modules are connected to the VSC (Refer to Vehicle/Diagrams). If no other modules are connected to the VSC, GO to the "YES" Action To Take. - One at a time, disconnect the modules associated with the VSC. 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. GO to DF7 and COMPLETE VSC Repair Verification Drive Cycle. REFER to the Vehicle Systems for further diagnosis of appropriate module. After repair, RESTORE vehicle. GO to DF7 and COMPLETE VSC Repair Verification Drive Cycle.
DF7	VSC REPAIR VERIFICATION DRIVE CYCLE		
	Warm engine to operating temperature. Complete the VSC Repair Verification Drive Cycle at least three times as described below: AUTOMATIC TRANSMISSIONS: - Place transmission range selector lever in DRIVE range. - Obey all local traffic laws. - Accelerate heavily to 56 km/h (35 mph). - Coast down to an idle and stop the vehicle. - Shut the engine off. - After the drive cycle is completed, retrieve any Continuous Memory DTCs. MANUAL TRANSMISSIONS: - Shift to second from first gear. - Obey all local traffic laws. - Accelerate moderately to 64 km/h (40 mph). - Coast down to an idle and stop the vehicle. - After the drive cycle is completed, retrieve any Continuous Memory DTCs. Were any Continuous Memory DTCs generated during the drive cycle?	Yes → No →	Testing is not complete. The repair has not been verified. REPAIR DTC(s). REFER to Powertrain Diagnostic Trouble Code (DTC) Charts. Testing is complete. The repair has been verified.

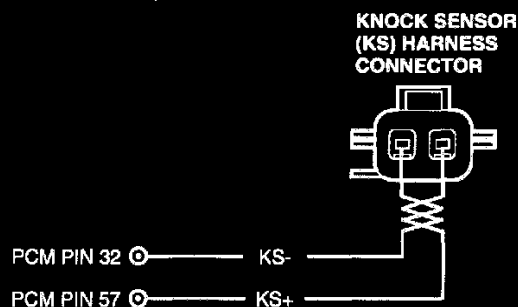
DF6 - DF7

Test DG: Knock Sensor (KS)

Knock Sensor (KS)**DG****Note**

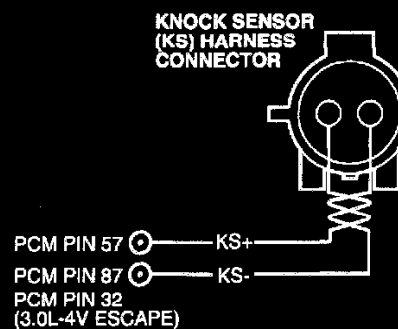
This Pinpoint Test is intended to diagnose the following:

- Knock sensor (12A699)
- Harness circuits: KS and SIG RTN
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematics and Connectors**3.0L-4V Taurus/Sable**

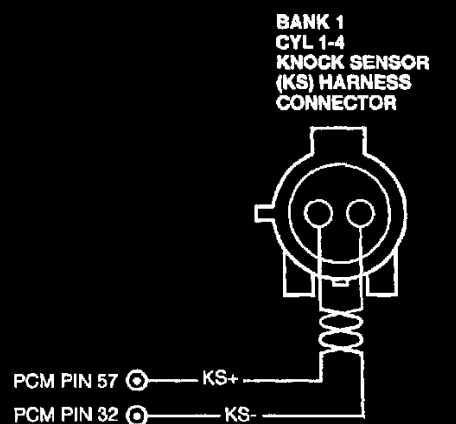
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0029831

2.0L-4V Escape, 2.0L-2V Escort, 2.0L-2V Focus, 2.0L-2V MTX Cougar

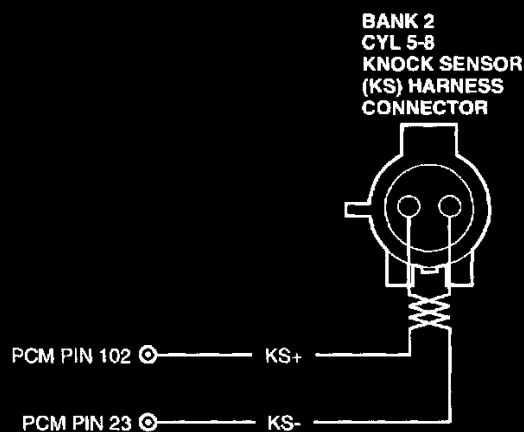
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

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Knock Sensor (KS)**DG****Continental, 4.6L-4V Mustang**

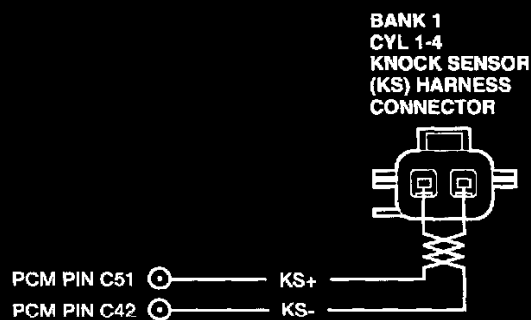
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VIEWED INTO MATING SURFACE**

AA4811-A



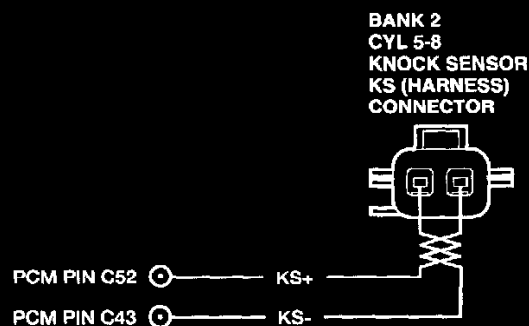
**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

A0029830

LS8

**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

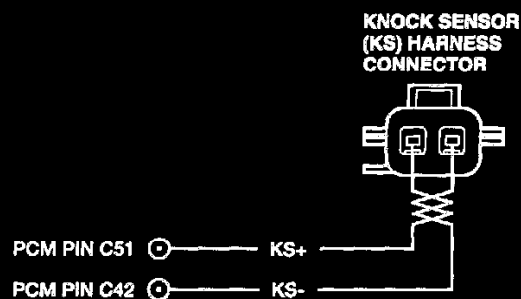
A0041625



**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

A0041626

Test Schematic

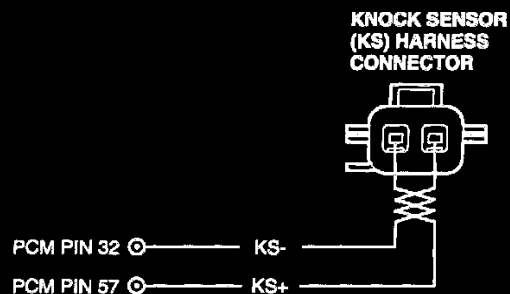
Knock Sensor (KS)**DG****LS6**

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0041627

Explorer 4.6L SOHC

A0041628

All Others

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0029831

Test Schematic

Knock Sensor (KS)**DG**

Test Steps		Results	Action to Take
DG1	DTC P0325, P0326 (KS1), P0330, P0331 (KS2), DTC P0325, P0326 (KS1): CHECK VOLTAGE ON KNOCK SENSOR PID		
	- Verify that KS is connected and installed properly. Then complete comprehensive repair verification drive cycle. Refer to Diagnostic Methods, Drive Cycles. - Key on, engine off. - Access KS PID. - Read AC voltage. Is the KS PID less than 3.0 volts?	Yes → No →	KEY OFF. GO to DG2 . GO to DG6 .
DG2	CHECK KS CIRCUIT FOR INTERMITTANT 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 the KS reading changing?	Yes → No →	ISOLATE fault and SERVICE as required. COMPLETE Comprehensive Component Repair Verification Drive Cycle. (REFER to Diagnostic Methods, Drive Cycles.) GO to DG3
DG3	CHECK KS SENSOR RESISTANCE		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Disconnect KS, measure resistance through the KS harness connector pins Is resistance between 4.39 and 5.35 megaohms?	Yes → No →	GO to DG7 . For resistance greater than 5.35 megaohms: GO to DG4 . For resistance less than 4.39 megohm: GO to DG5 .
DG4	CHECK FOR OPEN OF KS CIRCUIT BETWEEN KS HARNESS CONNECTOR AND PCM HARNESS CONNECTOR		
	- Disconnect PCM. - Measure resistance of the KS+ circuit between the PCM harness connector pin and the KS harness connector. - Measure resistance of KS- circuit between the PCM harness connector pin and the KS harness connector. Is each resistance less than 5.0 ohms?	Yes → No →	REPLACE KS. REPAIR open circuit. COMPLETE Comprehensive Component Repair Verification Drive Cycle. (REFER to Diagnostic Methods, Drive Cycles)
DG5	CHECK KS CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Measure resistance between the KS- circuit at the PCM harness connector and chassis GND. - Measure resistance between the KS+ circuit at the PCM harness connector and chassis GND. Is each resistance greater than 10,000 ohms?	Yes → No →	GO to DG7 . SERVICE short circuit. COMPLETE Comprehensive Component Repair Verification Drive Cycle. (REFER to Diagnostic Methods, Drive Cycles)

Knock Sensor (KS)**DG**

Test Steps		Results	Action to Take
DG6	CHECK KS CIRCUITS FOR SHORT TO POWER IN HARNESS		
- Disconnect PCM. - Key on. - Measure voltage between the KS+ circuit at the PCM harness connector and battery negative post. Is the voltage less than 0.5 volt?		Yes	→ REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). COMPLETE Comprehensive Component Repair Verification Drive Cycle. (REFER to Diagnostic Methods, Drive Cycles.)
		No	→ SERVICE short circuit. COMPLETE Comprehensive Component Repair Verification Drive Cycle. (REFER to Diagnostic Methods, Drive Cycles.)
DG7	CHECK INTERNAL PCM RESISTANCE		
- Disconnect PCM. - Measure resistance between KS+ and KS- pins through the PCM Is resistance greater than 10,000 ohms?		Yes	→ REPLACE KS. If concern is still present, REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). Component Repair Verification Drive Cycle. (REFER to Diagnostic Methods, Drive Cycles.)
		No	→ REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). COMPLETE Comprehensive Component Repair Verification Drive Cycle. (REFER to Diagnostic Methods, Drive Cycles.)

DG6 - DG7

Test DH: Throttle Position (TP) Sensor

Throttle Position (TP) Sensor**DH****Note**

This Pinpoint Test is intended to diagnose the following:

- Throttle Position (TP) Sensor (9B989)
- Binding and sticking Throttle Linkage
- Harness Circuits: TP, SIG RTN, VREF, Vehicle Power (VPWR), Power Ground (PWR GND)
- Powertrain Control Module (PCM) (12A650)

Graphs

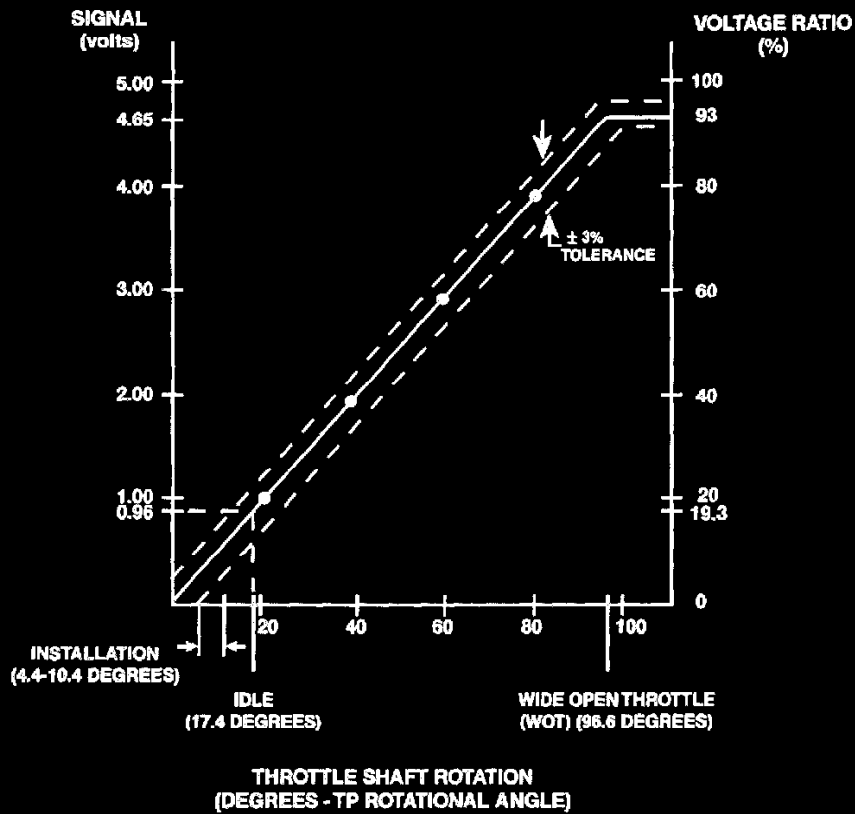
Note: The normal range of the throttle angle measurement for the throttle position (TP) sensor is 0 to 96.6 degrees.

Test Note

Throttle Position (TP) Sensor

DH

TP Sensor Graph
(Clockwise Rotation)



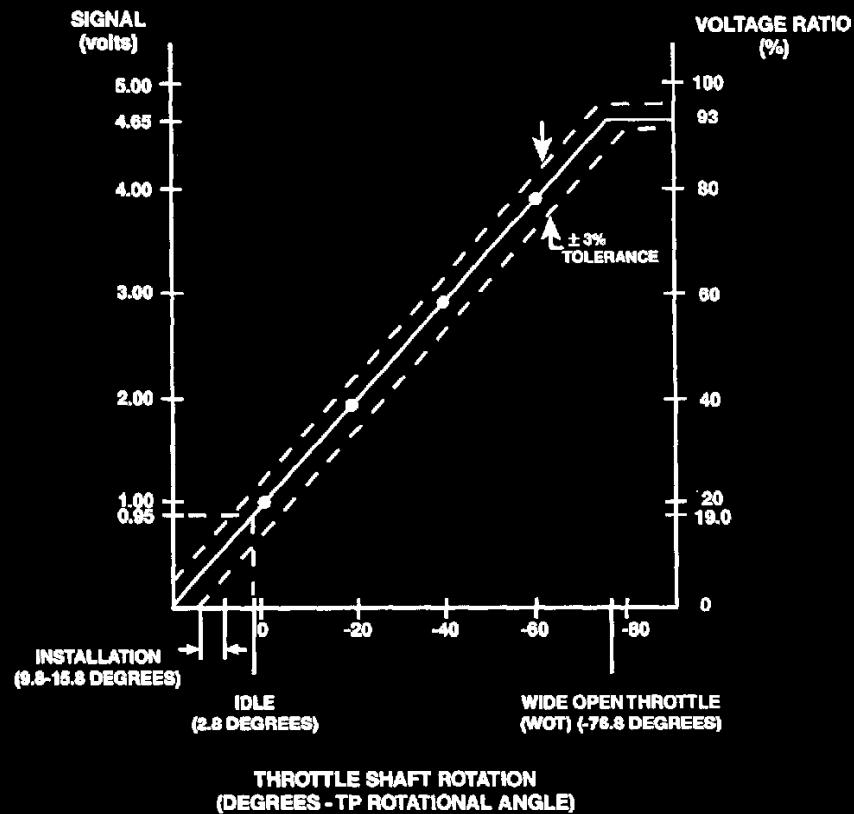
AA3324-B

Test Graph

Throttle Position (TP) Sensor

DH

TP Sensor Graph
(Counter Clockwise Rotation)



AA3325-B

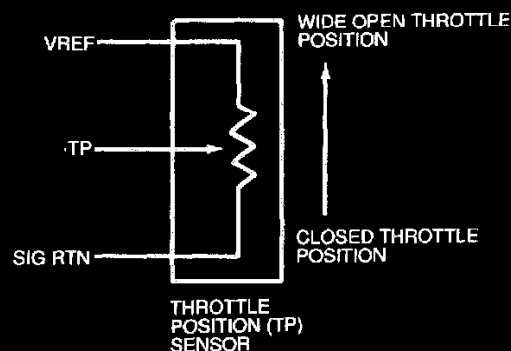
Test Graph

Throttle Position (TP) Sensor

DH

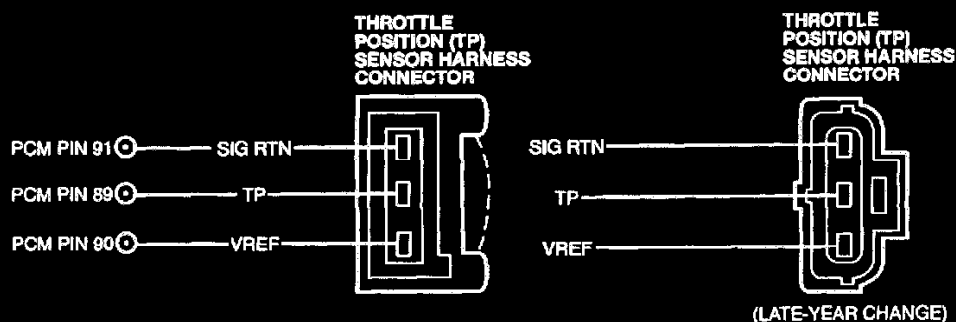
Pinpoint Test Schematics and Connectors

Contacting TP Sensor



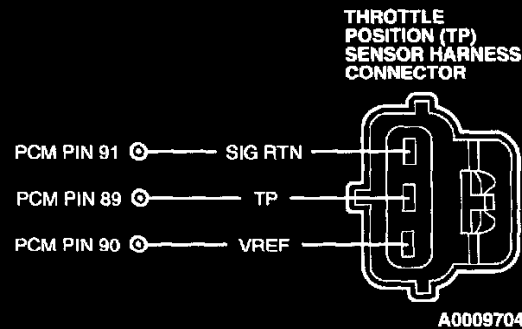
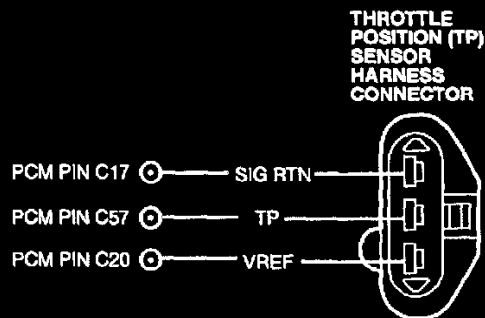
A15921-B

2.0L (4V) Escort, 2.0L Cougar

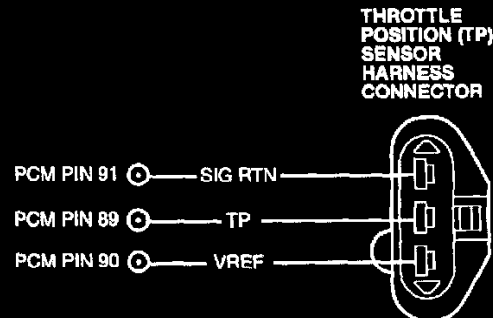


NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

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Throttle Position (TP) Sensor**DH****2.0L (4V) Focus, 2.3L Ranger****LS6/LS8, Thunderbird, Explorer/Mountaineer****All Others**

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

Test Steps		Results →	Action to Take
DH1	KOEO AND KOER DTC P1124: CHECK FOR OTHER DTCS		
	- Check for DTC P1400 in KOEO or KOER Self-Test. - Is KOEO or KOER DTC P1400 present with KOEO DTC P1124?	Yes → No →	RETURN to Powertrain Diagnostic Trouble Code (DTC) Charts for DTC P1400. KEY OFF. 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 DH8. REPAIR as necessary.

Test Schematic, Test DH1 - DH2

Throttle Position (TP) Sensor**DH**

Test Steps		Results	Action to Take
DH3	DTC P1120: CHECK TP CIRCUIT FOR FRAYED WIRES OR CORROSION ON CONNECTORS		
	• Key off. • Complete a visual inspection of pins on harness connector at the TP sensor for corrosion. • Complete a 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. GO to DH4.
DH4	CHECK FOR STUCK TP SENSOR		
	• 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). • While opening the throttle, is the TP PID (TPV PID) reading below 9.85% (0.49 volt)?	Yes → No →	KEY OFF. GO to DH5. 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. • Is voltage between 4.0 and 6.0 volts?	Yes → No →	KEY OFF. GO to DH6. GO to C1.
DH6	CHECK TP CIRCUIT FOR OPEN IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Disconnect PCM. • Measure resistance of TP circuit between PCM harness connector pin and TP harness connector. • Is resistance less than 5.0 ohms?	Yes → No →	GO to DH7. REPAIR open circuit.
DH7	CHECK TP SENSOR VOLTAGE TO PCM		
	• Reconnect PCM and TP sensor. • Start engine and idle for 2 minutes. • Access TP PID (TP V PID). • Slowly open the throttle from closed position and observe PID(s). • Is TP PID (TP V PID) reading at any time between 3.42-9.85% (0.17-0.49 volt)?	Yes → No →	REPLACE TP sensor. If DTC P1120 is still present, GO to DH20.

Throttle Position (TP) Sensor**DH**

Test Steps		Results →		Action to Take
DH8	DTC P0123 OR P1124: ATTEMPT TO GENERATE THE OPPOSITE THROTTLE POSITION ANGLE (VOLTAGE) PID READING			
	- Disconnect TP sensor. - Key on, engine off. - Access TP PID (TP V PID). - Is TP PID (TP V PID) less than 3.42% (0.17 volt)?	Yes → No →		GO to DH9 . KEY OFF. GO to DH10 .
DH9	CHECK VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS AT TP SENSOR			
	- Key on, engine off. - Measure voltage between VREF and SIG RTN circuits at the TP sensor harness connector. - Is voltage between 4.0 and 6.0 volts?	Yes → No →		REPLACE TP sensor. GO to C1 .
DH10	CHECK TP CIRCUIT FOR SHORT TO VREF OR VPWR IN HARNESS			
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Disconnect PCM. - Measure resistance between TP and VPWR circuits at the PCM harness connector. - Measure resistance between TP and VREF circuits at the PCM harness connector. (For 150PIN PCM, measure to both VREF pins.) - Is each resistance greater than 10,000 ohms?	Yes → No →		REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
DH11	DTC P0122: ATTEMPT TO GENERATE THE OPPOSITE THROTTLE POSITION ANGLE (VOLTAGE) PID READING			
	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 Z1 . - 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). - Is TP PID (TP V PID) greater than 93% (4.65 volts)?	Yes → No →		REPLACE TP sensor. 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. - Is voltage between 4.0 and 6.0 volts?	Yes → No →		KEY OFF. GO to DH13 . GO to C1 .

Throttle Position (TP) Sensor**DH**

Test Steps		Results	Action to Take
DH13	CHECK TP SENSOR CIRCUIT FOR OPEN IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Disconnect PCM. • Measure resistance of TP circuit between PCM harness connector pin and TP sensor harness connector. • Is resistance less than 5.0 ohms?	Yes → No →	GO to DH14 . REPAIR open circuit.
DH14	CHECK TP CIRCUIT FOR SHORT TO PWR GND OR SIG RTN IN HARNESS		
	• Disconnect PCM. • Disconnect scan tool from DLC. • Measure resistance between TP and PWR GND circuits at the PCM harness connector. • Measure resistance between TP and SIG RTN circuits at the PCM harness connector. • Are both resistances greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
DH15	DTC P1121: CHECK RATIONALITY OPERATION BETWEEN TP AND MAF SENSORS		
	• 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 A1 .
DH16	CHECK MECHANICAL OPERATION OF TP SENSOR		
	• 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). • While opening and closing the throttle, is there a change in the TP PID (TP V PID) between 9.85% and 93% (0.49 and 4.65 volts)?	Yes → No →	GO to DH17 . REPLACE TP sensor. VERIFY a symptom no longer exists.
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. • Is TP PID (TP V PID) greater than 49.02% (2.44 volts) and the LOAD PID reading less than 30%?	Yes → No →	LISTEN for air noise around MAF sensor and throttle body while engine is running. REPAIR if necessary. Otherwise, GO to HU1 for air restriction. If OK, REPLACE the TP sensor. GO to DH18 .

Throttle Position (TP) Sensor**DH**

Test Steps		Results	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 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. • Is TP PID (TP V PID) reading less than 4.82% (0.24 volts) and the LOAD PID reading greater than 55%?		Yes	→ TIGHTEN TP sensor to throttle body if necessary. CLEAR Continuous Memory DTCs. DRIVE vehicle exercising the throttle. If Continuous Memory P1121 is now present, REPLACE MAF sensor.
		No	→ Unable to identify the fault at this time. If vehicle is still a No Start, GO to A1 .
DH20	CONTINUOUS MEMORY DTCS P1120 OR P1125: CHECK FOR TP CIRCUIT INTERMITTENT SIGNAL		
• 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 completing the following: — Lightly tap on TP sensor and wiggle harness connector to simulate road shock. • Is TP PID (TP V PID) changing below the minimum 9.85% (0.49 volt) or above the maximum 93% (4.65 volts)?		Yes	→ INSPECT the TP sensor connector. If OK, REPLACE the TP sensor.
		No	→ KEY OFF. GO to DH21 .
DH21	CHECK TP SENSOR HARNESS FOR INTERMITTENT OPENS OR SHORTS		
• Again access the TP PID (TP V PID). • Key on, engine off. • Complete 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 TP PID (TP V PID) reading changing below the minimum 9.85% (0.49 volt) or above the maximum 93% (4.65 volts)?		Yes	→ ISOLATE and REPAIR as necessary.
		No	→ Unable to duplicate or identify fault at this time. GO to Z1 .

Throttle Position (TP) Sensor**DH**

Test Steps		Results	Action to Take
DH22	DTC P0121: CHECK FOR KOER SELF-TEST COMPLETION		
	Note: If KOER Self-Test terminates when placing the transmission range selector lever in gear (DRIVE or REVERSE), GO to DH25 directly. - Start engine, bring to idle (throttle closed). - Activate Key On Engine Running (KOER) Self-Test. - Attempt to drive vehicle, while still in Key On Engine Running Self-Test. - Key off, wait 15 seconds. - Start engine again. - Activate KOER Self-Test. Is DTC P0121 still present or does KOER Self-Test again fail to terminate?	Yes → No →	KEY OFF. GO to DH23. VERIFY a symptom no longer exists.
DH23	ISOLATE BINDING OR STICKING CONCERN		
	- Disconnect accelerator cable and speed control cable from throttle body linkage. CAUTION: Do not attempt to clean the throttle bore and plate area. Cleaning will damage the throttle body assembly. Note: Sticking or binding condition can either appear within cables or throttle body assembly. - Rotate throttle body linkage. Does the throttle body rotate freely without a sticking, binding or grabbing condition?	Yes → No →	REPAIR cable(s) causing concern. RERUN Quick Test. If the DTC P0121 is still present, GO to DH24. REPLACE throttle body assembly.
DH24	CHECK FUNCTIONALITY OF THE THROTTLE POSITION SENSOR		
	- Key on. - Access TP V PID. - From closed throttle, slowly begin to press accelerator to wide open throttle. Did the TP V PID display a smooth reading during accelerator movement?	Yes → No →	VERIFY a symptom no longer exists. KEY OFF. REPLACE TP sensor.
DH25	CHECK TP AND SIG RTN CIRCUITS FOR OPEN IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Disconnect PCM and TP sensor. - Key off. - Measure resistance of TP circuit between PCM harness connector and TP sensor harness connector. - Measure resistance of SIG RTN circuit between PCM harness connector and TP sensor harness connector. Is each resistance less than 0.5 ohms?	Yes → No →	REPLACE TP sensor. VERIFY a symptom no longer exists. REPAIR open circuit. VERIFY a symptom no longer exists.

DH22 - DH25

Test DJ: Air Conditioning Evaporator Temperature (ACET) Sensor

**Air Conditioning Evaporator
Temperature (ACET) Sensor****DJ****Note**

This Pinpoint Test is intended to diagnose the following:

- Air Conditioning Evaporative Temperature (ACET) sensor (19C734)
- Harness circuits: ACET and SIG RTN
- Powertrain control module (PCM) (12A650)

Table**A/C EVAPORATOR TEMPERATURE (ACET) SENSOR VOLTAGE AND RESISTANCE**

°C	°F	Volts	Resistance (K ohms)
100	212	0.47	2.08
90	194	0.61	2.80
80	176	0.80	3.84
70	158	1.05	5.34
60	140	1.37	7.55
50	122	1.77	10.93
40	104	2.23	16.11
30	86	2.74	24.25
20	68	3.28	37.34
10	50	3.73	58.99
0	32	4.14	95.85
-10	14	4.45	160.31
-20	-4	4.68	276.96

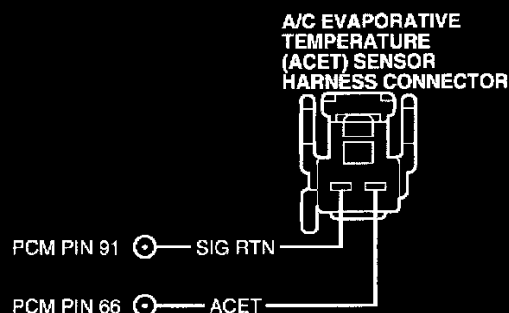
Note: These values can vary 15 percent due to sensor and VREF variations. Voltage values were calculated for VREF = 5.0 volts.

Note, Table

Air Conditioning Evaporator Temperature (ACET) Sensor

DJ

Pinpoint Test Schematics and Connectors



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
A0042254

Note: The A/C Evaporator Temperature (ACET) Sensor may also be referred to as an Evaporator Air Discharge Temperature (EADT) sensor.

Test Steps		Results →	Action to Take
DJ1	DTC P1437: SIMULATE OPPOSITE SIGNAL TO PCM		
	- Disconnect ACET sensor. - Connect a jumper wire between the ACET and SIG RTN circuits at the ACET sensor harness connector. - Rerun Self-Test where P1437 was received (Key On Engine Off or Key On Engine Running). Note: If a scan tool communication concern exists, remove jumper wire immediately and GO to DJ4. Is P1436 received?	Yes → No →	REPLACE suspect sensor. KEY OFF. REMOVE jumper wire. GO to DJ2.
DJ2	CHECK ACET AND SIG RTN CIRCUITS FOR OPEN IN HARNESS		
	- Disconnect PCM. - Measure resistance of ACET circuit between PCM harness connector pin 66 and ACET sensor harness connector. - Measure resistance of SIG RTN circuit between PCM harness connector pin 91 and ACET sensor harness connector. Are both resistances less than 5.0 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuit(s).

Schematics and Connectors, Test DJ1 - DJ2

Air Conditioning Evaporator Temperature (ACET) Sensor

DJ

Test Steps		Results	Action to Take
DJ4	CHECK ACET CIRCUIT FOR SHORT TO VREF IN HARNESS		
	• Key off. • Disconnect PCM. • Measure resistance between PCM harness connector pins 66 (ACET) and 90 (VREF). • Is resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR ACET short to VREF.
DJ5	DTCP1436: SIMULATE OPPOSITE SIGNAL TO PCM		
	• Disconnect ACET sensor. • Rerun Self-Test where P1436 was received (Key On Engine Off or Key On Engine Running). • Is P1437 received?	Yes → No →	REPLACE sensor. GO to DA21 .
DJ6	CHECK ACET CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	• Disconnect PCM. • Measure resistance between ACET and SIG RTN circuits at the ACET sensor harness connector. • Measure resistance between ACET circuit at the ACET sensor harness connector and ground. • Are both resistances greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
DJ10	CONTINUOUS MEMORY P1436 OR P1437: CHECK ACET AND SIG RTN CIRCUITS FOR INTERMITTENT CONCERNS		
	• Disconnect ACET sensor. • Connect a DVOM between the ACET and SIG RTN circuits at the ACET sensor harness connector. • Key on, engine off. • While monitoring the voltage reading on the DVOM, perform the following (The voltage should be between 4.5 and 5.5 volts. The voltage reading will change suddenly when a fault is detected. For P1436, a sudden change could indicate a short to ground. For P1437, a sudden change could indicate an open ACET or SIG RTN circuit.): — Shake, wiggle and bend small sections of wiring harness while working toward the PCM. • Key off. • Inspect associated connectors for damage. • Is there any change in the voltage reading, or is a concern found?	Yes → No →	ISOLATE fault. REPAIR as necessary. Unable to duplicate or identify fault at this time. For further diagnosis, GO to Z1 .

DJ4 - DJ10

Test DL: Cylinder Head Temperature (CHT) Sensor

Cylinder Head Temperature (CHT) Sensor

DL

Note

This Pinpoint Test is intended to diagnose the following:

- Cylinder head temperature (CHT) sensor (6G004)
- Harness circuits: CHT, VREF, and SIG RTN
- Powertrain control module (PCM) (12A650)

Tables and Graphs

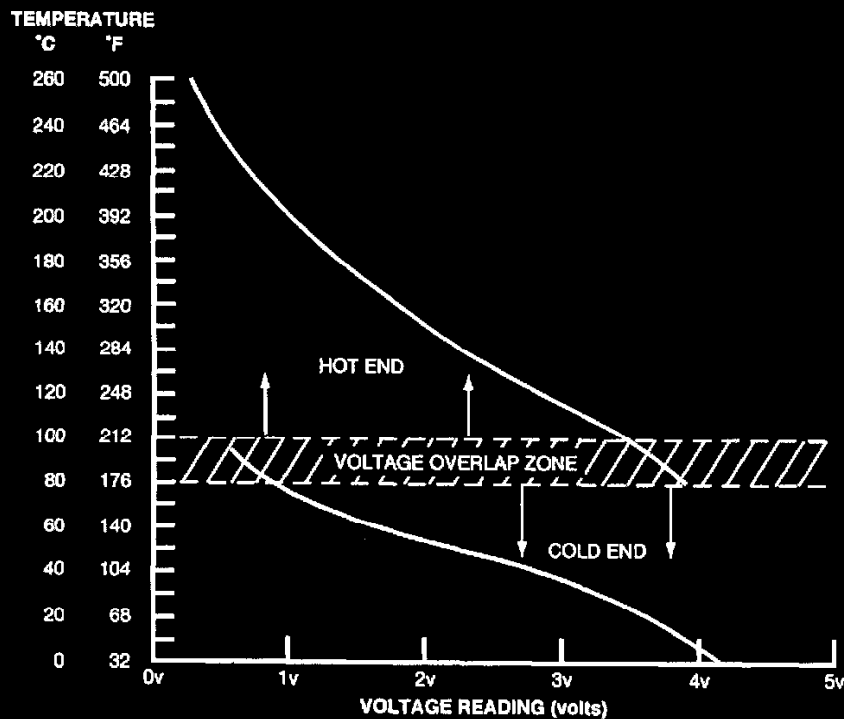
On applications that do not use a ECT sensor, the CHT sensor is used to determine the engine coolant temperature in place of the ECT sensor. In this case the PCM may store both CHT and ECT Diagnostic Trouble Codes (DTCs). To cover the entire temperature range of both the CHT and ECT sensors, the PCM 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.

Test Note, Description

Cylinder Head Temperature (CHT) Sensor

DL

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



AA0885-B

CYLINDER HEAD TEMPERATURE SENSOR EXPECTED VALUES

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

(Continued)

Graph and CHT Sensor Values Table

Cylinder Head Temperature (CHT) Sensor

DL

CYLINDER HEAD TEMPERATURE SENSOR EXPECTED VALUES

Temperature		CHT Sensor Values		
°C	°F	COLD END	HOT END	Resistance (K ohms)
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

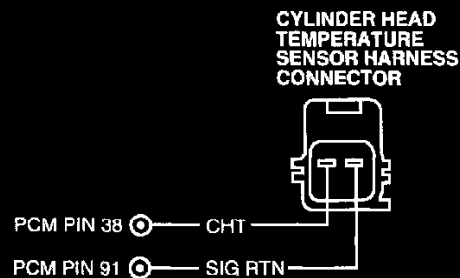
CHT Sensor Values Table

Cylinder Head Temperature (CHT) Sensor

DL

Pinpoint Test Schematics and Connectors

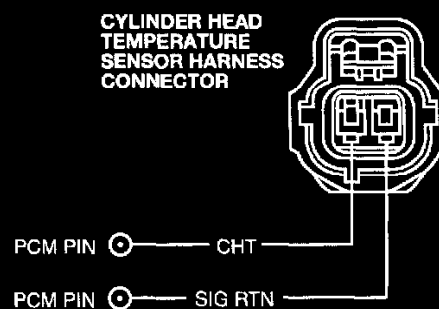
2.0L (4V) Focus, 2.0L (4V) Escape



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0027515

All Others



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0038853

PCM CONNECTOR PIN NUMBERS

PCM TYPE	CHT	SIG RTN
104 PIN	66	91
150 PIN	C40	C17

Cylinder Head Temperature (CHT) Sensor

DL

Test Steps		Results	Action to Take
DL1	DTC P1288 OR P1116: CHECK OPERATION OF CYLINDER HEAD TEMPERATURE SENSOR		
	- Run engine at 2000 rpm until engine temperature becomes stabilized. No Starts or Vehicle that Stalls: - GO to DL3. - 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		
	- Disconnect throttle position (TP) sensor. - Note: GO to Pinpoint Test DH and refer to Pinpoint Test Schematics and Connectors for TP harness connector pin-out information. - Key on, engine off. - Measure the voltage between VREF and SIG RTN circuits at the TP sensor harness connector. Is voltage between 4.0 volts and 6.0 volts?	Yes → No →	There is sufficient VREF voltage. RECONNECT TP sensor. GO to DL3 . GO to 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 →	For No Starts or Stalls, RETURN to Symptom Charts. All others, GO to DL4 . REPLACE CHT sensor.
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. Is resistance within specification?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPLACE CHT sensor.
DL5	DTC P1289 OR P1290: ACCESS CHT PID AND CHECK VOLTAGE		
	- Connect scan tool. - Key on, engine off. - Access CHT V PID. Is the CHT V PID less than 0.2 volt?	Yes → No →	GO to DL6 . GO to DL7 .

DL1 - DL5

Cylinder Head Temperature (CHT) Sensor

DL

Test Steps		Results	Action to Take
DL6	CHECK FOR GROUNDED CIRCUIT		
	- Disconnect CHT sensor. - Key on. - Access CHT V PID. Is the CHT V PID more than 4.6 volts?	Yes → No →	REPLACE CHT sensor. GO to DL21.
DL7	CHECK FOR OPEN HARNESS		
	- Disconnect CHT sensor. - Connect a jumper wire between the CHT signal and SIG RTN circuits at the CHT sensor vehicle harness connector. - Key on. Note: If a Scan Tool communication concern exists, remove jumper wire immediately and GO to DL12. - Access CHT V PID. Is the CHT V PID less than 0.2 volt?	Yes → No →	REPLACE CHT sensor. REMOVE jumper wire. GO to DL11. KEY OFF.
DL10	DTC P0118: SIMULATE OPPOSITE SIGNAL TO PCM		
	- Disconnect CHT sensor. - Connect a jumper wire between the CHT signal circuit and SIG RTN circuit at the CHT sensor vehicle harness connector. - Connect scan tool. - Key on. Note: If a Scan Tool communication concern exists, remove jumper wire immediately and GO to DL12. - Access CHT V PID. Is the CHT V PID less than 0.2 volt?	Yes → No →	REPLACE CHT sensor. REMOVE jumper wire. GO to DL11.
DL11	CHECK CHT SENSOR SIGNAL AND SIG RTN CIRCUITS FOR OPEN IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Disconnect PCM. - Measure resistance of CHT circuit between PCM harness connector pin and CHT sensor harness connector. - Measure resistance of SIG RTN circuit between PCM harness connector pin and CHT sensor harness connector. Is each resistance less than 5.0 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuits.

DL6 - DL11

Cylinder Head Temperature (CHT) Sensor

DL

Test Steps		Results	Action to Take
DL12	CHECK CHT SENSOR SIGNAL FOR SHORT TO VREF IN HARNESS		
	• Key off. • Disconnect PCM. • Measure resistance between CHT and VREF circuits at the PCM harness connector. • Is resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short to VREF.
DL20	DTC P0117: SIMULATE OPPOSITE SIGNAL TO PCM		
	• Disconnect CHT sensor. • Connect scan tool. • Key on. • Access CHT V PID. • Is the CHT V PID more than 4.6 volts?	Yes → No →	REPLACE CHT sensor. GO to DL21 .
DL21	CHECK VREF CIRCUIT VOLTAGE AT TP SENSOR		
	• Disconnect throttle position (TP) sensor. • Note: GO to Pinpoint Test DH and refer to Pinpoint Test Schematics and Connectors for TP harness connector pin-out information. • Key on, engine off. • Measure voltage between VREF and SIG RTN circuits at the TP sensor harness connector. • Is voltage between 4.0 and 6.0 volts?	Yes → No →	There is sufficient VREF voltage. RECONNECT TP sensor. GO to DL22 . KEY OFF. GO to C1 .
DL22	CHECK CHT SIGNAL CIRCUIT FOR SHORT TO GROUND		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Disconnect PCM. • Measure resistance between CHT signal and SIG RTN circuits and then between CHT signal and PWR GND circuits at the PCM harness connector. • Is each resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
DL30	DTC P1285: EARLY WARNING OF ENGINE OVERHEAT CONDITION		
	An engine overheat condition was sensed by the CHT sensor. • Check cooling system for: — Correct coolant level. — Internal or external coolant leaks. — Blockage of radiator. — Cooling fan operation. • Note: If electric cooling fan does not operate, return to Symptom Charts for electric cooling fan DTC or symptom diagnosis. • Is cooling system OK?	Yes → No →	CHECK CHT sensor operation. GO to DL3 . REPAIR as necessary.

**Cylinder Head Temperature (CHT)
Sensor****DL**

Test Steps		Results	→	Action to Take
DL40	ENGINE TEMPERATURE WARNING INDICATOR LAMP ON OR TEMPERATURE GAUGE INDICATES HOT, BUT ENGINE IS NOT OVERHEATING			
Note: PCM Quick Test must be performed prior to entering this Pinpoint Test.		Yes	→	No Diagnostic Trouble Codes (DTCs) received during PCM Quick Test. GO to DL41.
• Was PCM Quick Test performed prior to entering this Pinpoint Test?		No	→	GO to Symptom Charts and RERUN Quick Test. REPAIR any DTCs as necessary.

DL40

Cylinder Head Temperature (CHT) Sensor

DL

Test Steps		Results	Action to Take
DL41	ENGINE TEMPERATURE INDICATOR LAMP ON OR TEMPERATURE GAUGE INDICATES HOT, WITH NO DTCs		
	The Engine Temperature Warning Indicator (gauge or lamp) is a warning system that gives the driver information during an engine overheating condition. The PCM monitors the CHT sensor and determines if fail-safe cooling mode is needed. If fail-safe cooling is needed, the PCM can signal the driver in two ways: Temperature Warning Indicator hard wired to PCM: PCM grounds the engine temperature warning circuit when the engine is overheating. This causes the instrument cluster indicator to illuminate and/or forces the temperature gauge to H (hot) zone. A P1285 will also be stored in the PCM. Temperature Warning Indicator information received through SCP: PCM sends a SCP message to the instrument cluster to signal an overheating condition. This causes the instrument cluster indicator to illuminate and/or forces the temperature gauge to H (hot) zone. A P1285 will also be stored in the PCM. This test ONLY diagnoses the PCM hard wire systems with no PCM DTCs. For any other type of Engine Temperature Warning Indicator system problems, refer to the appropriate Vehicle Systems for diagnosis procedure. Possible causes: — Damaged engine coolant temperature sensor. — Instrument cluster concern. — Wiring harness fault between PCM and Instrument cluster. (PCM output pins: 42 for gauge or 45 for lamp.) — Damaged PCM. • Disconnect PCM. • Key on. • Is the engine temperature warning indicator lamp OFF and the temperature gauge in the normal zone with the PCM disconnected?	Yes → No →	Key off. REPLACE the PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). The PCM has not attempted to ground the Engine Temperature Warning circuit and turn the engine temperature indicator lamp ON or force the temperature gauge to the H (hot) zone. REFER to Instrument Panel, Gauges and Warning Indicators for further diagnosis. For Blackwood refer to Instrument Panel, Gauges and Warning Indicators.

DL41

Cylinder Head Temperature (CHT) Sensor

DL

Test Steps		Results	Action to Take
DL80	P0116: CHECK TEMPERATURE SENSOR RESISTANCE WITH ENGINE OFF		
	Note: Verify that engine temperature is at ambient room temperature before continuing with this test. A soak period of 6 hours may be required. Refer to Diagnostic Trouble Code (DTC) Descriptions, in Diagnostic Subroutines for information concerning P0116. • Key on, engine off. • Disconnect CHT sensor. • Measure CHT sensor resistance. Refer to the chart at the beginning of this Pinpoint Test for resistance specifications. • Is resistance within specification?	Yes → No →	GO to DL81. REPLACE suspect sensor.
DL81	P0116: CHECK TEMPERATURE SENSOR RESISTANCE WITH ENGINE RUNNING		
	Note: Verify that engine is at operating temperature before taking CHT 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 →	Fault is not present at this time. COMPLETE OBDII Drive Cycle to determine if Fuel, HEGO, Catalyst and Misfire monitors can be executed (REFER to Diagnostic Methods, Drive Cycles). Retest if necessary. REPLACE suspect sensor.
DL90	DTCS P0117, P0118, P1117, P1289 OR P1290: INTERMITTENT CHECK		
	• Connect scan tool. • Key on. • Access CHT PID. • While observing the PID, complete 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 OBDII Drive Cycle to verify repair (REFER to Diagnostic Methods, Drive Cycles). GO to DL91.
DL91	CHECK ELECTRONIC ENGINE CONTROL (EC) WIRING HARNESS		
	• Again access CHT PID. • While observing the PID, complete 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. • Is there any change in the temperature reading?	Yes → No →	ISOLATE fault. REPAIR as necessary. COMPLETE OBDII Drive Cycle to verify repair (REFER to Diagnostic Methods, Drive Cycles). GO to DL92.

Cylinder Head Temperature (CHT) Sensor

DL

Test Steps		Results	→	Action to Take
DL92	CHECK PCM AND VEHICLE HARNESS CONNECTOR			Methods
	- Disconnect PCM. - Disconnect CHT sensor. Are connectors and terminals OK?	Yes	→	Fault is not present at this time. COMPLETE OBDII Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
		No	→	REPAIR as necessary. COMPLETE OBDII Drive Cycle to verify repair (REFER to Diagnostic Methods, Drive Cycles).
DL100	DTC P1299 OR P0217 INDICATES AN ENGINE OVERHEAT CONDITION OCCURRED			
	Note: Refer to Diagnostic Subroutines, Diagnostic Trouble Code (DTC) Description for possible causes and additional DTC description information. WARNING: TO AVOID PERSONAL INJURY, DO NOT UNSCREW THE COOLANT PRESSURE RELIEF CAP WHILE THE ENGINE IS OPERATING OR HOT. THE COOLING SYSTEM IS UNDER PRESSURE; STREAM AND HOT LIQUID CAN COME OUT FORCEFULLY WHEN THE CAP IS LOOSENED SLIGHTLY. - Check engine coolant level. Is the engine coolant level fill correct?	Yes	→	REFER to Cooling System for symptom, Engine Overheats.
		No	→	REFER to Cooling System for symptom, Loss of Engine Coolant.
DL110	DTC P0125: CHECK ENGINE COOLANT LEVEL			
	Diagnostic Trouble Code (DTC) P0125 indicates the CHT sensor has not achieved the required engine operating temperature level 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. - Malfunctioning CHT sensor. WARNING: TO AVOID PERSONAL INJURY, DO NOT UNSCREW THE COOLANT PRESSURE RELIEF CAP WHILE THE ENGINE IS OPERATING OR HOT. THE COOLING SYSTEM IS UNDER PRESSURE; STREAM AND HOT LIQUID CAN COME OUT FORCEFULLY WHEN THE CAP IS LOOSENED SLIGHTLY. - Check engine coolant level. Is the engine coolant level fill correct?	Yes	→	GO to Cooling System for further diagnostics.
		No	→	FILL engine coolant to proper level. Complete Comprehensive Component Monitor Repair Verification Drive Cycle (Refer to Diagnostic Methods, Drive Cycles).

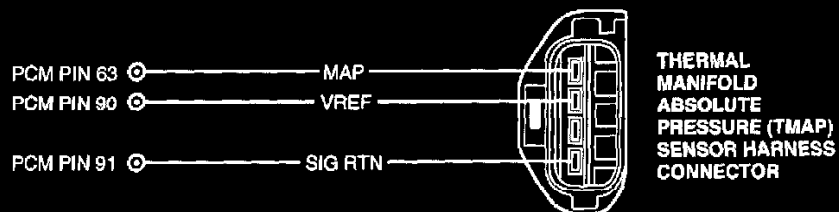
DL92 - DL110

Test DM: Thermal Manifold Absolute Pressure (TMAP) Sensor

Thermal Manifold Absolute Pressure (TMAP) Sensor**DM****Note**

This Pinpoint Test is intended to diagnose the following:

- TMAP sensor (9F479)
- Harness circuits: MAP SIG, SIG RTN, and VREF
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematics and Connectors**2.3L (4V) Ranger**

**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

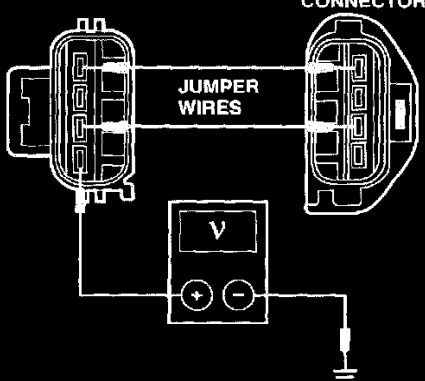
A0027478

Test Steps		Results →	Action to Take
DM1	DTC P0107 AND P0108: CHECK VOLTAGE BETWEEN VREF AND SIG RTN AT TMAP SENSOR		
	• Disconnect TMAP connector. • Measure voltage between VREF and SIG RTN circuits at the TMAP sensor harness connector. • Is VREF voltage between 4.0 and 6.0 volts?	Yes → No →	GO to DM2 GO to C1.

Note, Schematics and Connectors and Test DM1

Thermal Manifold Absolute Pressure (TMAP) Sensor

DM

Test Steps		Results	Action to Take
DM2	CHECK TMAP SENSOR OPERATION		
- Connect a jumper wire for the VREF circuit between the TMAP sensor harness connector and sensor connector. - Connect jumper wire for the SIG RTN circuit between the TMAP sensor harness connector and sensor connector. - Start engine and let idle. - Measure voltage between MAP circuit at the MAP sensor connector and chassis ground. - Observe voltage while rapidly increasing rpm to 3000 by depressing the accelerator pedal and then release. Did the voltage reading rapidly increase to approximately 4.0 volts and then decrease to approximately 0.7 volts?		Yes No	→ GO to DM3 → Replace TMAP sensor.
TMAP SENSOR CONNECTOR TMAP SENSOR HARNESS CONNECTOR  NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE A0038681			
DM3	CHECK TMAP CIRCUIT FOR SHORT TO VREF AND SIG RTN IN HARNESS		
- Disconnect PCM. - Measure resistance between the TMAP circuit and both the VREF and SIG RTN circuits at the TMAP sensor harness connector Is each resistance greater than 10,000 ohms?		Yes No	→ GO to DM4 → REPAIR short circuit.

DM2 - DM3

Thermal Manifold Absolute Pressure (TMAP) Sensor

DM

Test Steps		Results →	Action to Take
DM4	CHECK TMAP SENSOR CIRCUIT FOR OPEN IN HARNESS		
	• Disconnect PCM. • Measure resistance of MAP circuit between PCM harness connector pin 63 and MAP sensor harness connector. • Is resistance less than 5.0 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuit.
DM6	CONTINUOUS MEMORY DTC P0107, P0108: CHECK FOR INTERMITTENT CIRCUITS TO TMAP SENSOR		
	• Key on, engine off. • Access MAP V PID • Observe MAP V PID for an indication of a fault while performing the following (a fault will be indicated in a sudden change in the MAP V PID voltage): — Shake, wiggle, bend the MAP, SIG RTN and VREF circuits between the MAP sensor and the PCM. — Lightly tap on the MAP sensor to simulate road shock. • Is a fault indicated?	Yes → No →	ISOLATE fault and REPAIR as necessary. KEY OFF. Unable to duplicate or identify fault at this time. GO to Z1

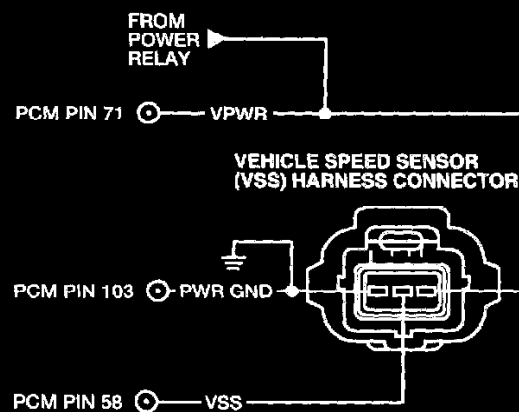
DM4 - DM6

Test DP: Vehicle Speed Sensor/Transfer Case Speed Sensor

**Vehicle Speed Sensor (VSS)/Transfer
Case Speed Sensor (TCSS)****DP****Note**

This Pinpoint Test is intended to diagnose the following:

- Vehicle speed sensor (VSS) (9E731)
- Transfer case speed sensor (TCSS) (7H103)
- Harness circuits: VSS + and VSS -
- Harness circuits: TCSS and SIGRTN
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematic and Connectors**2.0L (MTX) Cougar**

**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

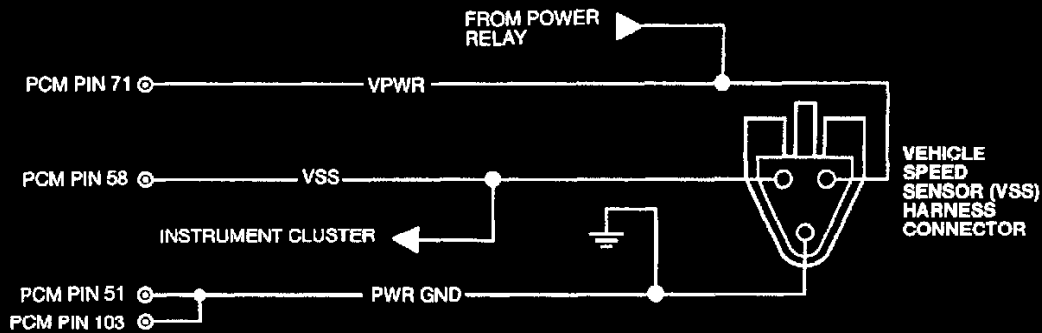
A0038854

Note, Schematic and Connectors

Vehicle Speed Sensor (VSS)/Transfer Case Speed Sensor (TCSS)

DP

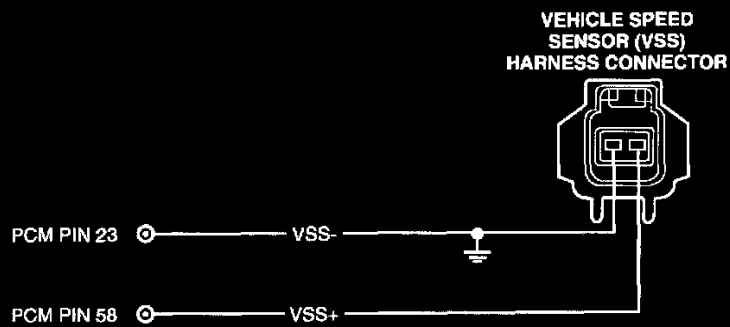
2.5L (MTX) Cougar



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

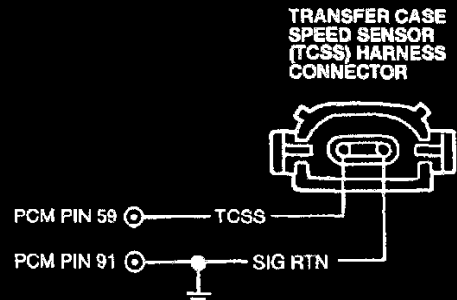
AA4819-A

2.0L (MTX) Escape



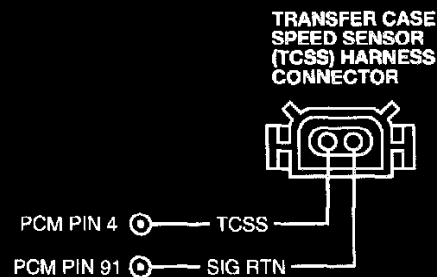
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Test Schematic

**Vehicle Speed Sensor (VSS)/Transfer
Case Speed Sensor (TCSS)****DP****4.2L F-150 4X4 Manual Shift-on-the-Fly (MSOF)**

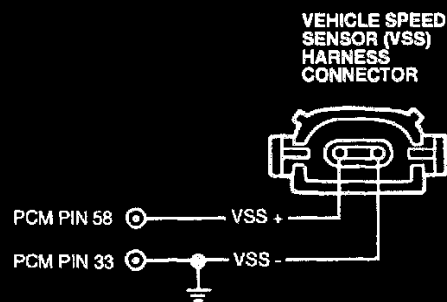
NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AA4862-A

**4.6L/5.4L F150/F250 4x4 Manual
Shift-on-the-Fly (MSOF)**

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0038855

All Others

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AA4820-A

Test Steps		Results →	Action to Take
DP1	DTC P0500/P0501/P1502: CHECK VSS CIRCUITS FOR OPEN IN HARNESS (VRS TYPE)		
Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.			
• Disconnect PCM. • Disconnect VSS. • Measure resistance of VSS+ circuit between PCM harness connector pin and VSS+ sensor harness connector. • Measure resistance of VSS- circuit between PCM harness connector pin and VSS- sensor harness connector. • Is each resistance less than 5.0 ohms?		Yes	→ GO to DP2.
		No	→ REPAIR open circuit. → COMPLETE an OBD II Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).

Schematic, Test DP1

Vehicle Speed Sensor (VSS)/Transfer Case Speed Sensor (TCSS)

DP

Test Steps		Results	Action to Take
DP2	CHECK VSS CIRCUITS FOR SHORT TO GROUND AND POWER IN HARNESS		
	- Measure resistance between VSS+ and PWR GND circuits at PCM harness connector. - Measure resistance between VSS+ and VSS- circuits at PCM harness connector. - Measure resistance between VSS+ and VPWR circuits at PCM harness connector. Is each resistance greater than 5.0 ohms?	Yes → No →	GO to DP3 . GO to DP12 .
DP3	CHECK VSS RESISTANCE		
	- Measure VSS resistance. Is resistance between 170 and 270 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). COMPLETE an OBD II Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). REPLACE the VSS. COMPLETE an OBD II Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
DP5	DTC P0500/P0501/P1502: CHECK VSS SIGNAL OUTPUT TO (PCM) POWERTRAIN CONTROL MODULE (HALL TYPE)		
	- Disconnect PCM. - Raise the vehicle to allow rotation of the front drive wheel. - Key on, transmission in NEUTRAL. - Note: The opposite wheel must be held stationary. Measure voltage between VSS+ and PWR GND circuits at the PCM harness connector, 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. Does the VSS output voltage rise and fall as specified while slowly rotating the drive wheel?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). COMPLETE an OBD II Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). 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. Is the voltage greater than 10.5 volts?	Yes → No →	GO to DP7 . KEY OFF. GO to DP10 .

DP2 - DP6

Vehicle Speed Sensor (VSS)/Transfer Case Speed Sensor (TCSS)

DP

Test Steps		Results	Action to Take
DP7	CHECK VSS CIRCUIT FOR SHORT TO POWER IN HARNESS		
	• Key on. • Measure voltage between VSS+ and PWR GND circuits at the PCM harness connector. • Key off. • Is 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 VSS+ and PWR GND circuits at the PCM harness connector. • 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 harness connector pin and VSS+ sensor harness connector. • Is resistance less than 5.0 ohms?	Yes → No →	REPLACE VSS. COMPLETE an OBD II Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). REPAIR open circuit. COMPLETE an OBD II Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
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. COMPLETE an OBD II Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). REPAIR open VSS PWR GND circuit. COMPLETE an OBD II Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
DP12	VERIFY IF VSS CIRCUIT IS SHORTED IN HARNESS OR ANOTHER MODULE		
	• Determine which, if any, modules are connected to the VSS circuit (Refer to Vehicle/Diagrams). 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. • Does the short circuit remain after all associated modules were disconnected?	Yes → No →	REPAIR short circuit. COMPLETE an OBD II Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). REFER to Vehicle Systems for further diagnosis of appropriate module.

DP7 - DP12

Vehicle Speed Sensor (VSS)/Transfer Case Speed Sensor (TCSS)

DP

Test Steps		Results	Action to Take
DP15	KOER DTC P1501: CHECK PCM VSS PID FOR INPUT SIGNAL		
	- 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. Is the reading on the VSS PID less than 5 km/h (3 mph)?	Yes → No →	Unable to duplicate or identify fault at this time. If DTC P1501 still exists. GO to Z1 . (REFER to Diagnostic Subroutines, Diagnostic Trouble Code (DTC) Descriptions for a list of possible causes.) GO to DP22 .
DP20	DTC P0503: INSPECT VSS AND CIRCUIT FOR AN INTERMITTENT		
	- 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 an OBDII Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). 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. Is 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.
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 Pinpoint Test Schematic and Connectors at beginning of pinpoint test. Are any concerns evident?	Yes → No →	REPAIR as necessary. COMPLETE an OBDII Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). Unable to duplicate or identify a fault at this time. GO to Z1 . (REFER to Diagnostic Subroutines, Diagnostic Trouble Code (DTC) Descriptions for a list of possible causes.)

DP15 - DP22

Vehicle Speed Sensor (VSS)/Transfer Case Speed Sensor (TCSS)

DP

Test Steps		Results	Action to Take
DP25	DTCP1500: VISUAL INSPECTION		
	- 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 an OBD II Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). RESTORE vehicle. Unable to duplicate or identify fault at this time. GO to Z1 . (REFER to Diagnostic Subroutines, Diagnostic Trouble Code (DTC) Descriptions for a list of possible causes.)
DP30	DTCP0500, P1502 VISUAL INSPECTION		
	Note: The transfer case speed sensor (TCSS) provides rotational speed of output shaft of the transfer case. The PCM use this information to control powertrain behavior and on some applications is used as the source of vehicle speed information. - Disconnect TCSS sensor. - Inspect TCSS vehicle harness connector for damage and proper seating. Have any problems been found?	Yes → No →	REPAIR as necessary. GO to DP31 . to
DP31	CHECK RESISTANCE OF TCSS SENSOR		
	- Measure resistance between TCSS signal and TCSS SIGTRN circuits at the TCSS sensor. Is resistance between 1,000 and 1,250 ohms?	Yes → No →	GO to DP32 . REPLACE TCSS sensor.
DP32	TCSS OUTPUT CHECK		
	- Measure frequency between TCSS signal and TCSS SIGRTN circuits at the TCSS sensor. - Drive vehicle between 0 and 48 km/h (0 and 30 mph). - Refer to Reference Values for frequency ranges. Does frequency reading increase and decrease with vehicle speed?	Yes → No →	GO to DP33 . REMOVE the TCSS and inspect target wheel. REPAIR as necessary. IF OK REPLACE TCSS.
DP33	CHECK HARNESS FOR SHORT TO PWR		
	- Key on. - TCSS sensor disconnected. - Measure voltage between the TCSS signal circuit at the TCSS harness connector and ground. If voltage less than 1.0 volt?	Yes → No →	KEY OFF. GO to DP34 . REPAIR short circuit.

Vehicle Speed Sensor (VSS)/Transfer Case Speed Sensor (TCSS)

DP

Test Steps		Results	→	Action to Take
DP34	CHECK HARNESS FOR OPEN			
	• Disconnect PCM. • Measure resistance of TCSS signal circuit between PCM harness connector pin and TCSS sensor harness connector. • Measure resistance of TCSS SIGRTN circuit between PCM harness connector pin and TCSS sensor harness connector. • Is each resistance less than 5.0 ohms?	Yes No	→ →	GO to DP35. REPAIR open circuit.
DP35	CHECK HARNESS FOR SHORT TO GROUND			
	• Measure resistance between TCSS signal and SIGRTN circuits at the TCSS harness connector. • Measure resistance between TCSS signal and GND circuits at the TCSS harness connector. • Is each resistance greater than 10,000 ohms?	Yes No	→ →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.

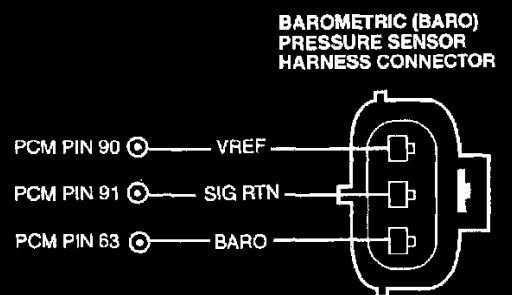
DP34 - DP35

Test DQ: Barometric Pressure (BARO) Sensor

Barometric Pressure (BARO) Sensor**DQ****Note**

This Pinpoint Test is intended to diagnose the following:

- BARO sensor (9F479)
- Harness circuits: BARO SIG, SIG RTN, and VREF
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematics and Connectors

**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

AA4833-A

BAROMETRIC PRESSURE REFERENCE CHART

Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude Above Sea Level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000

(Continued)

Note, Schematics and Connectors and Chart

Barometric Pressure (BARO) Sensor

DQ

BAROMETRIC PRESSURE REFERENCE CHART

Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude Above Sea Level (ft)
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000

Test Steps		Results	→	Action to Take
DQ1	DTC P0106, P0107, P0108 AND P0109: CHECK BARO PID			
Note: Most weather service reports are a local barometric pressure that has been corrected to sea level. However, the BARO PID reports the actual barometric pressure for the altitude the vehicle is being diagnosed in. Local weather conditions (high or low pressure areas) will change the local barometric pressure by several inches of mercury . • Verify the BARO sensor is connected. If not, repair as necessary. • Key on, engine off. • Check that the BARO PID is approximately the same as the barometric pressure reading for the location, day and altitude where the vehicle is being diagnosed. Compare PID readings with chart. — BARO PID values in Keep Alive Memory require updating at high throttle openings. If vehicle is driven down from higher altitudes for diagnosing, complete three or four heavy accelerations at greater than half-throttle to allow BARO PID to update. — BARO PID must be within +/- 6 Hz. (+/- 2 in.Hg.) of the altitude value in Barometric Pressure Reference Chart (at the beginning of this pinpoint test). — Make BARO PID comparisons to Barometric Pressure Reference Chart or daily airport barometric pressure reports, if available. • Does PID reading compare with that of chart?		Yes	→	Unable to duplicate or identify fault at this time. GO to Z1 .
		No	→	For DTC P0108:GO to DQ7 All others:GO to DQ2 .
DQ2	CHECK VREF VOLTAGE TO BARO SENSOR			
• Disconnect BARO connector. • Measure voltage between VREF and SIG RTN circuits at the BARO harness connector. • Is VREF voltage between 4.0 and 6.0 volts?		Yes	→	KEY OFF. GO to DQ5 .
		No	→	KEY OFF. GO to DQ3 .

Chart, Test DQ1 - DQ2

Barometric Pressure (BARO) Sensor**DQ**

Test Steps		Results	Action to Take
DQ3	CHECK VREF CIRCUIT FOR OPEN		
	- Measure resistance of the VREF circuit between PCM harness connector pin and VREF at the BARO sensor harness connector. Is resistance less than 5.0 ohms?	Yes → No →	GO to DQ4 . REPAIR open circuit.
DQ4	CHECK FOR VREF CIRCUIT SHORT TO GROUND		
	- Measure resistance between the VREF circuit and SIG RTN circuits at the PCM harness connector. - Measure resistance between the VREF circuit at the PCM harness connector and the battery negative post. Is each resistance greater than 10,000 ohms?	Yes → No →	GO to DQ5 REPAIR short circuit.
DQ5	CHECK BARO SIGNAL AND SIG RTN CIRCUIT FOR OPEN		
	- Measure resistance of the BARO circuit between PCM harness connector pin and BARO sensor harness connector. - Measure resistance of the SIG RTN circuit between PCM harness connector pin and SIG RTN at the BARO sensor harness connector. Is each resistance less than 5.0 ohms?	Yes → No →	GO to DQ6 . REPAIR open circuit.
DQ6	CHECK BARO CIRCUIT FOR SHORT TO GROUND		
	- Measure resistance between the BARO and SIG RTN circuits at the PCM harness connector. - Measure resistance between the BARO circuit at the PCM harness connector and the battery negative post. Is each resistance greater than 10,000 ohms?	Yes → No →	REPLACE BARO. If concern is still present, REPLACE PCM. (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
DQ7	DTC P0108: INDUCE OPPOSITE CODE		
	- Disconnect BARO sensor. - Key on. - Check DTCs. Is DTC P0107 present?	Yes → No →	KEY OFF. REPLACE BARO sensor. KEY OFF. GO to DQ8 .
DQ8	CHECK BARO SIGNAL FOR SHORT TO POWER		
	- Measure resistance between BARO and VPWR circuits at the PCM harness connector. Is each resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.

DQ3 - DQ8

Test DR: Camshaft Position (CMP) Sensor

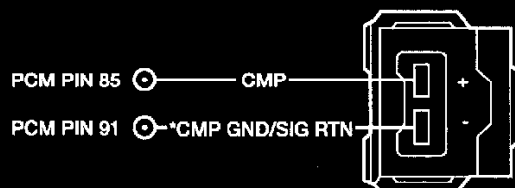
Camshaft Position (CMP) Sensor**DR****Note**

This Pinpoint Test is intended to diagnose the following:

- Camshaft Position (CMP) Sensor (6B288) (12A112)
- Harness Circuits: CMP, VPWR, SIG RTN, PWR GND, CMP/TSS GND
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematics and Connectors**Camshaft Position (CMP) Sensor Connectors****2.0L (2V) Escort, 4.0L SOHC Explorer**

CAMSHAFT POSITION
(CMP) SENSOR
HARNESS CONNECTOR
VARIABLE RELUCTANCE



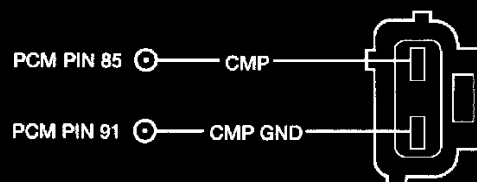
*CMP GND ON ESCORT/TRACER,
SIG RTN ON EXPLORER

**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

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2.0L (4V) Escort, 2.5L Cougar

CAMSHAFT POSITION
(CMP) SENSOR
HARNESS CONNECTOR
VARIABLE RELUCTANCE

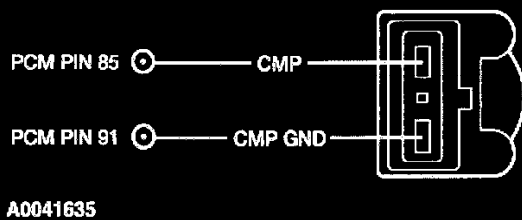


**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**
A0041634

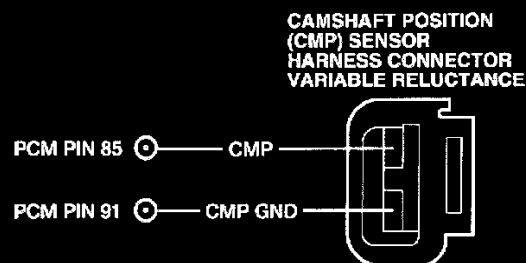
Camshaft Position (CMP) Sensor

DR

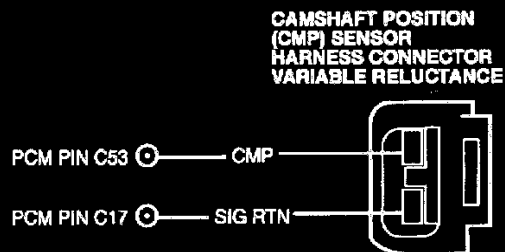
2.0L (2V) Focus



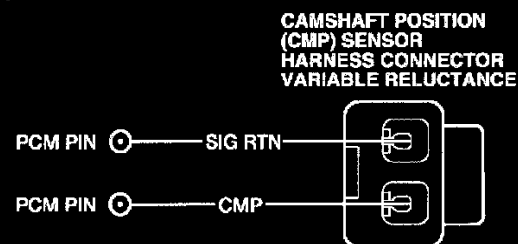
2.0L (4V) Focus, Escape



LS6



LS8, Expedition/Navigator, Explorer/Mountaineer, Thunderbird



PCM CONNECTOR PIN NUMBERS

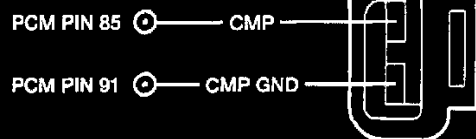
PCM TYPE	CMP	SIG RTN
Expedition Navigator	B31	B25
LS8, Thunderbird, Explorer Mountaineer	C53	C17

Test Schematic

Camshaft Position (CMP) Sensor

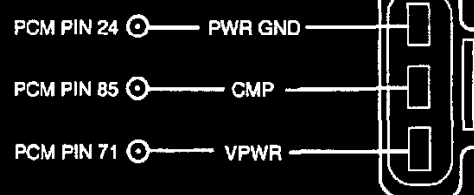
DR

3.0L (4V) Escape

CAMSHAFT POSITION
(CMP) SENSOR
HARNESS CONNECTOR
VARIABLE RELUCTANCE

A0041635

4.2L F-Series, 4.2L Econoline

CAMSHAFT POSITION
(CMP) SENSOR
HARNESS CONNECTOR
HALL EFFECTNOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE AA4378-B

All Others

CAMSHAFT POSITION
(CMP) SENSOR
HARNESS CONNECTOR
VARIABLE RELUCTANCENOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0041638

Test Steps		Results	Action to Take
DR1	DTC P0340: CHECK IF ENGINE WILL START		
	Note: Refer to the Pinpoint Test Schematic to determine the type of CMP sensor.	Yes	→ GO to DR2.
	- Start engine. - Will the engine start?	No	→ DTC P0340 is not the cause of the No Start. GO to Symptom Charts to diagnose the No Start symptom.
DR2	CLEAR AND ATTEMPT TO RE-GENERATE DTC P0340		
	- Complete PCM Reset to clear DTCs. - Increase rpm to greater than 1500 rpm for 10 seconds. Repeat two times. - Retrieve all Continuous Memory DTCs. - Is DTC P0340 present?	Yes	→ For VR type CMP: KEY OFF. GO to DR5 For Hall Effect type CMP: KEY OFF. GO to DR3
		No	→ The fault that produced DTC P0340 is intermittent. GO to Z1.

Schematic, Test DR1 - DR2

Camshaft Position (CMP) Sensor**DR**

Test Steps		Results →		Action to Take
DR3	CHECK VPWR VOLTAGE TO CMP SENSOR			
	- Disconnect CMP sensor. - Key on, engine off. - Measure VPWR circuit voltage between CMP sensor harness connector and battery negative post. Is voltage greater than 10.5 volts?	Yes No	→ →	KEY OFF. GO to DR4 . REPAIR open circuit.
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.
DR5	CHECK FOR OPEN CMP, SIG RTN/CMP GND AND PWR GND CIRCUITS BETWEEN PCM AND CMP SENSOR			
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Disconnect PCM and CMP sensor. - If VR type CMP: Measure resistance of CMP, CMP GND/SIG RTN circuits between PCM harness connector pin and CMP sensor harness connector. - If Hall type CMP: Measure resistance of CMP, VPWR and PWR GND circuits between PCM harness connector and CMP sensor harness connector. Are resistance measurements less than 5.0 ohms?	Yes No	→ →	GO to DR6 . REPAIR open circuit.
DR6	CHECK CMP CIRCUIT FOR SHORT TO POWER IN HARNESS			
	- Key on, engine off. - If Hall type CMP: Measure voltage between CMP and VPWR circuits at the PCM harness connector. - If VR type CMP: Measure voltage between CMP and CMP GND/SIG RTN circuits at the PCM connector. Is voltage less than 1.0 volt?	Yes No	→ →	KEY OFF. GO to DR7 . REPAIR short circuit.
DR7	CHECK CMP CIRCUIT FOR SHORT TO GND AND SIG RTN IN HARNESS			
	- If VR type CMP: Measure resistance between CMP and CMP GND/SIG RTN at the PCM harness connector. - If Hall type CMP: Measure resistance between CMP and PWR GND at the PCM harness connector. Is each resistance greater than 10,000 ohms?	Yes No	→ →	GO to DR8 . REPAIR short circuit.

Camshaft Position (CMP) Sensor**DR**

Test Steps		Results	Action to Take
DR8	CHECK FOR SHORTS IN PCM		
- Reconnect PCM. - For VR type CMP: Measure resistance between CMP and CMP GND/SIG RTN circuits at the CMP harness connector. - For Hall Effect type CMP: Measure resistance between CMP and VPWR and CMP and PWR GND circuits at the CMP harness connector. - Is each resistance greater than 500 ohms?		Yes	→ For VR type CMP: GO to DR9. For Hall Effect type CMP: GO to DR10.
		No	→ REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
DR9	CHECK CMP SENSOR OUTPUT		
- Reconnect CMP sensor. - Digital multimeter on ac scale (to monitor less than 5.0 volts). - Measure voltage between CMP and CMP GND/SIG RTN circuits while running engine at varying rpm. - Does AC voltage vary greater than 0.2 volt AC?		Yes	→ REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
		No	→ REPLACE CMP sensor.
DR10	CHECK CMP SENSOR OUTPUT DURING CRANK MODE		
- Disconnect PCM. - Reconnect CMP sensor. - Connect digital multimeter between CMP and the CMP sensor GND circuit. - 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	→ A CMP sensor that is installed out of synchronization will produce a DTC. VERIFY the correct installation. If CMP is installed properly, REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). Note: If vehicle has a miss with the P0340 code, ignition/alternator noise, RFI, and CKP concerns should be considered.
		No	→ REPLACE CMP sensor.

DR8 - DR10

Test DS: Air Conditioning Pressure (ACP) Sensor

Air Conditioning Pressure (ACP) Sensor

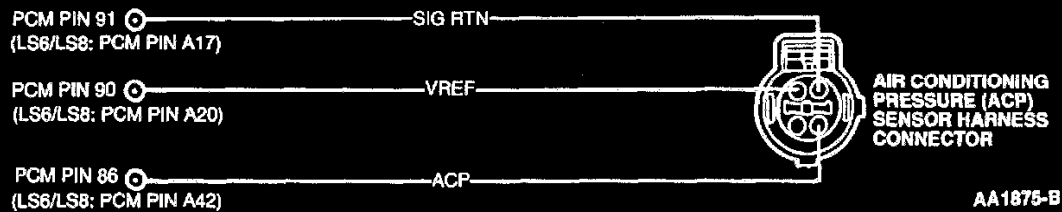
DS

Note

This Pinpoint Test is intended to diagnose the following:

- Harness circuits: ACP, VREF, SIG RTN
- Air Conditioning Pressure (ACP) Sensor (19D594)
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematics and Connector



Test Steps		Results	Action to Take
DS1	DTCP1461: CHECK ACP V PID		
	• Connect scan tool. • Key on, engine off. • Access ACP V PID. • Is 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. → KEY OFF. 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. KEY OFF. GO to C1 .

Note, Schematics and Connector and Test DS1 - DS2

Air Conditioning Pressure (ACP) Sensor

DS

Test Steps		Results →	Action to Take
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. REFER to Heating and Air Conditioning. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. KEY OFF. GO to DS4.
DS4	CHECK ACP CIRCUIT FOR SHORT TO VREF IN HARNESS		
	• 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. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.
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. • Is voltage less than 1.0 volt?	Yes → No →	For Escort, LS6/LS8, Thunderbird: KEY OFF. GO to DS6. All others: REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. REPAIR short circuit. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.
DS6	CHECK FOR OPEN ACP CIRCUIT IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Measure resistance of ACP circuit between PCM harness connector pin and the ACP sensor harness connector. • Is resistance less than 5.0 ohms?	Yes → No →	GO to DS7. REPAIR open circuit. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.

Air Conditioning Pressure (ACP) Sensor

DS

Test Steps		Results	Action to Take
DS7	CHECK PCM		
	- Reconnect PCM. - Connect a jumper wire between the ACP and SIG RTN Circuits at the ACP sensor harness connector. - 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 → No →	REPLACE ACP sensor. REFER to Heating and Air Conditioning. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.
DS10	DTC P1462: CHECK ACP V PID		
	- Connect scan tool. - Key on, engine off. - Access ACP V PID. - Is ACP V PID greater than 0.15 volt?	Yes → No →	The ACP circuit voltage is now above the minimum. GO to DS18 to determine if an intermittent condition exists. KEY OFF. A hard fault is present. GO to DS11.
DS11	CHECK VOLTAGE BETWEEN VREF AND SIG RTN 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 DS12. VREF is out of range. KEY OFF. GO to 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. Note: If any scan tool communication concern occurs, remove jumper immediately and GO to DS13. - Is ACP V PID greater than 4.0 volts?	Yes → No →	REPLACE ACP sensor. REFER to Heating and Air Conditioning. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. GO to DS13.

Air Conditioning Pressure (ACP) Sensor

DS

Test Steps		Results	Action to Take
DS13	CHECK ACP CIRCUIT FOR SHORT TO PWR GND OR SIG RTN IN HARNESS		
	• Key off. • 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 → No →	GO to DS14 . REPAIR short circuit. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.
DS14	CHECK ACP CIRCUIT FOR OPEN IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this Pinpoint Test. • Measure resistance of ACP circuit between PCM harness connector pin and the ACP sensor harness connector. • Is resistance less than 5.0 ohms?	Yes → No →	GO to DS15 . REPAIR open ACP circuit. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C 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 (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). START engine. TURN A/C on, WAIT 15 seconds then TURN A/C 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. (Refer to Heating and Air Conditioning). • Does the A/C system have a refrigerant charge?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. REPAIR A/C system. REFER to Heating and Air Conditioning. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.

Air Conditioning Pressure (ACP) Sensor

DS

Test Steps		Results	→	Action to Take
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 completing 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	→	ISOLATE fault and REPAIR as necessary. PERFORM PCM Reset to clear DTC(s). START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.
		No	→	Unable to duplicate or identify fault at this time. GO to Z1.
DS20	DTC P1463: VERIFY A/C CLUTCH CAN DISENGAGE			
	• A/C and defroster off. • Start engine. • Verify that the A/C clutch disengages. • Is the A/C clutch disengaged?	Yes	→	KEY OFF. GO to DS21.
		No	→	GO to Symptom Chart 21 (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. • 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. • Does test lamp light (or can A/C clutch be heard clicking on)?	Yes	→	GO to DS22.
		No	→	REFER to Heating and Air Conditioning.

Air Conditioning Pressure (ACP) Sensor

DS

Test Steps		Results	Action to Take
DS22	CHECK IF A SUFFICIENT A/C PRESSURE CHANGE CAN BE DETECTED BY THE ACP PID		
	- 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: REFER to Heating and Air Conditioning to check for proper operation of the A/C system. After any service. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. KEY OFF, A/C off. GO to DS23.
DS23	CHECK A/C SYSTEM PRESSURE AND PRESSURE CHANGE		
	- 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 →	KEY OFF. GO to DS24. A/C system pressure did not change as expected. REFER to Heating and Air Conditioning to check for proper mechanical operation of the A/C system. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.
DS24	CHECK VOLTAGE BETWEEN VREF AND SIG RTN 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 →	KEY OFF. GO to DS25. VREF is out of range. KEY OFF. GO to C1.

**Air Conditioning Pressure (ACP)
Sensor****DS**

Test Steps		Results	→	Action to Take
DS25	CHECK ACP CIRCUIT FOR OPEN IN SENSOR			
Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Key off. • ACP sensor disconnected. • Disconnect PCM. • Measure resistance of ACP circuit between PCM harness connector pin and the ACP sensor harness connector. • Is resistance less than 5.0 ohms?		Yes	→	REPLACE ACP sensor. REFER to Heating and Air Conditioning. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.
		No	→	REPAIR open circuit. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.

DS25

Test DT: Power Steering Pressure (PSP) Sensor

Power Steering Pressure (PSP) Sensor

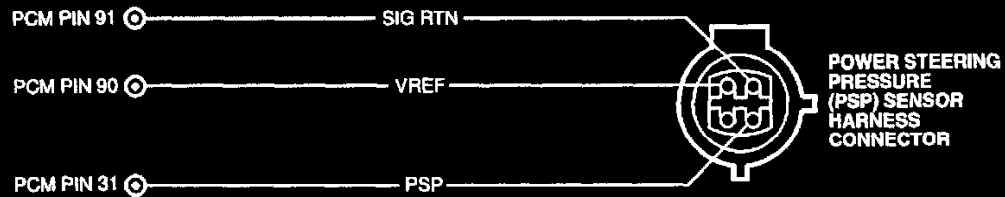
DT

Note

This Pinpoint Test is intended to diagnose the following:

- PSP sensor (3K215)
- Harness circuits: PSP signal, SIG RTN, VREF
- Powertrain Control Module (PCM) (12A650)

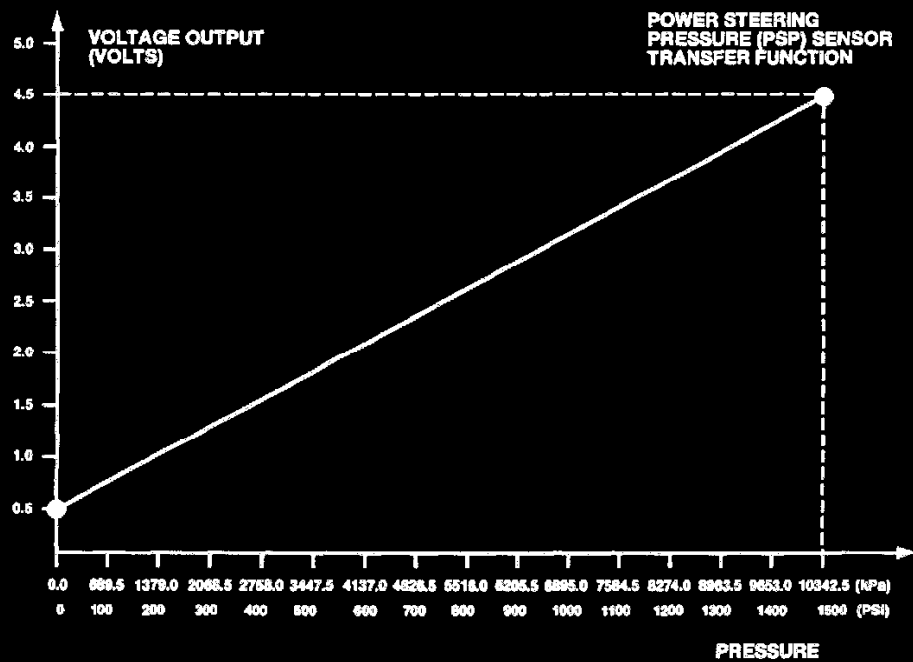
Pinpoint Test Schematics and Connectors



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

AA0499-C

Note, Schematics and Connectors

**Power Steering Pressure (PSP)
Sensor****DT****Graph****Power Steering Pressure (PSP) Sensor Transfer Function**

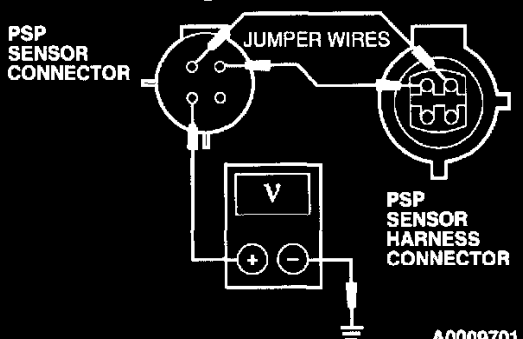
AA0930-C

Test Steps		Results	Action to Take
DT1	DTC P1550: VERIFY OPERATOR INTERACTION		
Did you turn the steering wheel at least one-half turn within 20 seconds of starting KOER self-test?		Yes	→ KEY OFF. If there are any symptoms with the power steering system (for example, lack of power assist), go to Steering. If no symptoms are present with the power steering system, GO to DT2.
		No	→ RERUN Quick Test.

Graph, Test DT1

Power Steering Pressure (PSP) Sensor

DT

Test Steps		Results	Action to Take
DT2	DTC P0552, P0553: CHECK VOLTAGE BETWEEN VREF AND SIG RTN AT PSP SENSOR		
	- Disconnect PSP sensor. - Key on, engine off. - Measure voltage between VREF and SIG RTN circuits at the PSP sensor harness connector. Is voltage between 4.0 and 6.0 volts?	Yes → No →	KEY OFF. GO to DT3 . KEY OFF. GO to C1 .
DT3	CHECK PSP SENSOR OPERATION		
	- Connect a jumper wire for the VREF circuit between the PSP sensor harness connector and sensor connector. - Connect jumper wire for the SIG RTN circuit between the PSP sensor harness connector and sensor connector. - Start engine and let idle. - Measure voltage between PSP circuit at the PSP sensor connector and chassis ground. - Observe voltage while turning the steering wheel at least one half turn right and left. Is voltage reading between 0.3 and 4.7 volts, and does the voltage change when the steering wheel is turned?	Yes → No →	KEY OFF. GO to DT4 . REPLACE PSP sensor.
 A0009701			
DT4	CHECK PSP SENSOR CIRCUIT FOR OPEN IN HARNESS		
	- Disconnect PCM. - Measure resistance of PSP circuit between PCM harness connector pin 31 and PSP sensor harness connector. Is resistance less than 5.0 ohms?	Yes → No →	GO to DT5 . REPAIR open circuit.
DT5	CHECK PSP CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Key on, engine off. - Measure voltage between PSP circuit at the PSP sensor harness connector and chassis ground. Is voltage less than 1.0 volt?	Yes → No →	KEY OFF. GO to DT6 . REPAIR short circuit.

DT2 - DT5

Power Steering Pressure (PSP) Sensor

DT

Test Steps		Results	Action to Take
DT6	CHECK PSP CIRCUIT FOR SHORT TO VREF, SIG RTN AND GROUND IN HARNESS		
	- Measure resistance between the PSP circuit and both the VREF and SIG RTN circuits at the PSP sensor harness connector. - Measure resistance between the PSP circuit at the PSP sensor harness connector and chassis ground. Is each resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
DT10	CONTINUOUS MEMORY DTC P0552, P0553: CHECK FOR INTERMITTENT CIRCUITS TO PSP SENSOR		
	- Key on, engine off. - Access PSP V PID. - Observe PSP V PID for an indication of a fault while performing the following (a fault will be indicated by a sudden change in the PSP V PID voltage): - Shake, wiggle, bend the PSP, SIG RTN and VREF circuits between the PSP sensor and the PCM. - Lightly tap on the PSP sensor to simulate road shock. Is a fault indicated?	Yes → No →	ISOLATE fault and REPAIR as necessary. KEY OFF. Unable to duplicate or identify fault at this time. GO to Z1.

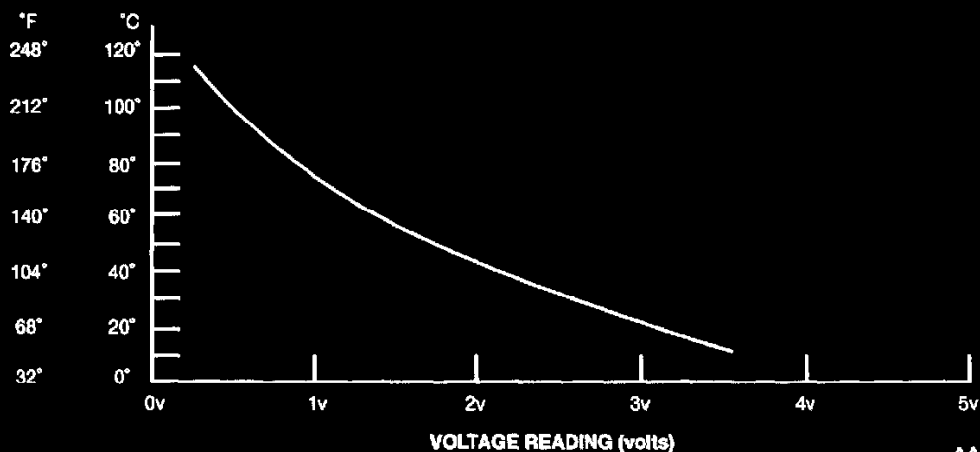
DT6 - DT10

Test DU: Intake Air Temperature 2 (IAT2)

Intake Air Temperature 2 (IAT2)**DU****Note**

This Pinpoint Test is intended to diagnose the following:

- Intake air temperature 2 (IAT2) sensor (12A697)
- Integrated intake air temperature 2 (IAT2) sensor portion of the Thermal Manifold Absolute Pressure (TMAP) Sensor (9F479).
- Harness circuits: IAT2 and SIG RTN
- Powertrain control module (PCM) (12A650)

Tables and Graphs**TEMPERATURE**

AA4397-A

TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS

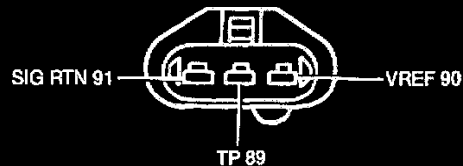
Temperature		Temperature Sensor Values	
°C	°F	Voltage (volts)	Resistance (K ohms)
120	248	0.27	1.18
110	230	0.35	1.55
100	212	0.46	2.07
90	194	0.60	2.80
80	176	0.78	3.84

(Continued)

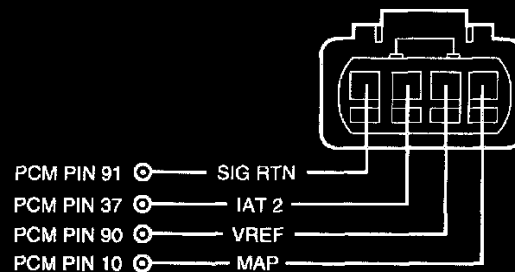
Note, Tables and Graphs

Intake Air Temperature 2 (IAT2)**DU****TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS**

Temperature		Temperature Sensor Values	
°C	°F	Voltage (volts)	Resistance (K ohms)
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

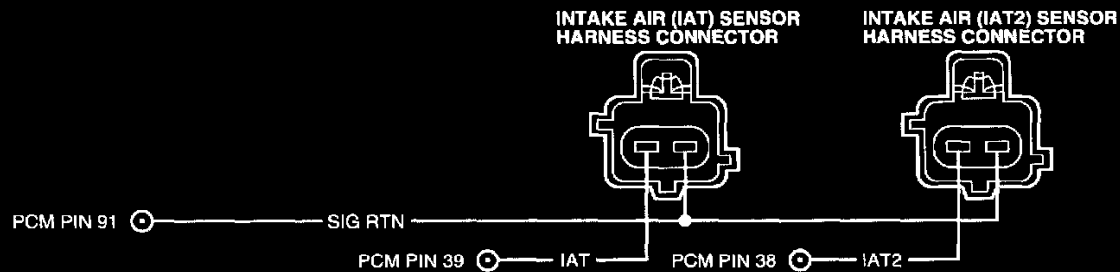
Pinpoint Test Schematics and Connectors**THROTTLE POSITION (TP)
SENSOR HARNESS CONNECTOR**

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE AA4400-A

4.6L 4V SC Mustang**THERMAL MANIFOLD ABSOLUTE
PRESSURE (TMAP) SENSOR
HARNESS CONNECTOR**

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE
A0039436

Table, Schematics and Connectors

Intake Air Temperature 2 (IAT2)**DU****5.4L SC**

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0013933

Test Steps		Results →	Action to Take
DU10	DTC P1115: SIMULATE OPPOSITE SIGNAL TO PCM		
- With IAT2 temperature sensor disconnected, connect a jumper wire between the sensor signal and SIG RTN circuits at the temperature sensor harness connector. - Key on. Note: If a scan tool communication concern exists, remove jumper wire immediately and GO to DU12. - Access IAT2 temperature sensor voltage PID. Is the IAT2 temperature sensor voltage PID less than 0.2 volts?		Yes → No →	REPLACE suspect sensor. KEY OFF. REMOVE jumper wire. GO to DU11 .
DU11	CHECK TEMPERATURE SENSOR SIGNAL AND SIG RTN CIRCUITS FOR OPEN IN HARNESS		
Note: Refer to the PCM connector pin numbers at the beginning of this pinpoint test. - Disconnect PCM. - Measure resistance of sensor signal circuit between PCM harness connector pin and IAT2 sensor harness connector. - Measure resistance of SIG RTN circuit between PCM harness connector pin and IAT2 temperature sensor harness connector. Is each resistance less than 5.0 ohms?		Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuits.

Schematic, Test DU10 - DU11

Intake Air Temperature 2 (IAT2)**DU**

Test Steps		Results →		Action to Take
DU12	CHECK TEMPERATURE SIGNAL FOR SHORT TO VREF IN HARNESS			
	• Key off. • Disconnect PCM. • Measure resistance between IAT2 temperature signal circuit at the sensor harness connector and VREF circuits at the PCM harness connector. • Is the resistance greater than 10,000 ohms?	Yes	→	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
		No	→	REPAIR short to VREF.
DU20	P1114: SIMULATE OPPOSITE SIGNAL TO PCM			
	• Disconnect harness from IAT2 temperature sensor. • Connect scan tool. • Key on. • Access IAT2 temperature sensor voltage PID. • Key off. • Is the IAT2 temperature sensor voltage PID greater than 4.2 volts?	Yes	→	REPLACE sensor.
		No	→	GO to DU21.
DU21	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. • Is voltage between 4.0 and 6.0 volts?	Yes	→	There is sufficient VREF voltage. RECONNECT TP sensor. GO to DU22. KEY OFF.
		No	→	GO to C1.
DU22	CHECK TEMPERATURE SIGNAL CIRCUIT FOR SHORT TO GROUND IN HARNESS			
	Note: Refer to the PCM connector pin numbers at the beginning of this pinpoint test. • Disconnect PCM. • Measure resistance between sensor signal and SIG RTN circuits and then between sensor signal and PWR GND circuits at the PCM harness connector. • Is each resistance greater than 10,000 ohms?	Yes	→	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
		No	→	REPAIR short circuit.
DU30	P0127 IAT2 TOO HIGH. CHECK SUPERCHARGER INTERCOOLER PUMP OPERATION			
	• Connect scan tool. • Access Output Test Mode. • Select Mode: ALL ON. • Command pump to run. • Does supercharger intercooler pump run?	Yes	→	GO to DU31.
		No	→	KEY OFF. GO to KP1 (Charge Air Cooler Pump).

DU12 - DU30

Intake Air Temperature 2 (IAT2)**DU**

Test Steps		Results	Action to Take
DU31	CHECK INTERCOOLER SYSTEM		
• Check intercooler system for: — low fluid level. — cracked coolant lines. — blocked heat exchanger or coolant lines. — crossed coolant lines. • Is intercooler system OK?		Yes	→ KEY OFF. GO to DU32 .
		No	→ REPAIR as necessary.
DU32	SIMULATE HIGH IAT2 VOLTAGE SIGNAL		
• Connect scan tool. • Key on. • Access IAT2 VPID. • Observe PID while disconnecting IAT2 sensor. • Is PID greater than 4.0V?		Yes	→ GO to DU33 .
		No	→ REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
DU33	SIMULATE LOW IAT2 VOLTAGE SIGNAL		
• Access IAT2 VPID. • Observe PID while connecting a jumper wire between the sensor signal and SIG RTN circuit at the temperature sensor harness connector. • Is PID less than 1.0V?		Yes	→ RECONNECT sensor and GO to Reference Values. COMPARE IAT2 PID to reference values under the given road test conditions. If sensor is not in range, REPLACE IAT2 sensor.
		No	→ REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

DU31 - DU33

Test EM: Emissions Compliance

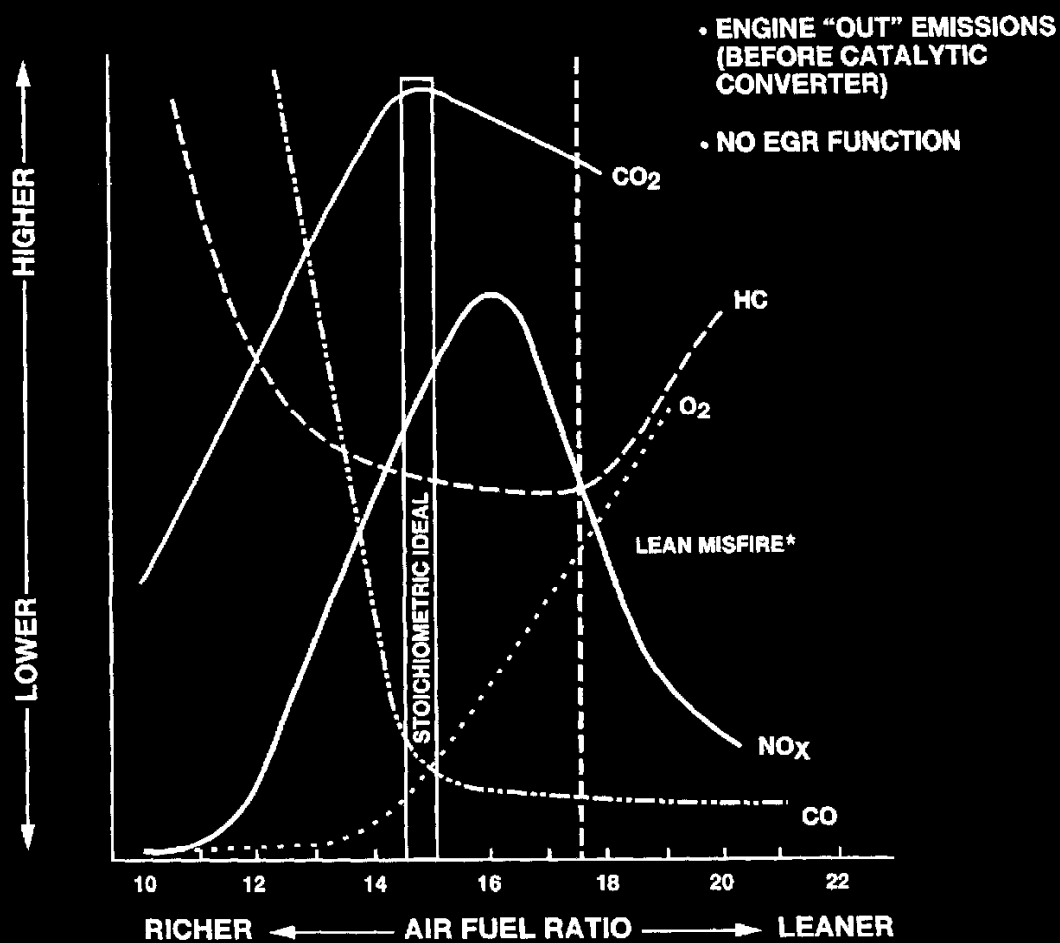
Emissions Compliance**EM****Note**

Canada and some states or metropolitan areas in the United States require periodic Emission, or Inspection and Maintenance (I/M) Tests. All Ford products have been designed to pass these tests. If a Ford product fails an I/M Test, it is probable that 1) the engine or catalyst temperature was not warm and stabilized before the test, or 2) the vehicle had idled excessively before the test.

— If any emission components are replaced, perform the following before repeating the I/M Test procedure:

- (1) Clear Keep Alive Random Access Memory (RAM)—Refer to Diagnostic Methods, Powertrain Control Module (PCM) Reset.
- (2) To relearn some basic Adaptive Learning (trim) values, run engine at 2500 rpm for one minute and idle engine for two minutes.

Test Note

Emissions Compliance**EM****Exhaust Gas Analysis Chart**

* EXACT AIR FUEL RATIO VARIES
DEPENDING ON ENGINE

AA0215-A

Verifying an Excessive Grams Per Mile (GPM) Indication Using a Parts Per Million (PPM) Reading

For the vehicle's gas reading(s) that is excessive, compare the actual GPM reading to the gas cutpoint level needed to pass testing. Determine how much the actual GPM reading is over the cutpoint. This will give an indication of how much the PPM reading will have to be reduced (if the actual reading is twice the cutpoint, the baseline reading will have to be cut in half or more). See following example.

Test Graph, Description

Emissions Compliance**EM****Example:**

- The actual HC produced by a vehicle was 1.6 GPM. The cutpoint for HC in this example is 0.8 GPM. The actual reading is twice the cutpoint.
- The HC reading obtained for the same vehicle during the baseline drive averages 440 PPM. In order for this vehicle to pass the I/M test, the HC reading from the verification trip must be at least half of the baseline reading, or an average of 220 PPM or less.
- This method only gives a general idea of how much the PPM reading needs to be reduced in order for the vehicle to pass an I/M test that calculates GPM. This test is not exact. Experience will still have to be used to determine if the emission readings have been reduced enough for the vehicle to pass the I/M test.

Test Steps		Results	→	Action to Take
EM1	ANALYZE VEHICLE'S INSPECTION AND MAINTENANCE (I/M) TEST REPORT			
	• Analyze I/M test report for data entry errors: — Correct model and year. — Correct test weight, if included on report (this number will be less than the vehicle's GVW). — Correct calibration, if included on report (such as Calif. or Federal). • Analyze I/M test report results: — Identify which gas readings are high AND which readings are low. — For reports that include a drive trace, identify during which mode the gas(es) failed. Be aware that if all gases were high early then decreased, the catalyst may have been cool when testing began. • Has the I/M test report been analyzed?	Yes No	→ →	GO to EM2. REPEAT this test step.
EM2	DID THE VEHICLE FAIL ONLY AN EVAP SYSTEM LEAK TEST OR A PURGE FLOW TEST (if these tests were performed)?			
	• Did the vehicle fail only an EVAP system leak test or purge flow test (all gases OK)?	Yes No	→ →	EVAP concern only. GO to EM35. GO to EM3.

Description, Test EM1 - EM2

Emissions Compliance**EM**

Test Steps		Results	Action to Take
EM3	BASELINE VEHICLE		
Note: Baselineing the vehicle's exhaust gas readings is important so the baseline readings can be used for comparison after any repair is made. - Baseline vehicle using an exhaust gas analyzer. If the vehicle must be driven, be certain any baseline drive used is repeatable. The same drive cycle will be used to verify any repair. - During the baseline, check for any related symptoms that may be present (such as driveability, transmission shifting or exhaust smoke concerns). Has the vehicle been baseline?		Yes →	GO to EM4 .
		No →	REPEAT this test step.
EM4	CHECK IF ANY OTHER SYMPTOMS ARE PRESENT		
Are any of the following symptoms present? Driveability Concerns (including Idle or Transmission Concerns). Exhaust smoke. Cooling System Concerns (engine not operating at proper temperature).		Yes →	GO to Symptom Charts (begin at Step 1: PCM Quick Test) for direction to repair the additional symptom. Also REFER to the Exhaust Gas Analysis Chart at the beginning of this pinpoint test for additional information. After any repair, GO to EM40 to verify repair.
		No →	No other concerns present. GO to EM5 .
EM5	PRELIMINARY CHECKS		
- Perform the following preliminary checks: - Vacuum lines (leaks/blockage). - Electrical connections. - Proper scheduled maintenance. - Intake air tube and air cleaner concerns (such as obstructions, leaks or dirty air cleaner element). - Ford authorized emission controls and components installed on vehicle. Are all checks OK?		Yes →	GO to EM6 .
		No →	REPAIR as necessary. After repair, GO to EM40 to VERIFY repair.
EM6	PERFORM PCM QUICK TEST		
- Complete PCM Quick Test to access any PCM DTCs (Refer to Symptom Charts, Step 1: PCM Quick Test (for Test Step procedure only)). Is a fault indicated?		Yes →	FOLLOW Symptom Charts Quick Test direction. After repair, GO to EM40 to verify repair.
		No →	GO to EM7 .

Emissions Compliance**EM**

Test Steps		Results	→	Action to Take
EM7	CHECK CARBON MONOXIDE (CO) LEVELS			
	• Did the vehicle have excessive CO levels?	Yes	→	Excessive CO levels indicate that the engine is running rich. GO to EM15 .
		No	→	GO to EM8 .
EM8	CHECK HYDROCARBON (HC) LEVELS			
	• Did the vehicle have excessive HC levels?	Yes	→	Excessive HC levels with low to normal CO levels indicate that the engine is running lean. GO to EM25 .
		No	→	GO to EM9 .
EM9	CHECK OXIDES OF NITROGEN (NO_x) LEVELS			
	• Did the vehicle have excessive NO _x levels?	Yes	→	GO to EM30 .
		No	→	VERIFY all previous testing.
EM15	HIGH CO LEVELS: CHECK HC LEVELS			
	• Did the vehicle have excessive HC levels?	Yes	→	GO to EM16 (to check for incomplete combustion/running rich).
		No	→	GO to EM17 (to check for running rich).
EM16	CHECK SECONDARY IGNITION SYSTEM			
	• GO to JB1 to check the secondary ignition system.	Yes	→	FOLLOW Pinpoint Test direction. After repair, GO to EM40 to verify repair.
	• Is a fault indicated?	No	→	GO to EM17 .
EM17	CHECK FUEL DELIVERY SYSTEM FOR CONCERNS SUCH AS HIGH FUEL PRESSURE AND ABILITY TO HOLD PRESSURE			
	• For Natural Gas applications: — GO to HB1 .	Yes	→	FOLLOW Pinpoint Test direction. After repair, GO to EM40 to verify repair.
	• All others: — GO to HC1 .	No	→	GO to EM18 .
	• Is a fault indicated?			
EM18	CHECK PCV SYSTEM FOR LEAKS, STUCK VALVE, ETC.			
	• GO to HG1 to check the PCV System.	Yes	→	FOLLOW Pinpoint Test direction. After repair, GO to EM40 to verify repair.
	• Is a fault indicated?	No	→	GO to EM19 .

Emissions Compliance**EM**

Test Steps		Results	Action to Take
EM19	CHECK EXHAUST SYSTEM		
	- GO to HF1 to check the exhaust system. Is a fault indicated?	Yes → No →	FOLLOW Pinpoint Test direction. After repair is performed, GO to EM40 to verify repair. GO to EM20 .
EM20	CHECK BASE ENGINE		
	- Go to Engine to check for proper compression, valvetrain, camshaft, etc. Is a fault indicated?	Yes → No →	REPAIR as required. After repair, GO to EM40 to verify repair. GO to EM21 .
EM21	ADDITIONAL CHECKS		
	- Additional checks: - Incorrect PCV valve. Are all checks OK?	Yes → No →	GO to EM45 . REPAIR as necessary. After repair, GO to EM40 to verify repair.
EM25	HIGH HC WITH NORMAL TO LOW CO LEVEL: CHECK FUEL DELIVERY SYSTEM FOR CONCERNS SUCH AS LOW FUEL PRESSURE		
	For Natural Gas applications: - GO to HB1. All others: - GO to HC1. Is a fault indicated?	Yes → No →	FOLLOW Pinpoint Test direction. After repair, GO to EM40 to verify repair. GO to EM26 .
EM26	CHECK SECONDARY IGNITION SYSTEM		
	- GO to JB1 to check the secondary ignition system. Is a fault indicated?	Yes → No →	FOLLOW Pinpoint Test direction. After repair, GO to EM40 to verify repair. GO to EM27 .
EM27	CHECK PCV SYSTEM		
	- GO to HG1 to check the PCV system. Is a fault indicated?	Yes → No →	FOLLOW Pinpoint Test direction. After repair, GO to EM40 to verify repair. GO to EM28 .
EM28	CHECK BASE ENGINE		
	- Go to Engine to check base engine for concerns such as intake manifold leaks, improper compression, valvetrain or camshaft damage. Is a fault indicated?	Yes → No →	REPAIR as required. After repair, GO to EM40 to verify repair. GO to EM29 .

Emissions Compliance**EM**

Test Steps		Results	→	Action to Take
EM29	ADDITIONAL CHECKS			
	- Additional checks: - Incorrect PCV valve. Are all checks OK?	Yes	→	GO to EM45 .
		No	→	REPAIR as necessary. After repair, GO to EM40 to verify repair.
EM30	HIGH NOx WITH NORMAL TO LOW HC AND CO LEVELS: CHECK BASE ENGINE FOR CONCERNS SUCH AS EXCESSIVE CARBON BUILD UP IN COMBUSTION CHAMBER			
	Go to the Engine to check for base engine concerns such as excessive carbon build up in the combustion chamber.	Yes	→	REPAIR as required. After repair, GO to EM40 to verify repair.
	Is a fault indicated?	No	→	GO to EM31 .
EM31	ADDITIONAL CHECKS			
	- Additional checks: - Transmission torque converter clutch operation. - Cooling System concerns (such as aftermarket front fascia covering intake air, intake air system modifications). - Engine running lean (concerns such as vacuum leaks, low fuel pressure (refer to steps starting at EM25)). Are all checks OK?	Yes	→	GO to EM45 .
		No	→	REPAIR as necessary. After repair, GO to EM40 to verify repair.
EM35	EVAP SYSTEM CONCERN: PRELIMINARY CHECKS			
	- Analyze I/M Test Report to determine when concern is present. Attempt to verify concern. - Make the following preliminary checks: - Fuel filler cap (check for proper installation, physical damage or contamination). - EVAP system lines/hoses (check for proper connections, damage or blockage). - Fuel vapor storage canister damage. Are all checks OK?	Yes	→	GO to EM36 .
		No	→	REPAIR as necessary. After repair, GO to EM38 to verify repair.
EM36	PERFORM PCM QUICK TEST			
	- Complete PCM Quick Test to access any PCM DTCs (Refer to Symptom Charts, Step 1: Quick Test (for Test Step procedure only)). Is a fault indicated?	Yes	→	FOLLOW Symptom Charts Quick Test direction. After repair, GO to EM38 to verify repair.
		No	→	GO to EM37 .

Emissions Compliance**EM**

Test Steps		Results	Action to Take
EM37	CHECK EVAP SYSTEM		
- Go to Evaporative Emissions System to check for system leaks. - Is a fault indicated?		Yes	→ FOLLOW Pinpoint Test direction. After repair, GO to EM38 to verify repair.
		No	→ VERIFY test results. If OK, GO to Z1 , or RETURN to Symptom Charts to repair any additional symptoms. After any repair, GO to EM38 to verify repair.
EM38	EVAP SYSTEM REPAIR VERIFICATION		
- Vehicle repair performed. - Reset the PCM Keep Alive Random Access Memory (RAM). Be aware that this will set DTC P1000 (and reset the On-Board System Readiness Test). - To relearn some basic Adaptive Learning (trim) values, run the engine at 2500 rpm for one minute and idle engine for two minutes. - Rerun PCM Quick Test (refer to Symptom Charts, Step 1: Quick Test). REPAIR any DTCs as directed. - Perform the EVAP system leak test and flow check. - Does the vehicle pass the EVAP system leak test and flow check?		Yes	→ Save any repair documentation that may be required by local/federal laws. RETURN vehicle to customer.
		No	→ Original concern not repaired, or another concern exists. GO to EM1 and proceed as directed.

Emissions Compliance**EM**

Test Steps		Results →	Action to Take
EM40	REPAIR VERIFICATION		
• Vehicle repair completed. • Reset the PCM Keep Alive Random Access Memory (RAM). Be aware that this will set DTC P1000 (and reset the On-Board System Readiness Test). • To relearn some basic Adaptive Learning (Trim) values, run the engine at 2500 rpm for one minute and idle engine for two minutes. • Rerun PCM Quick Test (refer to Symptom Charts, Step 1: Quick Test). REPAIR any DTCs as directed. • Again perform the baseline test using the exhaust gas analyzer. • Note: If vehicle needs to be driven for the baseline, it may be necessary to drive the vehicle first for up to 8 km (5 miles) to relearn some additional Adaptive Learning (trim) values. Also, during the baseline be certain to use the same drive mode that was used for the original baseline test (refer to EM3). • For I/M 240 Emission Testing areas (original gas concentrations reported in Grams Per Mile): — Refer to the beginning of this pinpoint test for information on verifying an excessive Grams Per Mile Indication using a Parts Per Million (PPM) reading. • All others (original gas concentrations reported in Parts Per Million): — Verify gas levels are within acceptable range. • Are all gases within the acceptable range?		Yes → SAVE any repair documentation that may be required by local/federal laws. RETURN vehicle to customer.	
		No →	Gas level is still high, or another gas level is above the acceptable range: GO to EM1 and proceed as directed.

Emissions Compliance**EM**

Test Steps		Results	Action to Take
EM45	CATALYST DELTA TEMPERATURE TEST		
• All previous testing as indicated completed. • Disable the AIR system, if equipped. • Run the engine for two minutes at 2500 rpm to heat the exhaust system. • Key OFF. • Disconnect and ground one spark plug wire from each cylinder bank (for Coil On Plug applications, disconnect coil connector). • Start engine and run at 1000 rpm. • Disconnect IAC valve (maintain 1000 rpm). • Measure the surface temperature of both the inlet and outlet of each under-body catalytic converter using an infrared temperature probe. • Compare the difference in temperature between the inlet and outlet readings of each under-body catalytic converter. • Does each catalytic converter have a difference of more than 28°C (50°F) between its inlet and outlet reading?		Yes	→ The catalytic converter(s) is operating correctly. RECONNECT spark plug wire(s), IAC valve and AIR system (if equipped). COMPLETE PCM Reset to clear any DTC(s) set during testing. VERIFY previous test results. If OK, GO to Z1, or RETURN to Symptom Charts to repair any additional symptoms. After any repair is completed, GO to EM40 to verify repair.
		No	→ For the catalytic converter(s), that had less than 28°C (50 °F) difference, testing indicates the catalytic converter is not working. REPEAT test step to verify results. If the temperature difference is still less than required, REPLACE the catalytic converter. RESTORE vehicle. GO to EM40 to verify repair.

EM45

Test FB: Power Take Off (PTO)

Power Take Off (PTO)**FB****Note**

This Pinpoint Test is intended to diagnose the following:

- PTO Harness circuit
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematic

Test Steps		Results	Action to Take
FB1	PTO PID DOES NOT CYCLE: CHECK FOR DEFECTIVE PTO SWITCH		
Note: Causes of concern: — 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 →	GO to FB2. REPAIR or REPLACE PTO switch. REFER to aftermarket component manufacturer for service information. RECONNECT PTO switch harness connector. COMPLETE an OBD II Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
FB2	CHECK PTO CIRCUIT FOR SHORT TO VPWR		
• Disconnect PCM. • Key on, engine off. • Measure voltage of PTO circuit between PCM harness connector pin 4 and battery negative post. • Is voltage less than 1.0 volt?		Yes → No →	RECONNECT PCM and PTO switch harness connector. GO to FB4. REPAIR short circuit.

Note, Schematic and Test FB1 - FB2

Power Take Off (PTO)**FB**

Test Steps		Results	Action to Take
FB3	MIL ON: CHECK PTO PID		
	Note: Causes of concern: — Open in PTO circuit. — Short to chassis ground in PTO circuit. • Connect scan tool to DLC. • Key on, engine off. • Access PTO PID. • Is the PTO PID available and displaying on or off?	Yes → No →	GO to FB1 . GO to FB9 .
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. • Access PTO PID. • Key on (may need to start engine to engage PTO). • Cycle PTO switch/handle while viewing PTO PID. • Does PTO PID cycle ON, delay, then turn OFF?	Yes → No →	RETURN to Symptom Charts. KEY OFF. GO to FB5 .
FB5	CHECK PTO CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	• Disconnect PCM. • Disconnect scan tool from DLC. • Disconnect PTO switch harness connector. • Measure resistance of PTO circuit between PCM harness connector pin 4 and battery negative post. • Is resistance greater than 10,000 ohms?	Yes → No →	RECONNECT PCM. GO to FB7 . REPAIR short circuit.
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. • Is PTO PID on with jumper inserted and off with jumper removed?	Yes → No →	RETURN to Symptom Charts. KEY OFF. GO to FB8 .
FB8	CHECK PTO CIRCUIT RESISTANCE		
	• Disconnect PCM. • Measure resistance of PTO circuit between PCM harness connector pin 4 and PTO switch harness connector. • Is resistance less than 5.0 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open PTO circuit.

Power Take Off (PTO)**FB**

Test Steps		Results →	Action to Take
FB9	COMPLETE KOEO AND KOER QUICK TESTS		
	The following steps are used for PTO diagnostics when the vehicle does not support the PTO circuit or PID. • Complete KOEO and KOER Quick Tests. Refer to Symptom Charts, GO to Quick Test QT1. • Are any KOEO or KOER DTCs present?	Yes → No →	FOLLOW direction in GO to Quick Test QT1 to REPAIR the KOEO or KOER DTCs. GO to FB10 .
FB10	COMPLETE 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. • Complete PCM Reset. - Note: Make sure the PTO is disengaged. • Complete OBD II Drive Cycle (refer to Diagnostic Methods, Drive Cycles). • Retrieve all Continuous Memory DTCs (refer to Diagnostic Methods , Accessing All Continuous Memory DTCs). • Are any Continuous Memory DTCs stored?	Yes → No →	GO to Powertrain Diagnostic Trouble Code (DTC) Charts, to 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 Z1 .

FB9 - FB10

Test FD: Brake Pedal Pos. (BPP) Sw./Brake Press. Applied (BPA) Sw.

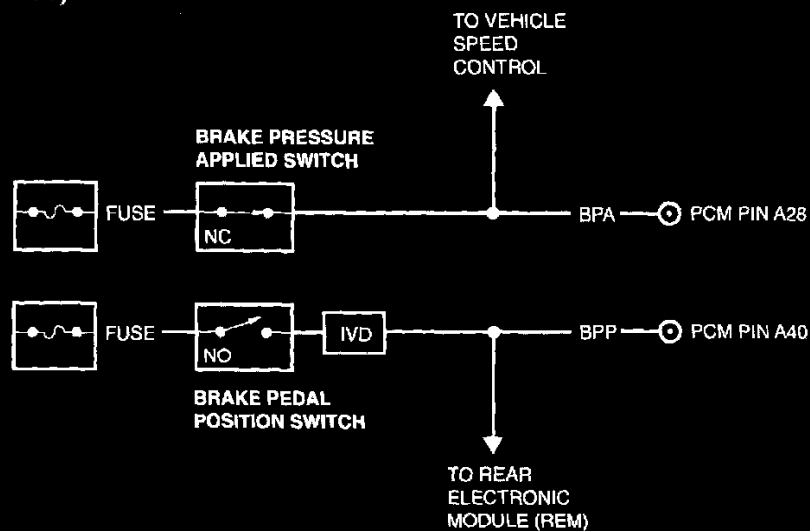
**Brake Pedal Position (BPP) Switch /
Brake Pressure Applied (BPA) Switch****FD****Note**

This Pinpoint Test is intended to diagnose the following:

- Brake pedal position (BPP) switch
- Brake pressure applied (BPA) deactivator switch
- Harness circuits: B+, BPA, BPP, GND and stoplamp PWR
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematics and Connectors

LS6/LS8 (with IVD)



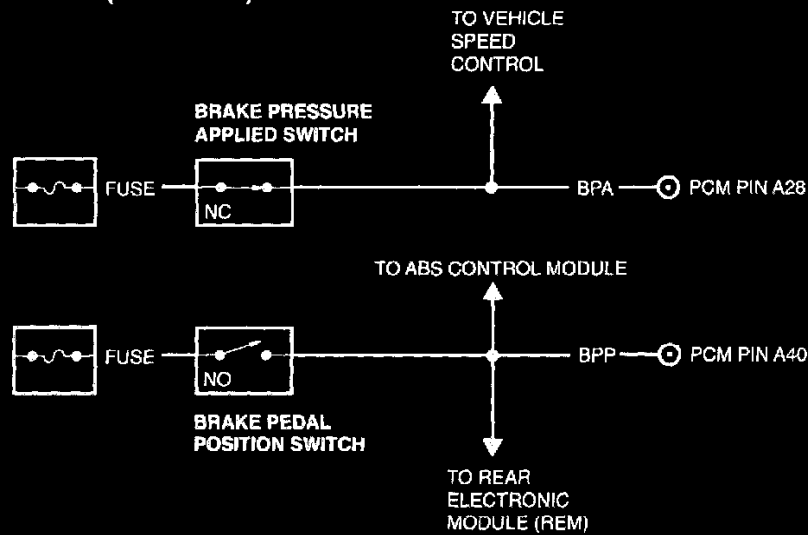
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Note, Schematics and Connectors

Brake Pedal Position (BPP) Switch / Brake Pressure Applied (BPA) Switch

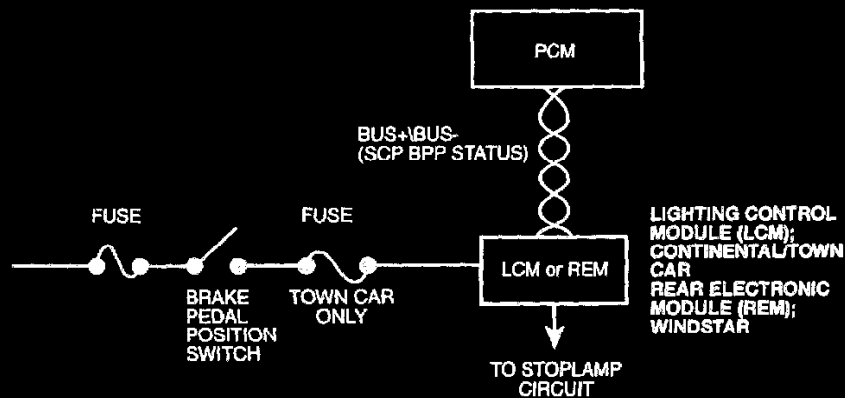
FD

LS6/LS8, Thunderbird (without IVD)



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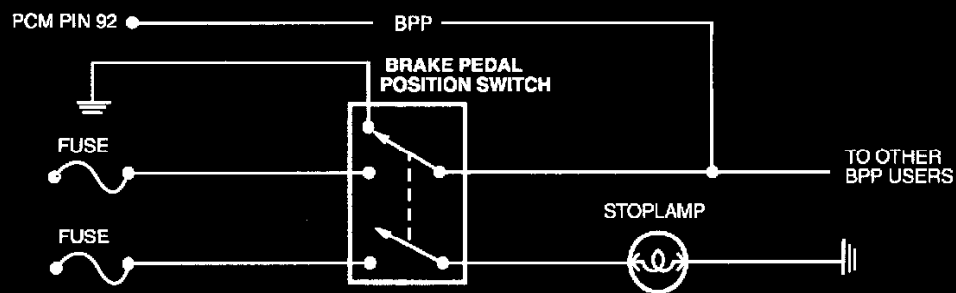
Continental, Town Car and Windstar



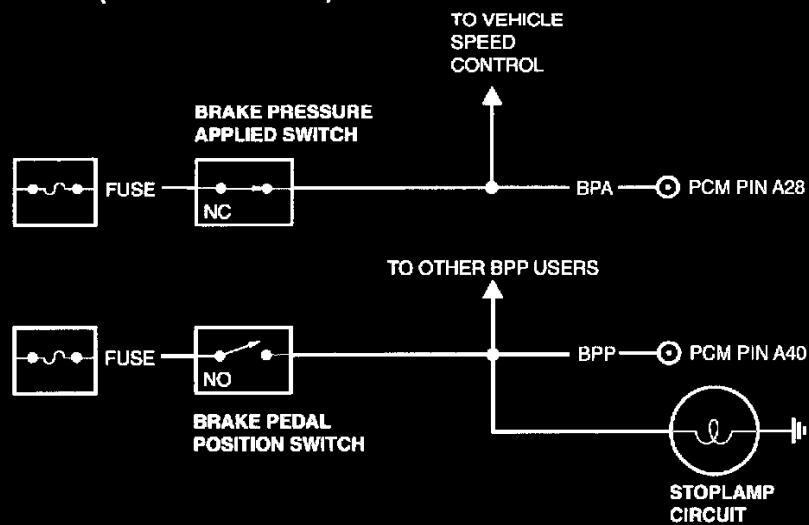
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The PCM receives BPP information through the SCP link. This pinpoint test will only verify Self-Test was performed correctly. For detail wiring information, refer to Vehicle/Diagrams.

Test Schematic

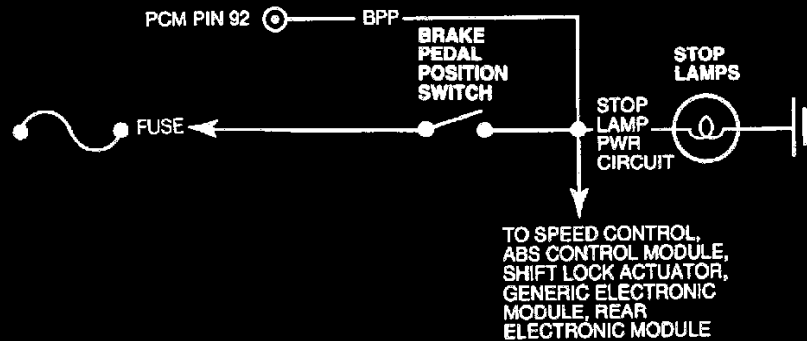
**Brake Pedal Position (BPP) Switch /
Brake Pressure Applied (BPA) Switch****FD****Explorer Sport/Sport Trac, Ranger, F-Series, Blackwood, Expedition/Navigator, Excursion**

A0009690

Explorer/Mountaineer (150 PIN PCM ONLY)

A0027484

Test Schematic

**Brake Pedal Position (BPP) Switch /
Brake Pressure Applied (BPA) Switch****FD****All Others****NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE****AA0841-E**

Test Steps		Results →	Action to Take
FD1	KOER DTC P0703 OR P1703: VERIFY BRAKE PEDAL WAS APPLIED		
• Was the brake pedal applied and released during KOER Self-Test?		Yes →	For Continental and Town Car: REFER to Brake Lamp System for further diagnosis of the lighting control module (LCM) system. For Windstar: REFER to General Module for further diagnosis of the Rear Electronic Module (REM).
		No →	All Others: KEY ON. GO to FD3. RERUN KOER Self-Test. APPLY and RELEASE brake pedal.

Schematic, Test FD1

Brake Pedal Position (BPP) Switch / Brake Pressure Applied (BPA) Switch

FD

Test Steps		Results	Action to Take
FD2	KOEO DTC P0703 OR P1703: VERIFY BRAKE PEDAL WAS NOT APPLIED		
	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: REFER to Brake Lamp System for further diagnosis of the lighting control module (LCM) system. For Windstar: REFER to General Module for further diagnosis of the Rear Electronic Module (REM). All others: KEY ON. GO to FD3.
FD3	DTCS P0703, P1572 AND P1703: CHECK OPERATION OF STOPLAMPS		
	- Apply and release the brake pedal several times and observe stoplamp operation. - Do the stoplamps operate normally?	Yes → No →	GO to FD4. For LS6/LS8 and Thunderbird: REFER to General Module for further diagnosis of the Rear Electronic Module (REM). For all others: GO to FD5 for stoplamps never on. GO to FD7 for stoplamps always on.
FD4	CHECK FOR PCM BPP PID CYCLING		
	- 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. - Does the BPP PID cycle ON/OFF?	Yes → No →	For P1572: GO to FD14. For all others: KEY OFF. Unable to duplicate or identify fault at this time. GO to Z1. KEY OFF. GO to FD10.

Brake Pedal Position (BPP) Switch / Brake Pressure Applied (BPA) Switch

FD

Test Steps		Results	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 (REFER to Vehicle/Diagrams) for short to ground. REPAIR as necessary.
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. REPLACE BPP switch.
FD7	VERIFY BRAKE PEDAL POSITION SWITCH IS NOT ALWAYS CLOSED		
	• Disconnect BPP switch. • Key on, engine off. • Are stoplamps still on?	Yes → No →	KEY OFF. GO to FD8. VERIFY proper installation of BPP switch. If OK, REPLACE switch.
FD8	CHECK FOR SHORT TO POWER IN PCM		
	• Disconnect PCM. • Key on. • Are stoplamps still on?	Yes → No →	KEY OFF. GO to FD9. KEY OFF. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
FD9	CHECK STOPLAMP CIRCUIT FOR SHORT TO POWER IN HARNESS		
	• One at a time, disconnect all modules associated with the stoplamp circuit (Refer to Vehicle/Diagrams). 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 →	REFER to Vehicle Systems for further diagnosis of appropriate module. REPAIR short to power in stoplamp circuit.

FD

**Brake Pedal Position (BPP) Switch /
Brake Pressure Applied (BPA) Switch****FD**

Test Steps		Results	→	Action to Take
FD15	BPP AND BPA RATIONALITY CHECK	Yes No	→ →	Check for misadjusted brake switch (BPP or BPA). Service as necessary. Test complete.
• Clear Continuous Memory DTCs. • Start engine. • Apply and release the brake pedal several times. • Run Continuous Memory Self-Test. • Is P1572 present?				

FD15

Test FF: Power Steering Pressure (PSP) Switch

Power Steering Pressure (PSP) Switch

FF

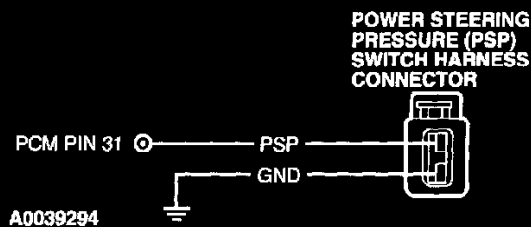
Note

This Pinpoint Test is intended to diagnose the following:

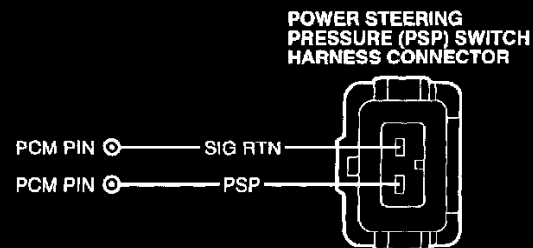
- Power steering pressure (PSP) switch (3N824)
- Harness circuits: PSP and SIG RTN
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematics and Connectors

Focus



All Others



NOTE: THE PSP AND SIG RTN CIRCUITS MAY BE REVERSED IN THE HARNESS CONNECTOR. REFER TO VEHICLE/DIAGRAMS FOR MORE INFORMATION.

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PCM CONNECTOR PIN NUMBERS

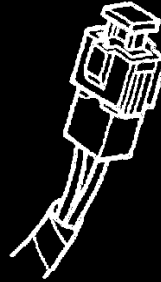
PCM TYPE	PSP	SIG RTN
104 pin	31	91
150 pin	A37	A17

Note, Schematics and Connectors

Power Steering Pressure (PSP) Switch

FF

Shorting Bar for Harness Circuit without PSP Switch (typical)



A24595-A

Test Steps		Results →	Action to Take
FF1	DTC P1650: CHECK PSP PID		
	Note: If P1650 was received in Key On Engine Running Self-Test, verify that the steering wheel was turned at least one half turn within 20 seconds of starting test. • Connect scan tool. • Key on, engine running. • Access PSP PID. • Turn the steering wheel back and forth. • Does the PSP PID indicate a change?	Yes → No →	GO to FF10. KEY OFF. GO to FF2.
FF2	CHECK PSP CIRCUITS TO PSP SWITCH FOR CYCLING		
	• Disconnect PSP switch or remove the shorting bar. • Key on, engine off. • Again access PSP PID. • While monitoring the PSP PID, install then remove a jumper wire across the PSP switch harness connector. • Does the PSP PID change from low to high?	Yes → No →	REPLACE the PSP switch or shorting bar. For Focus: GO to FF3. All others: GO to FF4.
FF3	CHECK FOR OPEN GND CIRCUIT TO PSP SWITCH		
	• Measure resistance between the GND circuit at the PSP switch harness connector and chassis ground • Is resistance less than 5.0 ohms?	Yes → No →	GO to FF4. REPAIR open circuit.

Schematic, Test FF1 - FF3

Power Steering Pressure (PSP) Switch

FF

Test Steps		Results →	Action to Take
FF4	CHECK PSP AND SIG RTN CIRCUITS FOR OPEN IN HARNESS		
	Note: Refer to the PCM connector pin numbers at the beginning of the pinpoint test. • Disconnect PCM. • Measure resistance of PSP circuit between PCM harness connector pin and PSP switch harness connector. • For all except Focus, measure resistance of SIG RTN circuit between PCM harness connector pin and PSP switch harness connector. • Is each resistance less than 5.0 ohms?	Yes → No →	GO to FF5. REPAIR open circuit.
FF5	CHECK PSP CIRCUIT FOR SHORT TO SIG RTN OR GROUND IN HARNESS		
	• Measure resistance between PSP signal at PSP switch harness connector and chassis ground. • For all except Focus, measure resistance between PSP signal and SIG RTN at PSP switch harness connector. • Is either resistance less than 10,000 ohms?	Yes → No →	REPAIR short circuit. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
FF10	DTC P1651: CHECK PSP CIRCUITS FOR INTERMITTENT CONCERNS		
	Note: Be aware that P1651 could be set if the vehicle is towed with the engine running, or if a power steering hydraulic concern was present. • Key on, engine off. • Access PSP V PID. • Check for open circuits while performing the following (a fault will be indicated by a sudden change in the PSP V PID): — Shake, wiggle, bend the PSP and SIG RTN (GND for Focus) circuits between the PSP switch and the PCM. — Lightly tap on the PSP switch (to simulate road shock). • Disconnect PSP switch. • Check PSP circuit for short to ground while performing the following (a fault will be indicated by a sudden change in the PSP V PID voltage): — Shake, wiggle, bend the PSP circuit between the PSP switch and the PCM. • Is a fault indicated?	Yes → No →	KEY OFF. ISOLATE fault and REPAIR as necessary. KEY OFF. RECONNECT PSP switch. Unable to duplicate or identify fault at this time. GO to Z1.

FF4 - FF10

Generator Load Input (GLI)

FH

Note

This Pinpoint Test is intended to diagnose the following:

- GLI circuit
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematic

PCM PIN 59



GLI

FROM VOLTAGE
REGULATOR/
GENERATOR

AA4834-A

Test Steps		Results	Action to Take
FH1	P1244, P1245 OR P1246: CHECK IF ANY BATTERY OR CHARGING SYSTEM CONCERNS ARE PRESENT		
	• Check generator drive belt condition and tension. • Verify that the battery is at proper charge. • Verify that there are no symptoms associated with the charging system. • Does the battery and charging system appear OK?	Yes → No →	GO to FH2 . REFER to Charging System
FH2	CHECK GENERATOR LOAD INPUT (GLI) CIRCUIT FOR SHORT TO POWER IN HARNESS		
	• Disconnect voltage regulator. • Disconnect PCM. • Key on. • Measure voltage between PCM harness connector Pin 59 and ground. • Is voltage less than 1.0 volts?	Yes → No →	KEY OFF. GO to FH3 . REPAIR short circuit.
FH3	CHECK GLI CIRCUIT FOR SHORT TO GROUND		
	• Disconnect scan tool from DLC. • Measure resistance between PCM harness connector Pin 59 and ground. • Is resistance greater than 10,000 ohms?	Yes → No →	GO to FH4 . REPAIR short circuit.

Note, Schematic and Test FH1 - FH3

Generator Load Input (GLI)**FH**

Test Steps		Results	→	Action to Take
FH4	CHECK FOR OPEN GLI CIRCUIT	Yes No	→ →	GO to FH5 . REPAIR open circuit.
	• Measure resistance of the GLI circuit between PCM harness connector Pin 59 and the voltage regulator harness connector. • Is resistance less than 5.0 ohms?			
FH5	CHECK PCM	Yes No	→ →	REFER to Charging System to verify operation of voltage regulator and generator. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
	• Reconnect PCM. • Key on, engine off. • Measure voltage between the GLI circuit at the voltage regulator harness connector and ground. • Is voltage greater than 2.0 volts?			

FH4 - FH5

Test H: Fuel Control

H: Fuel Control Introduction

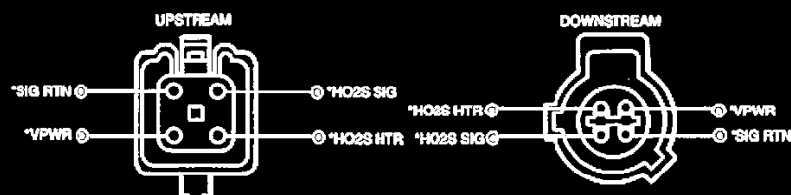
Note

This Pinpoint Test is intended to diagnose the following:

- HO2S/Heater (9F472)
 - HO2S/Heater (9G444)
 - Fuel Injector(s) (9F593)
 - Vacuum Systems
-
- Harness Circuits: HO2S GND, HO2S, INJ 1-10, VPWR and SIG RTN
 - Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematic

Cougar

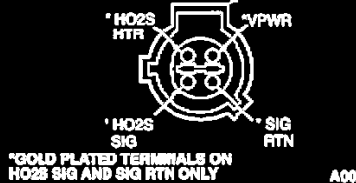


A24341-A

All Others

HO2S VEHICLE HARNESS CONNECTOR

PIN LOCATION REFERENCED
FROM LARGE TAB



A0006245

Note: Location of the small index tabs may differ from illustration.

Use the large index tab as your reference during analysis. Some connectors may not have the small index tabs.

Note And Schematics

PCM CONNECTOR PIN NUMBERS

	HO2S-11	HTR-11	HO2S-12	HTR-12	HO2S-21	HTR-21	HO2S-22	HTR-22	VPWR	SIG RTN	PWR GND	VREF
150 Pin	C45	C7	B28	B15	C44	C8	E29	B16	A32/A33	A17, B17, C17	A24-27	A20, C20
2.5L Cougar	60	*73	35	100	87	99	61	101	71/87	91	51/77, 103	90
All others	60	93	35	95	87	94	61	96	71/87	91	51/77, 103	90

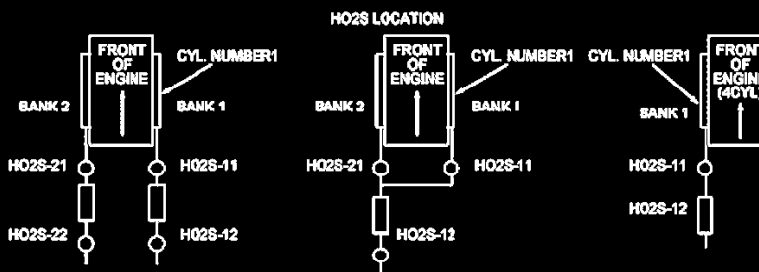
* 2.0L Cougar with Pin 93.

INJECTOR VEHICLE HARNESS CONNECTOR

A24533-A

INJECTOR PCM CONNECTOR PIN NUMBERS

Vehicles	Inj-1	Inj-2	Inj-3	Inj-4	Inj-5	Inj-6	Inj-7	Inj-8	Inj-9	Inj-10
150 Pin	C2	C14	C24	C32	C11	C21	C29	C37	—	—
2.5L Cougar	70	96	20	95	93	94	—	—	—	—
All others	75	101	74	100	73	99	72	98	68	42



N0013163

Test Charts And Schematics

H: Fuel Control**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
GO to Powertrain <u>Diagnostic Trouble Code (DTC) Charts</u> and SERVICE DTC P1127, P1128 or P1129.	GO to <u>H21</u> .

H21 DIAGNOSTIC TROUBLE CODE (DTC) P0133 AND P0153: HO2S RESPONSE TEST

DTC/HO2S Reference List:

- DTC P0133 = HO2S-11
- DTC P0153 = HO2S-21
- 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. (REFER to Diagnostic Monitoring Test Results.)

Is the indicated value greater than the minimum threshold?

Yes	No
COMPLETE PCM Reset to clear DTCs. COMPLETE HO2S Monitor Drive Cycle (REFER to <u>Drive Cycles</u>). GO to <u>H20</u> . If test results indicate a pass, testing is complete.	GO to <u>H23</u> .

H20 - H21

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, tube, and oil fill cap.
 - Exhaust leaks at flanges and gaskets.

Are any air leaks present?

Yes	No
REPAIR source of air leak. COMPLETE PCM Reset to clear DTCs. COMPLETE HO2S Monitor Drive Cycle (REFER to Drive Cycles).	GO to H24 .

H24 CHECK HO2S CIRCUIT WIRING

Note: Refer to the PCM connector pin number in the beginning of this pinpoint test.

- Disconnect suspect HO2S.
- Check for water contamination.
- Jumper HO2S signal to VPWR at the HO2S harness connector.
- Key on , engine off.

Note: HO2S displayed as O2S on Scan Tool.

- Access the correct HO2S PID.

Is the voltage greater than 1.50 volts?

Yes	No
KEY OFF. REPLACE HO2S. CHANGE oil/filter. COMPLETE PCM Reset to clear DTCs. COMPLETE HO2S Monitor Drive Cycle (REFER to Drive Cycles).	KEY OFF. REMOVE jumper wire. GO to H25 .

H25 DTCS P0141 AND P0161: HO2S HEATER CIRCUIT IS OPEN, CHECK HO2S SIGNAL AND SIGNAL RETURN CIRCUITS FOR OPEN IN HARNESS

Note: Refer to the PCM harness connector pin numbers in the beginning of this pinpoint test.

DTC/HO2S Reference List:

- DTC P0141 = HO2S HTR-12
- DTC P0161 = HO2S HTR-22

Note: On some applications, a vehicle hoist is required to access the HO2S harness.

- Visually inspect the HO2S circuit for exposed wiring, water contamination, corrosion and proper assembly.
- Measure resistance of HO2S SIG circuit between PCM harness connector pin and HO2S harness connector.
- Measure resistance of HO2S SIG RTN circuit between PCM harness connector pin and HO2S harness connector.

Is the resistance less than 5.0 ohms?

Yes	No
GO to H26 .	REPAIR open circuit. COMPLETE HO2S Monitor Drive Cycle (REFER to Drive Cycles).

H26 CHECK HO2S CIRCUIT FOR SHORT TO VPWR IN HARNESS

- Measure resistance between the HO2S SIG and VPWR circuit at the PCM harness connector pin.

Is the resistance greater than 10,000 ohms?

Yes	No
GO to H27 .	GO to H28 .

H25 - H26

H27 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.
 - Short drive cycles in cold weather.
 - Use of unapproved cleaning agents.

Were any of the above conditions or concerns found during inspection?

Yes	No
REPAIR source of contamination. REPLACE HO2S and oil filter. COMPLETE PCM Reset to clear DTCs. COMPLETE HO2S Monitor Drive Cycle (REFER to Drive Cycles).	If diagnosing DTC P0141 or P0161, GO to H30 . All others: REPLACE PCM.

H28 VERIFY WIRING IS IN PROPER PIN LOCATION

Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.

- Measure resistance of the HO2S SIG circuit and HO2S Signal Return circuit between the PCM harness connector pin and the HO2S harness connector.

Is the resistance less than 5.0 ohms?

Yes	No
REPLACE HO2S.	REPAIR as necessary.

H27 - H28

H30 DTCS P0135 AND P0155: HO2S HEATER CIRCUIT IS SHORTED TO GROUND, SHORTED TO VPWR OR EXCESSIVE CURRENT DRAW, LOW CURRENT DRAW

Note: Refer to the PCM harness connector pin numbers in the beginning of this pinpoint test.

DTC/HO2S Reference List:

- DTC P0135 = HO2S HTR-11
- DTC P0155 = HO2S HTR-21

Note: On some applications, a vehicle hoist is required to access the HO2S harness.

- Visually inspect the HO2S circuit for exposed wiring, water contamination, corrosion and proper assembly.

Were any concerns found during inspection?

Yes	No
REPAIR any concerns found during inspection.	GO to <u>H31</u> .

H31 PERFORM KEY ON ENGINE OFF (KOEO) SELF-TEST

- Key on, engine off.
- Perform KOEO Self-Test.

Are any of the following DTCs present: P0135, P0141, P0155, P0161?

Yes	No
KEY OFF. GO to <u>H32</u> .	KEY OFF. GO to <u>H33</u> .

H30 - H31

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 to be tested individually.

- Disconnect the appropriate HO2S(s).
- Key on, engine off.
- Measure voltage between VPWR and SIG RTN circuits at the HO2S harness connector.

Is the voltage greater than 10.5 volts?

Yes	No
KEY OFF. GO to <u>H33</u> .	CHECK fuse in circuit. If fuse is OK, REPAIR open circuit. For no VPWR on vehicles equipped with 150 Pin PCM: GO to <u>B5</u> .

H33 CHECK HO2S HEATER CIRCUIT FOR SHORT TO VPWR AND GND

- Disconnect PCM.
- Measure resistance between the suspect HO2S HTR circuit and PWR GND circuit.
- Measure resistance between the suspect HO2S HTR circuit and SIG RTN circuit at the HO2S harness connector.
- Measure resistance between the suspect HO2S HTR circuit and VPWR circuit at the HO2S harness connector.

Is each resistance greater than 10,000 ohms?

Yes	No
GO to <u>H34</u> .	REPAIR shorted circuit.

H32 - H33

H34 CHECK HO2S HTR CIRCUIT FOR OPEN IN HARNESS

- Measure resistance of the suspect HO2S HTR circuit between PCM harness connector pin and HO2S harness connector.

Is the resistance less than 5.0 ohms?

Yes	No
GO to <u>H35</u> .	REPAIR open or excessive resistance in the heater circuit in harness.

H35 CHECK HO2S HTR RESISTANCE

- Measure the resistance of the HO2S HTR to VPWR at HO2S connector (refer to schematic at the beginning of this Pinpoint Test).

Is the resistance between 3 and 30 ohms?

Yes	No
GO to <u>H36</u> .	REPLACE HO2S.

H36 CHECK HO2S CASE FOR SHORT TO VPWR, HTR AND SIG RTN

- Measure resistance between HO2S HTR pin at HO2S connector and the HO2S case.
- Measure resistance between the HO2S HTR pin and the SIG RTN Pin at the HO2S sensor.
- Measure the resistance between the HO2S VPWR pin at the HO2S connector and the HO2S case.

Is the resistance greater than 10,000 ohms?

Yes	No
REPLACE PCM (refer to <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	REPLACE HO2S.

H34 - H36

H40 DTCS P0171, P0174, P1130, P1131, P1150, OR P1151: LEAN SYSTEM DTCS

Note: Do not clear the DTCs or reset the keep alive memory (KAM).

Fuel System and HO2S DTC Reference List:

- Bank 1 = DTC P0171 (lean)
- Bank 2 = DTC P0174 (lean)
- HO2S-11 = DTCs P1130 and P1131
- HO2S-21 = DTCs P1150 and P1151
- Access and record the ECT PID from the freeze frame data. The freeze frame data will be used to recreate the concern.
- Retrieve and record the self-test DTCs.

Are any DTCs present other than P0171, P0174, P1130, P1131, P1150, or P1151?

Yes	No
DISREGARD the current diagnostic trouble code (DTC) at this time. GO to <u>Diagnostic Trouble Code (DTC) Charts</u> and REPAIR the other DTCs.	GO to <u>H41</u> .

H41 CARRY OUT A VISUAL INSPECTION OF THE INTAKE AIR SYSTEM AND ALL VACUUM HOSES

- Check the intake air system for leaks, obstructions, and damage.
- Inspect the entire length of all the vacuum hoses for:
 - proper connections.
 - damage or cracks.
 - damaged or cracked vacuum tees.
- Verify the integrity of the positive crankcase ventilation (PCV) system.
- Verify the proper PCV valve part number.

Is a concern present?

Yes	No
GO to <u>H44</u> .	GO to <u>H42</u> .

H40 - H41

H42 CHECK FOR THE PRESENCE OF A VACUUM LEAK

Note: Fuel trim values at idle are more sensitive to a vacuum leak. The vacuum leak (unmetered air) represents a larger portion of the total air flow at idle than at part throttle.

Note: The barometric pressure (BARO) PID is not a recommended PID to monitor when diagnosing a vacuum leak. Barometric pressure is calculated during high engine load, when the vacuum leak represents a small portion of the total air flow.

Note: As an example, when calculating the total fuel correction in the following steps, if LONGFT1 = +13% and SHRTFT1 = +23%, the total fuel correction for bank 1 = +36%, also if LONGFT2 = +24% and SHRTFT2 = -3% the total fuel correction for bank 2 = +21%.

Note: If the freeze frame ECT PID is available, stabilize the engine at the temperature recorded by the freeze frame ECT PID. If the freeze frame ECT PID is not available, maintain the engine coolant temperature between 82°C - 101°C (180°F - 215°F) and the intake air temperature less than 46°C (115°F).

- Key on, engine running.
- Access and monitor the ECT or CHT, IAT, LONGFT1, SHRTFT1, LONGFT2 and SHRTFT2 PIDs.
- Allow the engine to stabilize at the temperature necessary to recreate the concern.
- Add and record the LONGFT PID value to the SHRTFT PID value for each bank, for a total fuel correction at idle.
- Increase the engine speed to 2500 rpm for 10 seconds.
- Record the LONGFT1, SHRTFT1, LONGFT2, and SHRTFT2 PID values.
- Add and record the LONGFT PID value to the SHRTFT PID value for each bank, for a total fuel correction at 2500 rpm.

Is the total fuel correction value change, between idle and 2500 rpm, less than 15 percent?

Yes	No
No vacuum leak is present. GO to <u>H47</u> .	GO to <u>H43</u> .

H42

H43 LOCATE THE VACUUM LEAK

CAUTION: Do not clamp or pinch a hard plastic hose. Use a vacuum cap or equivalent to restrict the hose.

Note: Restricting the EVAP vapor hose while the EVAP emission canister is purging may shift the SHRTFT. Carry out a visual inspection as necessary.

Note: As an example, when monitoring for a decrease in the SHRTFT PIDs in the following steps, if SHRTFT1 is +15%, but when the hose is restricted SHRTFT1 decrease to -7%, the decrease in the SHRTFT PIDs = 22 percent.

- Locate the vacuum tees for the intake air and PCV systems.
- Access and monitor the SHRTFT1 and SHRTFT2 PIDs.
- Restrict the vacuum lines one at a time for 30 seconds. If a vacuum leak is present, the SHRTFT PID values will decrease as the hose is restricted.

Is the decrease in the SHRTFT PIDs greater than 15 percent when one of the vacuum hoses is restricted?

Yes	No
GO to H44 .	INSPECT the intake air system for a vacuum leak in the intake manifold or intake gaskets. REPAIR as necessary. For repair verification, GO to H44 .

H44 VACUUM LEAK REPAIR VERIFICATION

Note: If the freeze frame ECT PID is available, stabilize the engine at the temperature recorded by the freeze frame ECT PID. If the freeze frame ECT PID is not available, maintain the engine coolant temperature between 82°C - 101°C (180°F - 215°F) and the intake air temperature less than 46°C (115°F).

- Access and monitor the SHRTFT1 and SHRTFT2 PIDs.
- Allow the engine to stabilize at the temperature necessary to recreate the concern.
- Record the SHRTFT1 and SHRTFT2 PID values.
- Key off.
- Repair the vacuum leak.
- Key on, engine running.
- Allow the engine to stabilize at the temperature necessary to recreate the concern.
- Access and monitor the SHRTFT1 and SHRTFT2 PIDs.
- Compare the recorded SHRTFT PID values, prior to the vacuum leak repair, to the current SHRTFT PID values.

Is the decrease in the SHRTFT PIDs greater than 15 percent?

Yes	No
Fault found. RESET the keep alive memory (KAM). REFER to Resetting The Keep Alive Memory (KAM) .	A vacuum leak is still present, GO to H43 .

H45 DTCs P1132 AND P1152: UPSTREAM HO2S NOT SWITCHING.

Note: It is necessary to address all Continuous Memory Ignition and Misfire DTCs, if received during Continuous Memory testing, before addressing any KOER HO2S DTCs.

DTC/HO2S Reference List:

- HO2S-11 = DTC P1132
- HO2S-21 = DTC P1152
- 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.

Were any concerns found during inspection?

Yes	No
REPAIR as necessary.	GO to <u>H4Z</u> .

H46 DTCs P0172 AND P0175: FUEL SYSTEM AT THE CORRECTED FUEL TRIM

Note: It is necessary to address all Continuous Memory Ignition and Misfire DTCs, if received during Continuous Memory testing, before addressing any Fuel Trim DTCs.

Fuel System DTC Reference List:

- Bank 1 = DTC P0172 (rich)
- Bank 2 = DTC P0175 (rich)
- 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 fuel delivery system and filter for restriction.
- Check for vacuum leaks.

Were any concerns found during inspection?

Yes	No
REPAIR as necessary. RESET the keep alive memory (KAM) to clear DTCs. REFER to <u>Resetting The Keep Alive Memory (KAM)</u> .	GO to <u>H4Z</u> .

H47 PERFORM KOER SELF-TEST

- 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.
- Complete Key On Engine Running (KOER) Self-Test.

Are any HO2S DTCs P1127, P1128, P1129, P1131, P1132, P1151 or P1152 present?

Yes	No
KEY OFF. If DTC P1127, P1128 or P1129 is present, GO to Powertrain Diagnostic Trouble Code (DTC) Charts and REPAIR those DTCs first. DTCs (P1131, P1130) or (P1151, P1150): GO to <u>H48</u>. DTCs (P1132, P1130) or (P1152, P1150): GO to <u>H54</u>.	KEY OFF. For Continuous Memory DTCs Only P1130, P1150, P0171, P0174, P0172 and P0175: GO to <u>H57</u>. If DTC(s) P1132 and/or P1152 are no longer present, RECONNECT fuel vapor line. Vehicles experiencing KOER DTC 1131, 1132, 1151 or 1152: REFER to Evaporative Emissions, for system leakage. All others without recurring DTCs: Unable to duplicate or identify fault at this time. GO to <u>Z1</u>.

H48 HO2S CIRCUIT TEST (WITH LEAN DTCs)

- Disconnect the HO2S related to the DTC.
- Key on, engine off.
- Access the correct HO2S PID.

Note: If arcing occurs (indicating a short), remove jumper and GO to H52 (check fuse in the heater circuit).

- Jumper the HO2S SIG circuit to the VPWR circuit at the HO2S vehicle harness connector.

Is the reading 1.30 volts or greater?

Yes	No
KEY OFF. CHECK SIG RTN circuit. GO to <u>H49</u> .	KEY OFF. GO to <u>H51</u> .

H49 CHECK SIGNAL RETURN CIRCUIT FOR OPEN

- Measure resistance of HO2S SIG RTN circuit between the HO2S harness connector and the battery negative post.

Is the resistance reading less than 5.0 ohms?

Yes	No
GO to <u>H57</u> .	GO to <u>H50</u> .

H50 CHECK HO2S SIGNAL RETURN CIRCUIT FOR OPEN IN HARNESS

- Disconnect PCM.
- Measure resistance of HO2S SIG RTN circuit between the PCM harness connector pin and HO2S harness connector.

Is the resistance reading less than 5.0 ohms?

Yes	No
REPLACE PCM (refer to <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	REPAIR open circuit.

H51 CHECK HO2S SIGNAL AND HO2S GND CIRCUITS FOR OPEN IN HARNESS

- Disconnect PCM.
- Measure resistance of HO2S SIG circuit between PCM harness connector pin and the HO2S harness connector.

Is the resistance reading less than 5.0 ohms?

Yes	No
GO to <u>H52</u> .	REPAIR open circuit.

H49 - H51

H52 CHECK HO2S CIRCUIT FOR SHORT TO GROUND IN HARNESS

- Disconnect PCM.
- Measure resistance between the HO2S SIG and PWR GND circuits, and the HO2S SIG and SIG RTN circuits at the PCM harness connector.

Is each resistance greater than 10,000 ohms?

Yes	No
GO to <u>H53</u> .	REPAIR short circuit.

H53 CHECK HO2S CIRCUIT FOR SHORT TO GROUND

- Disconnect PCM.
- Reconnect HO2S.
- Measure resistance between HO2S SIG and PWR GND circuits and HO2S SIG and SIG RTN circuits at the PCM harness connector.

Is each resistance greater than 10,000 ohms?

Yes	No
REPLACE PCM (refer to <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	REPLACE HO2S.

H54 HO2S CIRCUIT CHECK (FOR RICH DTCS)

- Disconnect the HO2S related to the DTC received.
- Key on.
- Access the correct HO2S PID(s).

Is the reading 0.2 volt or less?

Yes	No
KEY OFF. GO to <u>H56</u> .	KEY OFF. GO to <u>H55</u> .

H52 - H54

H55 CHECK HO2S CIRCUIT FOR SHORT TO VPWR AND HO2S HEATER GROUND IN HARNESS

- Disconnect PCM.
- Measure resistance between the HO2S SIG and VPWR circuits; and HO2S Signal and HO2S HTR circuits at the PCM harness connector.

Is each resistance greater than 10,000 ohms?

Yes	No
REPLACE PCM (refer to <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	REPAIR short circuit.

H56 CHECK HO2S SIGNAL FOR SHORT TO HO2S HEATER CIRCUIT IN THE SENSOR

- Suspect HO2S sensor disconnected.
- Measure resistance between the HO2S SIG and HO2S HTR circuits at the HO2S connector.

Is the resistance greater than 10,000 ohms?

Yes	No
KEY OFF. GO to <u>H57</u> .	KEY OFF. REPLACE HO2S.

H57 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.
- Key on, engine off.
- Access Output Test Mode 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. (GO to Pinpoint Test HC to refer to the Fuel Delivery System Test Information Chart.)

Is the fuel pressure within range for the vehicle being diagnosed?

Yes	No
KEY OFF. GO to <u>H58</u> .	KEY OFF. GO to <u>HC1</u> .

H58 CHECK FUEL SYSTEM FOR PRESSURE STABILITY — FAST LEAKDOWN

- Cycle key on and off several times.
- 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
GO to H59 .	Check fuel system for external leaks. If external leak is detected, GO to <u>H51</u> . If no external leak is detected, GO to <u>H60</u> .

H59 CHECK FUEL SYSTEM FOR PRESSURE STABILITY WITH KEY ON — SLOW LEAKDOWN

- Cycle key on and off several times.
- Key on and engine off, monitor fuel pressure gauge.

Does the fuel pressure remain within 34 kPa (5 psi) of the highest reading after one minute?

Yes	No
For H02S DTCs displayed with misfire DTCs: GO to <u>H61</u> . All other DTCs: GO to H64 .	GO to <u>H65</u> .

H60 CHECK INJECTOR FAULT PIDS AND ASSOCIATED DTCs

- Access INJ1F-INJ10F PIDs.

Note: If misfire DTCs are present, access only injector fault PIDs corresponding to misfire DTCs.

Is DTC P0201 through P0210 or an injector(s) fault present?

Yes	No
GO to <u>H61</u> .	For DTCs P0300 through P0310: GO to <u>H612</u> . For all other DTCs: GO to <u>H64</u> .

H61 CHECK FUEL INJECTOR(S) AND HARNESS RESISTANCE

Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.

Note: This erases Continuous Memory DTCs.

Use the injector fault PID to determine the fuel injector circuit(s) requiring testing.

- Disconnected PCM.
- Measure resistance between the suspect fuel injector signal circuit and the VPWR circuit at the PCM harness connector.

Is the resistance between 11.0-18.0 ohms?

Yes	No
For Continuous Memory DTCs P0201 through P0210: Concern may be intermittent. Attempt to duplicate concern. If unable to duplicate concern GO to <u>Z1</u> . <u>REPLACE PCM. REFER to Flash Electrically Erasable Programmable Read Only Memory (EEPROM).</u>	For KOEO and KOER DTCs: GO to <u>H62</u> .

H62 CHECK FUEL INJECTOR HARNESS RESISTANCE

- Disconnect fuel injector harness connector at the suspect fuel injector.
- Measure resistance of VPWR circuit between PCM harness connector pin and the fuel injector harness connector.
- Measure resistance of fuel injector circuit between PCM harness connector pin and the fuel injector harness connector.

Is each resistance less than 5.0 ohms?

Yes	No
GO to <u>H63</u> .	REPAIR open harness circuit.

H63 CHECK FUEL INJECTOR HARNESS CIRCUIT FOR SHORT TO POWER AND GROUND

- Disconnect PCM.
- Suspect fuel injector disconnected.
- Measure resistance between fuel injector SIG and VPWR circuits; and between fuel injector SIG and PWR GND circuits at the PCM harness connector.

Is each resistance greater than 10,000 ohms?

Yes	No

H64 FLOW TEST FUEL INJECTOR(S)

- Use the Rotunda 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	No
DTC P0171 and P0174: GO to H66 .	REPLACE fuel injector.
DTC P0172 and P0175: GO to D C25 .	
For DTC P1130 and P1150: GO to H66 .	
For DTC P1131 and P1151: GO to H65 .	
For DTC P1132 and P1152: GO to H69 .	

H65 CHECK FOR SECONDARY AIR INTRUSION

Note: If the vehicle is not equipped with Secondary Air Injection System, GO to [H66](#) .

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	No
GO to H66 .	Cause of DTC(s) is in the Secondary Air Injection System. GO to HMZ for Secondary Air Injection System diagnostics.

H66 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	No
REPAIR as necessary.	CONTINUOUS DTCs P0171, P0174, P1130 or P1150: GO to <u>DC25</u> . DTCs P1131 and P1138 or P1151 and P1150: GO to <u>H67</u> .

H67 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.

Are cylinder compression readings within specification?

Yes	No
For DTCs P1131, P1130, P1151 and P1150: GO to <u>H68</u> . For DTCs P1132 and P1152: GO to <u>H69</u> . Misfire DTCs displayed with fuel control DTCs: GO to <u>HD20</u> .	REPAIR as necessary.

H66 - H67

H68 CHECK HO2S'S ABILITY TO GENERATE A VOLTAGE GREATER THAN 0.5 VOLT

Any vacuum or air leaks can cause DTCs P1131, P113D, P1151 and P115D.

Possible causes:

- Water contamination in connector.
- 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.
- Inspect HO2S harness for chafing, burned wires or other damage and repair as necessary.
- Unplug the suspect HO2S.
- 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 on digital multimeter.

While monitoring, does the voltage ever increase to greater than 0.5 volts?

Yes	No
KEY OFF. GO to <u>H71</u> .	KEY OFF. REPLACE HO2S.

H69 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.

Is DTC P1131 or P1151 present?

Yes	No
KEY OFF. REMOVE jumper. GO to <u>H7D</u> .	KEY OFF. 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 (refer to <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).

H68 - H69

H70 HO2S SENSOR VOLTAGE CHECK

- 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.

Does the voltage reading indicate less than 0.4 volt within 30 seconds?

Yes	No
KEY OFF. RECONNECT vacuum hose and HO2S. GO to <u>H71</u> .	KEY OFF. REPLACE HO2S. PERFORM KOER SELF-TEST. If DTCs P1132 or P1152 still exist, REPLACE PCM (refer to Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

H71 MONITOR HO2S (PID) FOR SWITCHING WHILE PERFORMING WIGGLE TEST

- Key on, engine running.
- Engine at operating temperature.

Note: HO2S displayed as O2S on Scan Tool.

- Access suspect HO2S PID.
- Wiggle, bend and shake small sections of the Electronic Engine Control harness from the PCM to the HO2S.

Note: Do not compare HO2S switch rate from Bank to Bank as an indication of the sensor's function. It is normal to have a variance in switch ratio from Bank to Bank.

While monitoring the HO2S PID, did the HO2S stop switching?

Yes	No
KEY OFF. ISOLATE area of harness concern causing lack of HO2S switches and repair.	KEY OFF. GO to <u>H72</u> .

H70 - H71

H72 TEST DRIVE WHILE MONITORING HO2S PID FOR SWITCHING

Note: This test step requires an observer to monitor HO2S PID.

- Access HO2S PID.
- Access LOOP PID, ensure that vehicle is in Closed Loop before proceeding.
- While observer views PIDs, test drive vehicle in a manner consistent with the Freeze Frame Data in an attempt to simulate the original fault.

Does the HO2S switch?

Yes	No
GO to <u>DC25</u> .	KEY OFF. REPLACE HO2S.

H80 DTC P0136 AND P0156 MONITOR DOWNSTREAM HO2S OUTPUT VOLTAGE FOR ACTIVITY. DTCs P1137, P1138, P1157 AND/OR P1158 INDICATE LACK OF HO2S SWITCHING

Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.

Note: It is necessary to address all Continuous Memory Ignition and Misfire DTCs, if received during Continuous Memory testing, before addressing any KOER HO2S DTCs.

- DTC P0136, P1137 and P1138=HO2S-12
- DTC P0156, P1157 and P1158=HO2S-22
- Visually inspect for:
 - pinched, shorted and corroded wiring and pins
 - water / oil / fluid contamination in HO2S and PCM connectors
 - crossed sensor wires
 - contaminated or damaged sensor

Were any concerns found during inspection?

Yes	No
REPAIR as necessary.	Continuous Memory DTC P0136 and P0156: GO to <u>H81</u> . All others: GO to <u>H82</u> .

H72 - H80

H81 CHECK FOR KOER DTCS P1137, P1157, P1138 AND P1158

- Key on.
- Engine at 2000 rpm for 3 minutes.
- Activate KOER Self-Test.
- Check for DTCs.

Is DTC P1137, P1138, P1157 or P1158 present?

Yes	No
KEY OFF. GO to <u>H82</u> .	KEY OFF. For DTC P0136 and P0156: Unable to duplicate or identify at this time. GO to <u>Z1</u> .

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.

- Place vehicle on a hoist, transmission in PARK, emergency brake applied, raise vehicle.
- Inspect the following:
 - Exhaust flanges for leaks.
 - HO2S torque.
 - incorrect exhaust installation
 - aftermarket exhaust
 - Check for punctures and cracks in catalyst and pipes leading to them.

Is an exhaust leak present?

Yes	No
REPAIR as necessary.	GO to <u>H83</u> .

H83 CHECK HO2S HARNESS CIRCUIT FOR SHORT TO VPWR AND GROUND

- Disconnect PCM.
- Disconnect suspect HO2S.
- Measure resistance between HO2S SIG and SIG RTN circuits at the PCM harness connector.
- Measure resistance between HO2S SIG circuit and VPWR and VREF circuits at the PCM harness connector.
- Measure resistance between HO2S SIG circuit and PWR GND circuit at the PCM harness connector.

Is the resistance greater than 10,000 ohms?

Yes	No
GO to <u>H84</u> .	REPAIR short in harness.

H84 CHECK HO2S SIGNAL CIRCUIT AND HO2S SIGNAL RETURN CIRCUITS FOR OPEN IN HARNESS

- Measure resistance of VPWR circuit between the PCM harness connector pin and the HO2S harness connector.
- Measure resistance of HO2S SIG circuit between the PCM harness connector pin and the HO2S harness connector.
- Measure resistance of SIG RTN circuit between the PCM harness connector pin and HO2S SIG RTN vehicle harness connector.

Is the resistance reading less than 5.0 ohms?

Yes	No
GO to H85 .	REPAIR open circuit.

H85 CHECK HO2S CIRCUIT VOLTAGE

- Connect PCM.
- Suspect HO2S connected to harness.
- Key on , engine off.

Note: HO2S displayed as O2S on Scan Tool.

- Access the correct HO2S PID.

Is the voltage greater than 1.5 volts?

Yes	No
KEY OFF. GO to H88 .	KEY OFF. GO to H86 .

H86 CHECK HO2S GROUND CIRCUIT IN THE PCM

- Disconnect PCM.
- Measure resistance between SIG RTN and PWR GND circuits at the PCM connector.

Is the resistance reading less than 5.0 ohms?

Yes	No
GO to H87 .	REPLACE PCM (refer to Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

H84 - H86

H87 HO2S CIRCUIT CHECK

- PCM connected.
- Suspect HO2S disconnected.
- Jumper VPWR to HO2S SIG circuit at the HO2S harness connector.
- Key on.
- Access HO2S PID.

Is the PID value greater than 1.5 volts?

Yes	No
REPLACE HO2S.	REPLACE PCM (refer to <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).

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 (refer to <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	REPLACE HO2S.

H100 KOER DTC P1127

- Address all other DTCs before proceeding with this pinpoint test.
- Key on, engine running.
- Access all HO2S heaters and HO2S heater monitor PIDs.

Do all PIDs switch or indicate ON?

Yes	No
Engine still operating. PERFORM KOER Self-Test.	Operate the engine until all PIDs indicate on. PERFORM KOER Self-Test.

H110 DTCS P1128 AND P1129 KOER

Note: Refer to the PCM harness connector pin numbers in the beginning of this pinpoint test.

- P1128 refer to the upstream HO2S.
- P1129 refer to the downstream HO2S.
- 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.	GO to H111 .

H111 VERIFY PROPER HO2S SIGNAL PIN LOCATION

- 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 of HO2S signal circuits between PCM harness connector pins and HO2S harness connector.

Is the resistance less than 5.0 ohms?

Yes	No
Unable to duplicate or identify at this time. GO to Z1.	CONNECT HO2S connector to proper HO2S signal pins in the PCM harness connector or HO2S harness connectors. RERUN Quick Test.

H110 - H111

H115 CHECK HO2S CIRCUIT VOLTAGE

- Visually inspect the HO2S circuit for exposed wiring, water contamination, corrosion and proper assembly.
- On some applications, a hoist is required to access the HO2S harness.
- Key on, engine running

Note: HO2S is displayed as O2S on Scan Tool.

- Access suspect HO2S PID(s).
 - P0132 = HO2S-11
 - P0138 = HO2S-12
 - P0152 = HO2S-21
 - P0158 = HO2S-22

Is PID voltage 1.5 volts or greater?

Yes	No
GO to <u>H116</u> .	Concern may be intermittent. Attempt to duplicate concern, perform wiggle test on suspect circuit harness and component. If concern was reproduced: Perform this Pinpoint test again. All others:GO to <u>Z1</u>

H116 CHECK HO2S SIGNAL FOR SHORT TO POWER INSIDE OF SENSOR

- Key off.
- Suspect HO2S disconnected.
- Key on, engine off.
- Access suspect HO2S PID(s).

Is PID voltage .5 volts or greater?

Yes	No
GO to <u>H117</u>	Replace HO2S sensor.

H117 CHECK HO2S SIGNAL FOR SHORT TO POWER IN HARNESS

- Key off.
- Suspect HO2S disconnected.
- PCM disconnected.
- Check resistance between HO2S Signal circuit and both VPWR and VREF circuits at the PCM connector.

Are resistance values greater than 10,000 Ohms?

Yes	No
REPLACE PCM (refer to <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	Repair short to power in harness between PCM and HO2S.

H115 - H117

Test HC: Fuel Delivery System

Fuel Delivery System**HC****Note**

This Pinpoint Test is intended to diagnose the following:

- Chassis Components
- Engine Vacuum
- Fuel Pressure
- Fuel Filter
- Fuel Return
- Fuel Supply
- Fuel Injector (9F593)

Tables and Charts**Fuel Delivery System Test Information / Specification Chart**

Engine Application	Resistance (Ohms)	Flow (Lb./Hr.)	Fuel System Type	Fuel Pressure kPa	Fuel Pressure PSI	Injector Supplier
CAR:						
2.0L 2V Focus	13.8-15.2	17	ERFS ₃	240-448	35-65	B
2.0L 4V Focus/Escape	13.8-15.2	17	ERFS ₃	240-448	35-65	B
2.0L 4V Escort ZX2	13.8-15.2	17	ERFS ₃	240-448	35-65	B
2.5L Cougar	13.8-15.2	21	ERFS ₃	270-380	39-55	B
3.0L 2V Taurus/Sable	11.4-12.6	16	ERFS ₃	270-450	39-65	V
3.0L Taurus/Sable FFV E85	11.4-12.6	21	ERFS ₃	240-448	30-65	V
3.0L 4V Taurus/Sable Escape	13.1-14.5	22	ERFS ₃	270-380	39-55	D
3.0L Lincoln LS6	13.8-15.2	24	ERFS ₃	270-380	39-55	B
3.8L Mustang	11.4-12.6	21	ERFS ₃	240-380	35-55	V
3.9L Lincoln LS8/Thunderbird	11.4-12.6	21	ERFS ₃	270-450	39-65	S
4.6L Crown Victoria/Grand Marquis/Town Car	13.8-15.2	19	RFS ₁	207-310	30-45	B
4.6L 2V Mustang	13.8-15.2	19	ERFS ₃	270-483	40-70	B
4.6L 4V Mustang/Continental	13.8-15.2	24	ERFS ₃	270-380	39-55	B
4.6L 4V Marauder	11.4-12.6	24	ERFS ₃	270-483	40-70	V
4.6L Crown Victoria NGV	4-6	160	NGV ₄	276-827	40-120	B
TRUCK:						
3.0L Ranger	11.4-12.6	12	MRFS ₂	275-448	40-65	V
3.0L Ranger FFV E85	11.4-12.6	21	MRFS ₂	275-380	40-55	V

(Continued)

Note, Tables and Charts

Fuel Delivery System

HC

Fuel Delivery System Test Information / Specification Chart

Engine Application	Resistance (Ohms)	Flow (Lb./Hr.)	Fuel System Type	Fuel Pressure kPa	Fuel Pressure PSI	Injector Supplier
3.8L Windstar	11.4-12.6	21	RFS ₁	207-310	30-45	V
4.0L SOHC Ranger/ Explorer FFV	11.0-18	24	MRFS ₂	207-448	30-65	B
4.0L SOHC Explorer Sport/ Explorer Sport Trac FFV	11-18	24	MRFS ₂	207-448	30-65	B
4.0L SOHC Explorer/Mountaineer/ Explorer Sport Trac	11-18	19	MRFS ₂	207-448	30-65	B
4.0L SOHC Explorer USPS	11-18	24	MRFS ₂	207-448	30-65	B
4.2L E+F-Series	11.4-12.6	21	RFS ₁	207-310	30-45	S
4.6L Explorer/Mountaineer	11.4-12.6	16	MRFS ₂	270-448	39-65	B
4.6L E+F-Series/Expedition	13.8-15.2	19	RFS ₂	207-310	30-45	B
4.6L 4V Navigator	11.4-12.6	24	ERFS ₃	276-483	40-70	V
5.4L 2V E+F-Series/Expedition/ Navigator/Excursion	13.8-15.2	19	MRFS ₂	207-380	30-55	B
5.4L E+F-Series NGV	4-6	160	NGV ₄	276-827	40-120	B
5.4L 2V Supercharged F-Series	13.8-15.2	42	RFS ₁	207-310	30-45	B
5.4L 4V Navigator/Blackwood	13.8-15.2	24	RFS ₁	207-310	30-45	B
6.8L E+F-Series/Excursion	11-18	19	RFS ₁	207-310	30-45	B

- (1) Return Fuel Systems (RFS) return fuel to the fuel tank by means of a return line from the fuel rail.
- (2) Mechanical Returnless Fuel Systems (MRFS) do not return fuel to the fuel tank by means of a fuel return line. The fuel pressure regulator is mounted on the Fuel Pump Module located in the fuel tank. Excess fuel is returned from this point.
- (3) Electronic Returnless Fuel Systems (ERFS) 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 continuously varying the fuel pump speed through the Fuel Pump Driver Module (FPDM).
- (4) Natural Gas Vehicle (NGV) fuel systems do not return fuel to the fuel tanks. This system typically includes multiple fuel tanks, Fuel Tank Solenoid Shut-off Valves, mechanical fuel pressure regulator, Fuel Rail Solenoid Shut-off Valve, Fuel Rail Pressure (FRP) sensor, and an Engine Fuel Temperature (EFT) sensor.

Note: Service replacement fuel injectors may not be the same color as the injectors in the vehicle. Verify replacement injector is correct for the application by part number.

Injector supplier key:

B= Bosch

D= Denso

S= Siemens

Fuel Delivery System

HC

V= Visteon

Description

For additional information on the Fuel Delivery System, refer to Description and Operation.

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. ON VEHICLES NOT EQUIPPED WITH A SCHRADER VALVE, USE ROTUNDA FUEL PRESSURE TEST KIT #134R0087 OR EQUIVALENT.**
- **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.**
- **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.**

CAUTION

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

FIRE

- **Report all fires to the appropriate authorities.**
- **Flames from methanol or methanol-gasoline blends can be invisible.**

Description, Warning and Caution

Fuel Delivery System

HC

- 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.

FIRST AID

- If swallowed:
 - 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.

HEALTH

- All fuels can be harmful or fatal if swallowed.
- Be aware, if fuel is swallowed, onset of serious health effects can be delayed 12 to 24 hours.
- Fuels and 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 made with gasoline contain benzene which is a cancer-causing agent.

HANDLING

- 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.

Test Caution

Fuel Delivery System

HC

- 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.

SPILLS

- 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 (IFS) 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 present, reset the IFS switch by pushing the reset button on the top of the switch (refer to Owner Guide for switch location). 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 Steps		Results	Action to Take
HC1	CHECK SYSTEM INTEGRITY		
• Visually inspect the complete fuel delivery system for damage; including fuel lines, connections, relays, fuel tank, fuel pump, fuel pressure regulator, fuel pulse damper 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. • Are any concerns present?		Yes No	→ REPAIR as necessary. → GO to HC2.

Test Caution, Warning and Test HC1

Fuel Delivery System

HC

Test Steps		Results	Action to Take
HC2	CHECK VOLTAGE AT FUEL PUMP HARNESS CONNECTOR		
• 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 (refer to Vehicle/Diagrams for correct pin location). • Access Output Test Mode (refer to Diagnostic Methods) and turn on the fuel pump circuit and monitor the voltage reading. • Was the voltage greater than 12.5 volts?		Yes → KEY OFF. EXIT Output Test Mode. GO to HC3 . No → KEY OFF. FOR vehicles with electronic returnless fuel systems: GO to KB70 . ALL others: CHECK for opens and shorts in the fuel pump power and ground circuits.	
HC3	CHECK FUEL FILTER FOR PROPER MAINTENANCE		
• Locate and inspect the vehicle maintenance schedule and fuel filter. Check for last repair date. • Was the fuel filter replaced within the last 48,280 km/30,000 miles?		Yes → GO to HC4 . No → REPLACE fuel filter. GO to HC4 .	

HC2 - HC3

Fuel Delivery System

HC

Test Steps		Results	→	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 DIRECTIONS 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 and run the fuel pump to obtain maximum fuel pressure. (GO to Pinpoint Test HC to refer to the Fuel Delivery System Test Information / Specification Chart.) Note: The fuel pump will only operate for approximately 8 seconds when Output Test Mode is selected and activated. • Is the fuel pressure within the specified pressure range as stated in the Fuel Delivery System Test Information / Specification Chart?		Yes	→	KEY OFF. For Electronic Returnless Fuel Systems : GO to HC6. KEY OFF. For Mechanical Returnless Fuel Systems: GO to HC12. All others: GO to HC5.
		No	→	KEY OFF. For Mechanical Returnless Fuel System with fuel pressure greater than 448 kPa (65 psi). REPLACE fuel pressure regulator in fuel tank. For Mechanical Returnless Fuel System with fuel pressure less than 310 kPa (45 psi): GO to HC6. For Electronic Returnless Fuel Systems with fuel pressure less than 207 kPa (30 psi). GO to HC13. For Electronic Returnless Fuel Systems with fuel pressure greater than 448 kPa (65 psi). RERUN Quick Test. Other DTC's should be present if fuel pressure is out of range. All others: Fuel pressure greater than 280 kPa (40 psi) (Cougar 415 kPa, 60 psi) on returnable fuel systems, GO to HC10. Fuel pressure less than 240 kPa (35 psi) (Cougar 310 kPa, 45 psi) on returnable fuel systems, GO to HC13.
HC5	CHECK FUEL PRESSURE LEAKDOWN			
• Observe Warning, Caution and Notes. • Fuel pressure tester installed. • Key on, engine off. • Access Output Test Mode 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 .

Fuel Delivery System

HC

Test Steps		Results	→	Action to Take
HC6	CHECK PRESSURE REGULATOR AND PULSE DAMPER 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 or pulse damper port. - Inspect for fuel in the vacuum hose or regulator port or pulse damper. Is fuel present in the vacuum hose, regulator or pulse damper port?	Yes	→	REPLACE fuel pressure regulator.
		No	→	For Mechanical Returnless Fuel System: Replace pulse damper. For Mechanical Returnless: GO to HC13. All others: GO to HC12.
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	→	GO to HC8.
		No	→	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 increases?	Yes	→	Concern is elsewhere. RETURN to Symptom Charts, for further direction.
		No	→	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	→	REPAIR vacuum source.
		No	→	REPLACE fuel pressure regulator.

Fuel Delivery System

HC

Test Steps		Results	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 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 within specification and is fuel returning to the container?	Yes No	→ KEY OFF. GO to HC11 . → KEY OFF. Fuel pressure out of specification. REPLACE fuel pressure regulator.
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. → REPAIR the fuel return line.
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 using Injector Flow Tester. Are test results satisfactory?	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. → REPLACE faulty fuel injector(s).
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. → REPAIR cause of restriction.

HC10 - HC13

Test HD: Misfire Detection Monitor

Misfire Detection Monitor**HD****Note**

This Pinpoint Test is intended to diagnose the following:

- Ignition System
- Fuel injectors (9F593)
- Fuel pressure
- Vacuum system
- Evaporative emission system
- Fuel vapor storage canister
- EVAP canister purge valve (9C915)
- Base engine
- Crankshaft position (CKP) sensor (6C315)
- Crankshaft Pulse Wheel
- Powertrain control module (PCM) (12A650)

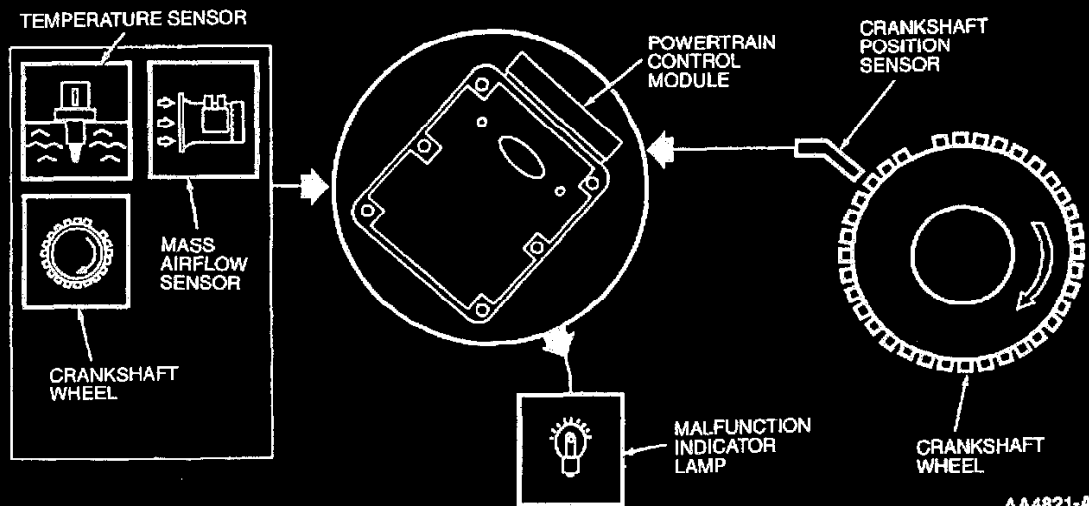
Test Note

Misfire Detection Monitor

HD

Pinpoint Test Schematics and Connectors

Misfire Detection Monitor



Test Steps		Results →	Action to Take
HD1	CHECK FOR ADAPTIVE FUEL MONITOR AND HO2S CONTINUOUS MEMORY DTCS		
	Note: The following is a list of non-misfire DTCs to look for in the Continuous Memory. P0136, P0156 P0171, P0172, P0175 P1130, P1150 • Are any of the DTCs listed above present?	Yes → No →	GO to HD3. GO to HD2.
HD2	CHECK FOR OTHER NON-MISFIRE CONTINUOUS MEMORY DTCS		
	Note: Check for other non-misfire Continuous Memory DTCs, which could cause the misfire DTC. • Are other non-misfire Continuous Memory DTCs present?	Yes → No →	ADDRESS the next Continuous Memory DTC. DISREGARD Misfire DTC at this time. GO to Powertrain Diagnostic Trouble Code (DTC) Charts. GO to HD3.

Misfire Detection Monitor

HD

Test Steps		Results	→	Action to Take
HD3	CHECK FOR KEY ON ENGINE OFF (KOEO) 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	→	GO to Powertrain Diagnostic Trouble Code (DTC) Charts, and PROCEED as required.
		No	→	GO to JB1 to evaluate spark plugs and secondary wires. If OK, GO to HD4 .
HD4	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	→	If DTCS P1132, P1138, P1152, P1158, P1131, P1137, P1151 or P1157 are present, GO to HD8 . All others: GO to Powertrain Diagnostic Trouble Code (DTC) Charts, and PROCEED as required.
		No	→	If Misfire is present: Those with DPFEGR Systems, GO to HD6 . All others: GO to HD7 . If Intermittent: GO to Diagnostic Methods for Freeze Frame Data and GO to Z1 for Intermittent Diagnosis. If OK, GO to HD7 .
HD6	CHECK/COMPARE PID VALUES			
	- Start engine and warm to normal operating temperature. - Access DPFEGR PID. - Record DPFEGR PID value. - Key off. - Key on, engine off. - Again access DPFEGR PID. - Compare key on, engine off and engine running PID values. Was engine running PID value within 0.15 volt of key on, engine off value?	Yes	→	KEY OFF. GO to HD7 .
		No	→	KEY OFF. GO to HE100 .
HD7	EGR RESTRICTION/FLOW TEST			
	Note: DTCS may be induced and will need to be cleared at end of testing. - Record and clear codes. - Disconnect vacuum line at EGR valve and plug the vacuum line. - Complete Misfire Monitor Drive Cycle. Is Misfire code still present?	Yes	→	GO to HD8 .
		No	→	REFER to Engine for EGR and intake port inspection.

Misfire Detection Monitor**HD**

Test Steps		Results	Action to Take
HD8	CHECK INJECTOR DRIVER PIDS INJ1F THRU INJ10F		
	• Key on, engine off. • Access appropriate INJxF PID(s) for the suspect fuel injector. • Is the PID status Yes?	Yes → No →	GO to HD9. GO to HD10.
HD9	CHECK FUEL INJECTOR(S) AND HARNESS FOR OPEN		
	• Disconnect PCM. • Measure resistance of fuel injector and harness circuit between the fuel injector and VPWR circuits at the fuel injector harness connector (GO to Pinpoint Test H to refer to the injector connector chart). • GO to Pinpoint Test HC Refer to the Fuel Delivery System Test Information Chart (at the beginning of the pinpoint test) for injector resistance values. • Is the resistance value(s) within specification?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). GO to H57 to diagnose fuel injectors.
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. • Is the fuel pressure at the specified pressure? GO to Pinpoint Test HC to use the fuel pressure chart.	Yes → No →	KEY OFF. GO to HD11. REFER 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. • Did fuel pressure remain at specification within 34 kPa (5 psi) for 60 seconds?	Yes → No →	KEY OFF. GO to HD12. REFER to Fuel Delivery and Air Induction to determine which area within the Fuel Delivery System is at fault.

Misfire Detection Monitor

HD

Test Steps		Results	Action to Take
HD12	CHECK FUEL INJECTOR FOR FLOW AND LEAKAGE		
	- GO to Pinpoint Test HC to refer to the Warning, Caution, and Handling, 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 (REFER to Diagnostic Methods, Drive Cycles).
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 (REFER to Diagnostic Methods, Drive Cycles).
HD21	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 (REFER to Diagnostic Methods, Drive Cycles). GO to HD22 .
HD22	CHECK EVAPORATIVE EMISSION SYSTEM		
	The Misfire Monitor can be influenced by Evaporative Emission System. The next five 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 (REFER to Diagnostic Methods, Drive Cycles). CHECK fuel tank vent system. GO to HD23 .
HD23	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 HD24 . REPAIR as necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).

HD

Test Steps		Results	Action to Take
HD24	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 (REFER to Diagnostic Methods, Drive Cycles). GO to HD26.
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. COMPLETE PCM Reset to clear DTCs.
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. COMPLETE Misfire Monitor Repair Verification Drive Cycle. REMOVE vacuum pump. RECONNECT all components. GO to HD29.

Misfire Detection Monitor

HD

Test Steps		Results	→	Action to Take
HD29	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. Note: Engine temperature may affect results. Perform the following tests in order to evaluate base engine integrity: • Perform Engine Compression and leakdown tests. • Perform Valve Train analysis. • Check Positive Crankcase Ventilation System. • Check possible leakage points. • Is any service required?	Yes	→	REFER to Engine, Diagnosis and Testing, to make repairs.
		No	→	The cause of the Misfire DTC is intermittent. To diagnose the Ignition System, GO to Z1. If OK, GO to HD30.
HD30	CHECK FOR ADDITIONAL MISFIRE DTCS			
	Diagnostic Trouble Code P0300 indicates multiple cylinders are misfiring or PCM cannot identify which cylinder is misfiring. • Are any other misfire DTCs present?	Yes	→	GO to HD1.
		No	→	GO to HD31.
HD31	CHECK FOR OTHER CONTINUOUS MEMORY DTCS			
	• Are other Continuous Memory DTCs present?	Yes	→	GO to Powertrain Diagnostic Trouble Code (DTC) Charts. PROCEED as required.
		No	→	GO to HD32.
HD32	CHECK/COMPARE PID VALUES			
	• Start engine and warm to normal operating temperature. • Access DPFEGR PID. • Record PID value. • Key off. • Key on, engine off. • Again access DPFEGR PID. • Compare key on, engine off and engine running PID values. • Is engine running DPFEGR PID value within 0.15 volt of key on, engine off value?	Yes	→	KEY OFF. Vehicles with VRS type CMP, GO to HD41. KEY OFF. Vehicles with hall effect type CMP, GO to HD40.
		No	→	KEY OFF. GO to HE100.

Misfire Detection Monitor**HD**

Test Steps		Results	Action to Take
HD40	CHECK CMP SENSOR OUTPUT — PCM DISCONNECTED		
Diagnostic Trouble Code (DTC) P1309 indicates Misfire Detection Monitor is not enabled. • Disconnect PCM. • Connect digital multimeter. • Measure voltage between CMP and PWR GND circuits at the PCM harness connector. • 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 (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). RERUN Quick Test.
		No	→ REPLACE CMP sensor. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). RERUN Quick Test.
HD41	CHECK CMP SENSOR OUTPUT — PCM CONNECTED		
• Connect PCM. • Connect digital multimeter. • Start engine and vary engine RPM. • Measure voltage between CMP and PWR GND circuits at the PCM harness connector. • Does AC voltage vary greater than 0.1 volt AC?		Yes	→ VERIFY the correct installation by. If CMP is installed properly, REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). RERUN Quick Test.
		No	→ REPLACE CMP sensor. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).

Misfire Detection Monitor**HD**

Test Steps		Results	Action to Take
HD42	CHECK THE PHYSICAL CONDITION OF THE CRANKSHAFT PULSE WHEEL.		
	Note: DTC P0315 is set when the PCM is unable to learn and correct for mechanical variations in the Crankshaft Pulse Wheel tooth spacing (the allowable correction tolerances have been exceeded). • Inspect the Crankshaft Pulse Wheel for damaged teeth. • Inspect the Crankshaft Pulse Wheel for wobble. • Inspect for a loose Crankshaft Pulse Wheel. • Inspect the CKP sensor for damage. • Are the CKP sensor and Crankshaft Pulse Wheel OK?	Yes → No →	INSPECT the Crankshaft by referring to the Engine, Diagnosis and Testing, to make repairs. REPAIR as necessary. DISCONNECT the battery for 5 minutes to allow PCM to learn new data.

HD42

Test HE: Exhaust Gas Recirculation (EGR) Systems

Exhaust Gas Recirculation (EGR) Systems

HE

Note

This Pinpoint Test is intended to diagnose the following:

- Differential pressure feedback EGR sensor (9J460)
- Exhaust gas recirculation (EGR) valve (9D460) (9D475)
- EGR vacuum regulator solenoid (9J459)
- Orifice tube assembly (9D477)
- Differential pressure feedback EGR sensor pressure hoses
- Vacuum lines
- Harness circuits: VREF, DPFE, SIG, SIG RTN, EVR, EVR PWR
- Powertrain control module (PCM) (12A650)

Test Note

HE

**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**
A0041631

Test Schematic And Connectors

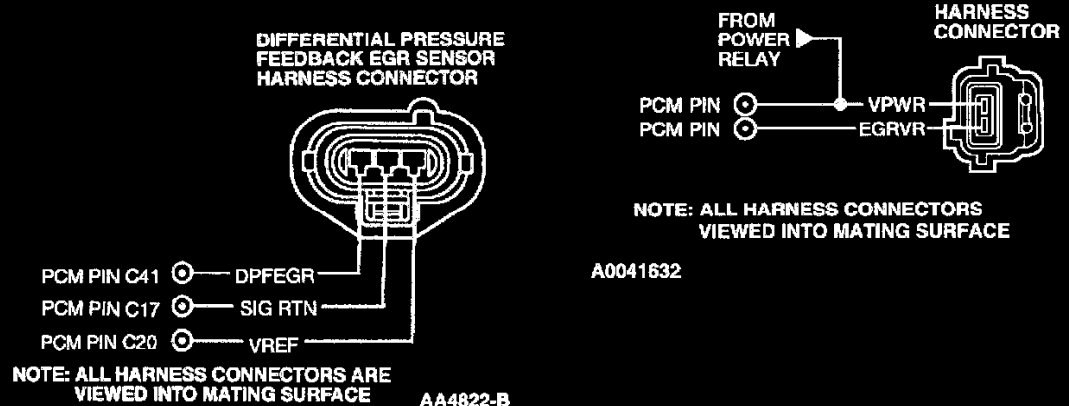
Exhaust Gas Recirculation (EGR) Systems

HE

PCM CONNECTOR PIN NUMBERS

APPLICATION	DPFERG	SIG RTN	VREF
EXPEDITION NAVIGATOR	B33	B25	B36
ALL OTHERS	65	91	90

LS6/LS8, EXPLORER/MOUNTAINEER, THUNDERBIRD



PCM CONNECTOR PIN NUMBERS

APPLICATION	EVR	VPWR
EXPLORER MOUNTAINEER	C16	B68
EXPEDITION NAVIGATOR	B22	A34/A36
LS6/LS8, THUNDERBIRD	C16	B69
ALL OTHERS	47	71

Test Steps		Results →	Action to Take
HE1	DTC P0405 AND P1400: DETERMINE PRESENT DPFEGR PID VOLTAGE		
	- Key on, engine off. - Access DPFEGR PID. - Is DPFEGR PID voltage less than 0.2 volt?	Yes → No →	Fault is currently present. KEY OFF. GO to HE2. Fault is intermittent. GO to HE5.
HE2	ATTEMPT TO INDUCE OPPOSITE D.P.F. EGR SENSOR VOLTAGE		
	- Disconnect D.P.F. EGR sensor. - Key on, engine off. - Is DPFEGR PID value between 4.0 and 6.0 volts?	Yes → No →	REPLACE D.P.F. EGR sensor. GO to HE3.

Schematic, Test HE1 - HE2

Exhaust Gas Recirculation (EGR) Systems

HE

Test Steps		Results	→	Action to Take
HE3	CHECK VREF AND SIG RTN CIRCUITS FOR OPEN IN HARNESS TO D.P.F. EGR SENSOR	Yes No	→ →	KEY OFF. GO to HE4 . GO to C1 .
	- Measure voltage between VREF and SIG RTN circuits at the D.P.F. EGR sensor harness connector. Is VREF voltage between 4.0 and 6.0 volts?			
HE4	CHECK DPFEGR CIRCUIT FOR SHORT TO GROUND AND SIG RTN IN HARNESS	Yes No	→ →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Disconnect scan tool from DLC. - Disconnect PCM. - Measure resistance between DPFEGR and SIG. RTN circuits at the PCM harness connector. - Measure resistance between DPFEGR circuit at the PCM harness connector and battery negative post. Is each resistance greater than 10,000 ohms?			
HE5	PERFORM WIGGLE TEST ON D.P.F. EGR SENSOR AND CIRCUIT WHILE MONITORING DPFEGR PID FOR A SUDDEN CHANGE	Yes No	→ →	REPAIR as necessary. Unable to duplicate or identify fault at this time. GO to Z1 .
	- While monitoring DPFEGR PID, tap on the D.P.F. EGR sensor and wiggle the wiring while looking for a sudden change in value as an indication of an intermittent. Is intermittent fault found?			
HE10	DTC P0406 AND P1401: DETERMINE PRESENT DPFEGR PID VOLTAGE	Yes No	→ →	Fault is currently present. KEY OFF. GO to HE11 . Fault is intermittent. GO to HE19 .
	- Key on, engine off. - Access DPFEGR PID. Is DPFEGR PID voltage greater than 4.0 volts?			
HE11	CHECK DPFEGR CIRCUIT FOR SHORT TO PWR	Yes No	→ →	KEY OFF. GO to HE12 . GO to HE13 .
	- Disconnect D.P.F. EGR sensor. - Key on, engine off. - Measure voltage between DPFEGR circuit at the D.P.F. EGR sensor harness connector and chassis ground. Is voltage greater than 10.5 volts?			

HE3 - HE11

Exhaust Gas Recirculation (EGR) Systems

HE

Test Steps		Results	Action to Take
HE12	CHECK DPFEGR CIRCUIT FOR SHORT TO PWR IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Disconnect PCM. • Key on, engine off. • Measure voltage between DPFEGR circuit at the PCM harness connector and the battery negative post. • Is voltage greater than 10.5 volts?	Yes → REPAIR short circuit. No → REPLACE damaged PCM.	
HE13	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. Note: If a scan tool communication concern exists, key off, remove jumper immediately and GO to HE18. • Access DPFEGR PID. • Is DPFEGR PID voltage less than 0.05 volt?	Yes → REMOVE jumper. GO to HE14. No → Unable to induce opposite signal. KEY OFF. GO to HE16.	
HE14	CHECK VREF VOLTAGE TO D.P.F. EGR SENSOR		
	• Measure voltage between VREF and SIG RTN circuits at the D.P.F. EGR sensor harness connector. • Is VREF voltage between 4.0 and 6.0 volts?	Yes → GO to HE15. No → GO to C1.	
HE15	CHECK DPFEGR CIRCUIT FOR SHORT TO VREF IN HARNESS		
	• Disconnect PCM. • Measure resistance between DPFEGR and VREF circuits at the PCM harness connector. (For LS6/LS8, Thunderbird, Explorer/Mountaineer, Expedition/Navigator measure to both VREF pins.) • Is resistance greater than 10 K ohms?	Yes → REPLACE D.P.F. EGR sensor. No → REPAIR short circuit.	
HE16	CHECK DPFEGR CIRCUIT FOR OPEN IN HARNESS		
	• Disconnect PCM. • Measure resistance of DPFEGR circuit between PCM harness connector pin and D.P.F. EGR sensor harness connector. • Is resistance less than 5.0 ohms?	Yes → GO to HE17. No → REPAIR open circuit.	

HE12 - HE16

Exhaust Gas Recirculation (EGR) Systems

HE

Test Steps		Results	Action to Take
HE17	CHECK SIG RTN CIRCUIT FOR OPEN IN HARNESS		
	- Measure resistance of SIG RTN circuit between PCM harness connector pin and D.P.F. EGR sensor harness connector. Is resistance less than 5.0 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuit.
HE18	CHECK DPFEGR CIRCUIT FOR SHORT TO VREF IN HARNESS		
	- Disconnect PCM. - Measure resistance between DPFEGR and VREF circuits at the PCM harness connector. (For LS6/LS8, Thunderbird, Explorer/Mountaineer, Expedition/Navigator measure to both VREF pins.) Is resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
HE19	COMPLETE A WIGGLE TEST ON D.P.F. EGR SENSOR AND CIRCUIT WHILE MONITORING DPFEGR PID FOR A SUDDEN CHANGE		
	- While monitoring DPFEGR PID, tap on the D.P.F. EGR sensor and wiggle the wiring while looking for a sudden change in value as an indication of an intermittent. Is intermittent fault found?	Yes → No →	REPAIR as necessary. Unable to duplicate or identify fault at this time. GO to Z1.
HE20	DTC P0402: CHECK FOR EGR FLOW AT IDLE WITH EGR VACUUM HOSE DISCONNECTED		
	Note: If DTC P1405 is in continuous memory, diagnose that first starting with HE50. - Disconnect vacuum hose at EGR valve and plug hose. - Run Key On Engine Running (KOER) Self-Test. Is KOER DTC P0402 output or unable to run KOER Self-Test due to engine stall or no start?	Yes → No →	KEY OFF. 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. 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. Is 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. Fault is intermittent. INSPECT pressure hoses for pinching and icing. REPAIR as necessary. If OK, GO to HE30.

HE17 - HE21

Exhaust Gas Recirculation (EGR) Systems

HE

Test Steps		Results	Action to Take
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.
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 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. - The DPFEGR PID voltage must be between 0.2 and 1.3 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. Does the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?	Yes → No →	REPLACE D.P.F. EGR sensor. RECONNECT D.P.F. EGR sensor. GO to HE24.

HE22 - HE23

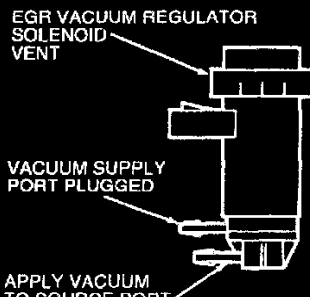
Exhaust Gas Recirculation (EGR) Systems

HE

Test Steps		Results	Action to Take
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. • Does 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	→ This indicates a fault in the EGR vacuum regulator solenoid. KEY OFF. GO to HE25.
		No	→ KEY OFF. GO to HE26.

Exhaust Gas Recirculation (EGR) Systems

HE

Test Steps		Results	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.	Yes → No →	REPAIR EGR vacuum regulator solenoid as necessary. If unable to repair, REPLACE EGR vacuum regulator solenoid. REPLACE EGR vacuum regulator solenoid.
	 AA0897-A • Is the EGR vacuum regulator solenoid vent or vent filter plugged or restricted?		
HE26	CHECK 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 EGR vacuum regulator solenoid.
HE27	CHECK EGRVR CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Disconnect scan tool from DLC. • Disconnect PCM. • Measure resistance between EGRVR circuit at the PCM harness connector and battery negative post. • Is resistance greater than 10,000 ohms?	Yes → No →	GO to HE28. REPAIR short circuit.

HE25 - HE27

Exhaust Gas Recirculation (EGR) Systems

HE

Test Steps		Results	Action to Take
HE28	CHECK EGRVR CIRCUIT FOR SHORT TO VREF		
	- Measure resistance between EGRVR and VREF circuits at the PCM harness connector. (For LS6/LS8, Thunderbird, Explorer/Mountaineer, Expedition/Navigator measure to both VREF pins.) Is resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
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 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. - The DPFEGR PID voltage must be between 0.2 and 1.3 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. Does the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?	Yes → No →	REPLACE D.P.F. EGR sensor. RECONNECT D.P.F. EGR sensor. GO to HE31.

Exhaust Gas Recirculation (EGR) Systems

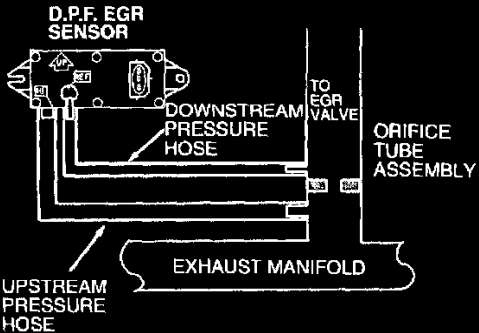
HE

Test Steps		Results	Action to Take
HE31	CHECK D.P.F. EGR SENSOR VOLTAGE WHILE EXERCISING EGR VALVE		
	• Key on, engine off. • View DPFEGR PID and make note of voltage. — Typical D.P.F. EGR sensor voltage with no EGR flow is between 0.2 and 1.3 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. (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.) • Does 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. KEY OFF. GO to HE32.
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. • Remove hand vacuum pump. • Connect vacuum gauge to EGR valve vacuum hose. • 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. • Is intermittent fault found?	Yes → No →	ISOLATE fault and REPAIR as necessary. RECONNECT vacuum hose. KEY OFF. GO to HE33.

HE31 - HE32

Exhaust Gas Recirculation (EGR) Systems

HE

Test Steps		Results →	Action to Take
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. Is 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. Unable to duplicate or identify fault at this time. GO to Z1 .
HE50	DTC P1405: INSPECT UPSTREAM PRESSURE HOSE CONNECTIONS		
	- 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 → No →	REPAIR as necessary. COMPLETE EGR Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). GO to HE51 .
HE51	INSPECT UPSTREAM PRESSURE HOSE FOR PLUGGING		
	Note: It is essential that the D.P.F. EGR pressure hose used is the correct repair part and not a substitute. - Visually inspect upstream pressure hose routing. Hose must not be pinched or have dips in it where water could settle or freeze. - Remove upstream pressure hose and carefully inspect for plugging, water or leaks. Is there a fault detected in the hose?	Yes → No →	REPAIR or REPLACE upstream pressure hose as necessary. COMPLETE EGR Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). GO to HE52 .

Exhaust Gas Recirculation (EGR) Systems

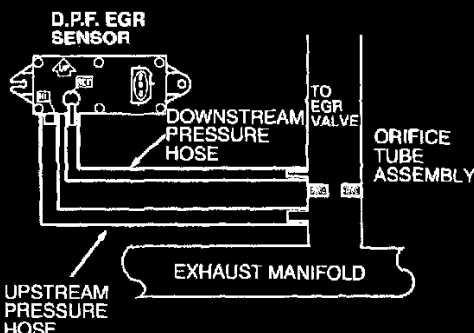
HE

Test Steps		Results	→	Action to Take
HE52	CHECK ORIFICE TUBE ASSEMBLY AND D.P.F. EGR SENSOR			
	- Inspect the upstream connection on the D.P.F. EGR sensor for plugging or damage at the sensor. - Inspect the exhaust manifold side pressure pickup tube at the orifice tube assembly for plugging or damage. Is the D.P.F. EGR sensor or orifice tube assembly plugged or damaged?	Yes	→	REPAIR or REPLACE D.P.F. EGR sensor or orifice tube assembly as necessary. COMPLETE EGR Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
		No	→	GO to HE53 .
HE53	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 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. - The DPFEGR PID voltage must be between 0.2 and 1.3 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. Does the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?	Yes	→	REPLACE D.P.F. EGR sensor. COMPLETE an EGR Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
		No	→	Unable to duplicate or identify fault at this time. GO to Z1 .

HE52 - HE53

Exhaust Gas Recirculation (EGR) Systems

HE

Test Steps		Results	Action to Take
HE60	DTC P1406: INSPECT DOWNSTREAM PRESSURE HOSE CONNECTIONS		
	Note: If the fault is currently present, DTC P1408 will be output in Key On Engine Running (KOER) Self-Test. - Inspect downstream 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 No	→ REPAIR as necessary. → GO to HE61.
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 as necessary. → 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. → GO to HE63.

HE60 - HE62

Exhaust Gas Recirculation (EGR) Systems

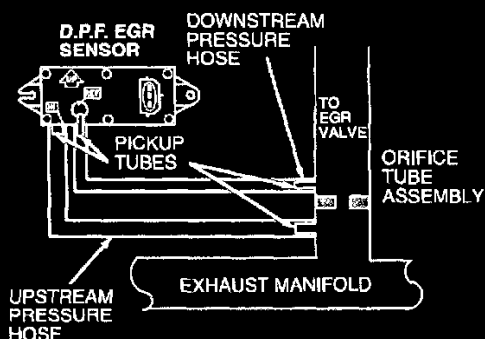
HE

Test Steps		Results	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 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. - The DPFEGR PID voltage must be between 0.2 and 1.3 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. Does the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?	Yes No	→ REPLACE D.P.F. EGR sensor. → Unable to duplicate or identify fault at this time. GO to Z1.
HE70	DTC P0401: RUN KOER SELF-TEST		
	- Run KOER Self-Test. Is KOER DTC P1408 output?	Yes No	→ Fault is currently present. GO to HE71. → GO to HE90.
HE71	DTC P1408: RETRIEVE CONTINUOUS MEMORY DTCS		
	Note: If any DTC other than DTC P1408 is output, record DTC and refer to Diagnostic Trouble Code (DTC) Charts after completing this Pinpoint Test. - Retrieve all Continuous Memory DTCs. Is DTC P1408 output?	Yes No	→ GO to HE60. → GO to HE72.

Exhaust Gas Recirculation (EGR) Systems

HE

Test Steps		Results	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. Does the vacuum increase to 10 kPa (3.0 in-Hg) or greater at any time during KOER Self-Test?	Yes → No →	The vacuum indicated is sufficient to open the EGR valve. Fault is unlikely to be in EGR vacuum control system. KEY OFF. GO to HE73. The vacuum indicated is insufficient to open the EGR valve. KEY OFF. 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 → No →	REPAIR pressure hoses as necessary. GO to HE74.



A21169-B

HE72 - HE73

Exhaust Gas Recirculation (EGR) Systems

HE

Test Steps		Results	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 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. - The DPFEGR PID voltage must be between 0.2 and 1.3 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. Does the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?	Yes No	→ REPLACE D.P.F. EGR sensor. → RECONNECT pressure hoses. GO to HE76 .
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. - 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. Does the DPFEGR PID voltage indicate that the EGR valve is operating as described in this test?	Yes No	→ 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.

HE74 - HE76

Exhaust Gas Recirculation (EGR) Systems

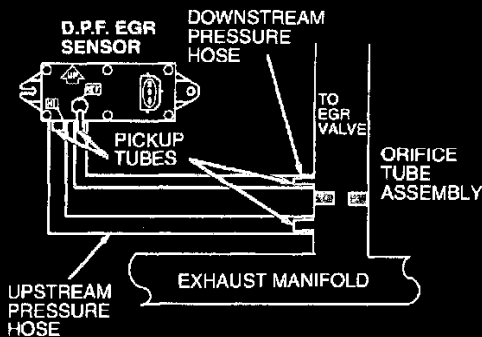
HE

Test Steps		Results	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. Is the vacuum gauge reading a minimum of 51 kPa (15 in-Hg) at idle and vacuum lines OK?	Yes No	→ KEY OFF. GO to HE81 . → ISOLATE fault and REPAIR as necessary.
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. Is EGR vacuum regulator solenoid VPWR voltage greater than 10.5 volts?	Yes No	→ KEY OFF. GO to HE82 . → REPAIR open circuit.
HE82	CHECK EGR VACUUM REGULATOR SOLENOID RESISTANCE		
	- Measure EGR vacuum regulator solenoid resistance. Is solenoid resistance between 26 and 40 ohms?	Yes No	→ GO to HE83 . → REPLACE EGR vacuum regulator solenoid.
HE83	CHECK EGRVR CIRCUIT FOR SHORT TO PWR IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Disconnect PCM. - Key on, engine off. - Measure voltage between EGRVR circuit at the PCM harness connector and battery negative post. Is voltage greater than 1.0 volt?	Yes No	→ REPAIR short circuit. → KEY OFF. GO to HE84 .
HE84	CHECK EGRVR CIRCUIT FOR OPEN IN HARNESS		
	- Measure resistance of EGRVR circuit between PCM harness connector pin and EGR vacuum regulator solenoid harness connector. Is resistance less than 5.0 ohms?	Yes No	→ RECONNECT PCM and EGR vacuum regulator solenoid. GO to HE85 . → REPAIR open in EGRVR circuit.

Exhaust Gas Recirculation (EGR) Systems

HE

Test Steps		Results	Action to Take
HE85	CHECK EGR VACUUM REGULATOR SOLENOID VACUUM OUTPUT CAPABILITY BY GROUNDING EGRVR CIRCUIT		
	- Disconnect vacuum hose at the EGR valve and connect to a vacuum gauge. - Key on, engine running. - With engine at idle, jumper PCM EGRVR circuit to chassis ground. Is vacuum gauge reading 13.5 kPa (4.0 in-Hg) or greater?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPLACE EGR vacuum regulator solenoid.
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. GO to HE91 .
HE91	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 → No →	REPAIR pressure hoses as necessary. GO to HE92 .



A21169-B

HE85 - HE91

Exhaust Gas Recirculation (EGR) Systems

HE

Test Steps		Results	Action to Take
HE92	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 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. - The DPFEGR PID voltage must be between 0.2 and 1.3 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. Does the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?	Yes No	→ REPLACE D.P.F. EGR sensor. → RECONNECT pressure hoses. GO to HE93.
HE93	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. - 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. Does the DPFEGR PID voltage indicate that the EGR valve is operating as described in this test?	Yes No	→ GO to HE94. → 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.

HE92 - HE93

HE

Test Steps		Results	Action to Take
HE94	INSPECT EGR VACUUM SIGNAL SUPPLY FOR INTERMITTENT FAILURE		
	- Disconnect plugged hose at EGR valve and connect to a vacuum gauge. - Key on, engine running. - Connect a jumper wire between EGRVR circuit 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. Is a fault indicated?	Yes → No →	ISOLATE fault and REPAIR as necessary. 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 Z1.
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 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. Is 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. 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.

Exhaust Gas Recirculation (EGR) Systems

HE

Test Steps		Results	Action to Take
HE110	DTC P1409: CHECK EGR VACUUM REGULATOR SOLENOID RESISTANCE		
	- Disconnect EGR vacuum regulator solenoid. - Measure EGR vacuum regulator solenoid resistance. Is solenoid resistance between 26 and 40 ohms?	Yes → No →	GO to HE111 . REPLACE EGR vacuum regulator solenoid.
HE111	CHECK VPWR VOLTAGE TO EGR VACUUM REGULATOR SOLENOID		
	- Key on, engine off. - Measure VPWR circuit voltage at EGR vacuum regulator solenoid harness connector. Is voltage greater than 10.5 volts?	Yes → No →	KEY OFF. GO to HE112 . REPAIR open in VPWR circuit.
HE112	CHECK EGRVR CIRCUIT FOR OPEN IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Disconnect PCM. - Measure resistance of EGRVR circuit between PCM Pin and EGR vacuum regulator solenoid harness connector. Is resistance less than 5.0 ohms?	Yes → No →	GO to HE113 . REPAIR open in EGRVR circuit.
HE113	CHECK EGRVR CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Key on, engine off. - Measure voltage between EGRVR at the PCM harness connector and battery negative post. Is voltage less than 1.0 volt?	Yes → No →	KEY OFF. GO to HE114 . REPAIR short circuit.
HE114	CHECK EGRVR CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Measure resistance between EGRVR and PWR GND circuits at the PCM harness connector. Is each resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.

Exhaust Gas Recirculation (EGR) Systems

HE

Test Steps		Results	→	Action to Take
HE120	CONTINUOUS MEMORY DTC P1409: WIGGLE EGR VACUUM REGULATOR SOLENOID WHILE MONITORING VPWR			
Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.		Yes	→	ISOLATE fault and REPAIR as necessary.
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.		No	→	Unable to duplicate or identify fault at this time. GO to Z1 .
• Disconnect PCM. • Key on. • Measure voltage between EGRVR and PWR GND circuits at the PCM harness connector. • 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. • Is a fault indicated?				

HE120**Test HF: Catalyst Efficiency Monitor and Exhaust Systems**

Catalyst Efficiency Monitor and Exhaust Systems

HF

Note

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)

For additional information on the Catalyst Efficiency Monitor, refer to Description and Operation, On Board Diagnostic II System.

For additional information on Exhaust Systems, refer to Description and Operation, Catalyst and Exhaust Systems.

Test Steps		Results	Action to Take
HF1	DTCs P0420 OR P0430: CHECK FOR MISFIRE DETECTION MONITOR DTCs		
NOTE 1: Be sure customer has not: (1) Refueled vehicle with leaded gasoline. (2) Noticed high vehicle oil consumption. (Engines that consume oil at a high rate will deposit high levels of phosphorus on the catalyst and reduce the catalyst efficiency) NOTE 2: If entering this Pinpoint Test for symptoms only, immediately GO to HF5 . NOTE 3: 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.		Yes	→ GO to Powertrain Diagnostic Trouble Code (DTC) Charts, to address the Misfire Detection Monitor DTCs.
• 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?		No	→ GO to HF2.

Note, Test HF1

Catalyst Efficiency Monitor and Exhaust Systems

HF

Test Steps		Results	Action to Take
HF2	CHECK FOR HO2S MONITOR DTCS		
	NOTE: 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. • 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 →	GO to Powertrain Diagnostic Trouble Code (DTC) Charts, to address the HO2S Monitor DTCS.
		No →	GO to HF3.
HF3	CHECK FOR ECT OR CHT SENSOR DTCS		
	Note: ECT or CHT 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 or CHT sensor DTCS recorded in HF1: P0117, P0118, P0125, P1117, P1285, P1288, P1289, P1290 and P1299?	Yes →	GO to Powertrain Diagnostic Trouble Code (DTC) Charts, to address the ECT or CHT 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 →	GO to Powertrain Diagnostic Trouble Code (DTC) Charts, to 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 (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). COMPLETE Catalyst Monitor OBD II Drive Cycle to verify repair (Refer to Diagnostic Methods, Drive Cycles).
		No →	No Electronic EC root causes related to the DTCS or symptoms. GO to HF6.

HF2 - HF5

Catalyst Efficiency Monitor and Exhaust Systems

HF

Test Steps		Results	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. • RETURN FUEL SYSTEM — Inspect the vacuum hose going to the fuel pressure regulator for proper installation and cracks. Repair as necessary. — Verify vacuum source to fuel pressure regulator. • MECHANICAL RETURNLESS FUEL SYSTEM — If applicable, inspect the vacuum hose going to the fuel rail pulse damper for proper installation and cracks. Repair as necessary. • Install fuel pressure gauge. NOTE: On Electronic Returnless Fuel System, the fuel pressure can be monitored by scan tool using the Fuel Rail Pressure (FRP) sensor PID. • 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. GO to Pinpoint Test HC and compare fuel pressure to the Fuel Pressure Delivery System Test Information/Specification Chart at the beginning of the pinpoint. • Key off. • Was the fuel pressure within specifications?	Yes → No →	Fuel pressure is OK. If applicable, REMOVE the fuel pressure gauge. GO to HF7. Fuel pressure is out of specification. GO to HC4, Fuel Delivery Systems in Pinpoint Tests for diagnosis.
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 → No →	GO to HF8. REPAIR the leak source(s). COMPLETE Catalyst Monitor OBD II Drive Cycle to verify repair (Refer to Diagnostic Methods, Drive Cycles).

HF6 - HF7

Catalyst Efficiency Monitor and Exhaust Systems

HF

Test Steps		Results	Action to Take
HF8	CHECK FOR OBVIOUS RESTRICTIONS IN THE EXHAUST SYSTEM		
	A slight pressure in the exhaust system is normal, but excessive exhaust back pressure seriously affects engine operation. Causes of high exhaust back pressure are dents or obstructions in the exhaust pipe, a plugged catalytic converter or muffler. - Inspect the following for dents, areas of collapsed material and unusual bending: - Front and rear exhaust pipes. - Catalytic converter. - Muffler/tailpipe assembly. Are the components free of dents and areas of collapsed or unusual bending or damaged?	Yes → No →	GO to HF9. REPAIR the restricted component(s) as necessary. COMPLETE Catalyst Monitor OBD II Drive Cycle to verify repair (Refer to Diagnostic Methods, Drive Cycles).
HF9	CHECK FOR EXCESSIVE EXHAUST BACK PRESSURE		
	- If available install a exhaust back pressure tester and follow tool manufacturer installation and testing instructions. Note: If no tester is available. GO to HF10 - Typical exhaust back pressure (when measured near the exhaust manifold and at normal engine operating temperature) should not exceed 20.7 kPa (3 PSI) at idle and 55.2 kPa (8 PSI) at WOT under load. Did exhaust back pressure test indicate a restriction?	Yes → No →	REPAIR the restricted component(s) as necessary. COMPLETE Catalyst Monitor OBD II Drive Cycle to verify repair (Refer to Diagnostic Methods, Drive Cycles). For further diagnosis of symptom (e.g. Lack of Power, Loss of Power, or No Start) REFER to Symptom Charts 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 Catalyst Monitor OBD II Drive Cycle to verify repair (Refer to Diagnostic Methods, Drive Cycles). For further diagnosis of symptom (e.g. Lack of Power, Loss of Power, or No Start) REFER to Symptom Charts.

HF8 - HF9

Catalyst Efficiency Monitor and Exhaust Systems

HF

Test Steps		Results	Action to Take
HF10	CHECK MANIFOLD VACUUM FOR INDICATION OF EXCESSIVE EXHAUST SYSTEM RESTRICTION		
	• Attach a vacuum gauge to the intake manifold vacuum source. • Monitor RPM with scan tool or tachometer. • Observe the vacuum gauge needle while completing the following: Note: The vacuum gauge reading may be normal when the engine is first started and idling. However, excessive restriction in the exhaust system will cause intake manifold vacuum to decrease with the engine at a steady/constant idle speed. — 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 HF11. Manifold vacuum did not reach an acceptable level. GO to HF12 to check for excessive restriction in the exhaust system.
HF11	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 HF12. 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 Catalyst Monitor OBD II Drive Cycle to verify repair (Refer to Diagnostic Methods, Drive Cycles). For further diagnosis of symptom (e.g. Lack of Power, Loss of Power, or No Start) REFER to Symptom Charts.

HF10 - HF11

Catalyst Efficiency Monitor and Exhaust Systems

HF

Test Steps		Results →	Action to Take
HF12	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. • GO to HF11 and repeat the vacuum measurement. • Did the vacuum needle QUICKLY rise above 54 kPa (16 inches-Hg) with the engine speed at 2000 rpm?	Yes → The exhaust system restriction is downstream of the exhaust manifold. RECONNECT exhaust system at exhaust manifold. GO to HF13. No → 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. COMPLETE Catalyst Monitor OBD II Drive Cycle to verify repair (Refer to Diagnostic Methods, Drive Cycles).	
HF13	CHECK MANIFOLD VACUUM WITH MUFFLER/TAILOPIPE ASSEMBLY DISCONNECTED FOR INDICATION OF A RESTRICTION		
	• Disconnect muffler/tailpipe assembly from the catalytic converter. • GO to HF11 to repeat the vacuum measurement. • Did the vacuum needle QUICKLY rise above 54 kPa (16 inches-Hg) with the engine speed at 2000 rpm?	Yes → There is a restriction in the muffler/tailpipe assembly. REPLACE the muffler/tailpipe assembly. COMPLETE Catalyst Monitor OBD II Drive Cycle to verify repair (Refer to Diagnostic Methods, Drive Cycles). No → There is a restriction in the catalytic converter. REPLACE the catalytic converter. INSPECT the muffler to be certain converter debris has not entered. COMPLETE Catalyst Monitor OBD II Drive Cycle to verify repair (Refer to Diagnostic Methods, Drive Cycles).	

HF12 - HF13

Positive Crankcase Ventilation (PCV) System

HG

Note

This Pinpoint Test is intended to diagnose only the following:

- Positive Crankcase Ventilation (PCV) valve (6A666) and related vacuum lines

Test Steps		Results	→	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. RETURN to Symptom Charts for other possible causes of vehicle symptoms.
		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. REFER to Evaporative Emissions System.
		No	→	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.

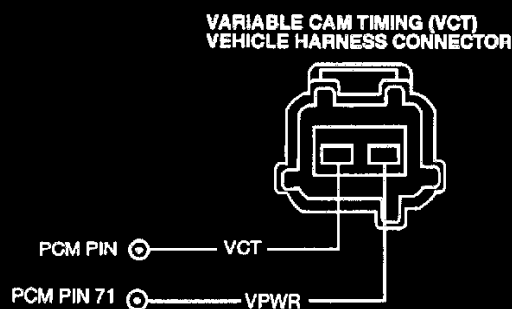
Note, Test HG1 - HG3

Test HK: Variable Cam Timing (VCT)

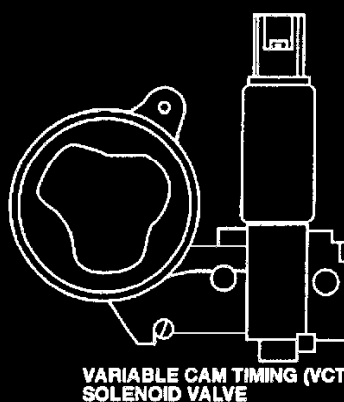
Variable Cam Timing (VCT)**HK****Note**

This Pinpoint Test is intended to diagnose the following:

- Powertrain Control Module (PCM) (12A650)
- Harness circuits: VCT and VPWR
- VCT Solenoid (6L713)

Pinpoint Test Schematic

**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**



AA4826-B

PCM CONNECTOR PINOUT

Application	VPWR	SIG RTN	PWR GND	VCT
2.0L Cougar	71	91	51/77/103	45
All others	71	91	51/77/103	44

Test Steps		Results	Action to Take
HK1	DTC P1380: CHECK FOR KOEO OR KOER DTC		
• Start engine and bring up to operating temperature. • Check for DTC P1380 during KOEO or KOER Self-Test. • Is DTC P1380 present during KOEO or KOER Self-Test?		Yes	→ KEY OFF. GO to HK2.
		No	→ Unable to duplicate or identify fault at this time. GO to Z1.

Note, Schematic, Table and Test HK1

Variable Cam Timing (VCT)**HK**

Test Steps		Results	Action to Take
HK2	CHECK VPWR VOLTAGE AT VCT SOLENOID VALVE HARNESS CONNECTOR		
	- Disconnect the VCT solenoid valve harness connector. - Key on. - Measure VCT circuit voltage at the VCT solenoid valve harness connector. - Is the voltage reading greater than 10.5 volts?	Yes No	→ KEY OFF. GO to HK3 . → KEY OFF. REPAIR VPWR circuit.
HK3	CHECK VCT CIRCUIT FOR OPEN IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Disconnect PCM. - Measure resistance of VCT circuit between PCM harness connector pin and the VCT solenoid valve harness connector. - Is the resistance less than 5.0 ohms?	Yes No	→ GO to HK4 . → REPAIR open circuit.
HK4	CHECK VCT CIRCUIT FOR SHORT TO GROUND AND VPWR IN HARNESS		
	- Measure resistance between VCT PCM Pin and PCM Pins VPWR, SIG RTN and PWR GND. - Is each resistance greater than 10,000 ohms?	Yes No	→ GO to HK5 . → REPAIR short to GND or PWR.
HK5	CHECK VCT SOLENOID VALVE COIL RESISTANCE		
	- Measure resistance of the VCT solenoid valve coil at the two connector terminals. - Is the resistance between 3.0 and 6.0 ohms?	Yes No	→ GO to HK6 . → REPLACE VCT solenoid valve assembly.
HK6	CHECK VCT SOLENOID VALVE FOR SHORT TO CASE		
	- Measure resistance between each connector terminal of the VCT solenoid valve and the solenoid body. - Is each resistance greater than 10,000 ohms?	Yes No	→ REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). → REPLACE VCT solenoid valve.
HK11	DTC P1381 AND P1383: CHECK VCT FOR PROPER OPERATION		
	- Key on. - Check for DTC P1381 or P1383 in KOER Self-Test. - Are P1381 or P1383 present during KOER Self-Test?	Yes No	→ KEY OFF. DTC P1381 or P1383 present. GO to HK12 . → KEY OFF. Unable to duplicate or identify fault at this time. GO to Z1 .

HK2 - HK11

Variable Cam Timing (VCT)**HK**

Test Steps		Results	→	Action to Take
HK12	CHECK CAMSHAFT TIMING			
• Verify camshaft timing. • Is the camshaft timing within specification?		Yes	→	Camshaft advance mechanism is seized. REPLACE camshaft advance mechanism. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
		No	→	REFER to Engine for proper direction in setting cam timing. RERUN Quick Test.

HK12

Test HM: Secondary Air Injection (AIR) System

Secondary Air Injection (AIR) System

HM

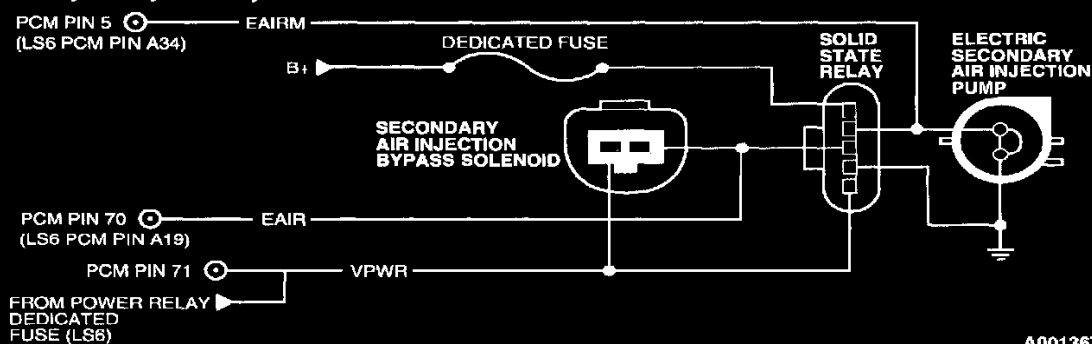
Note

This Pinpoint Test is intended to diagnose the following:

- Harness circuits: B+, EAIR, EAIR Monitor, Ground, AIRB
- Solid state relay (SSR) (2C013)
- Electric secondary air injection (AIR) pump (9A486)
- Secondary air injection (AIR) bypass solenoid (9H465)
- Powertrain control module (PCM) (12A850)
- Secondary air injection (AIR) diverter valve (9F491)
- Vacuum supply
- Air silencer (9H467)
- Secondary air injection (AIR) check valve (12A197)
- Hoses (9B460)
- Partial restricted exhaust

Pinpoint Test Schematics and Connectors

Secondary Air Injection System Connectors

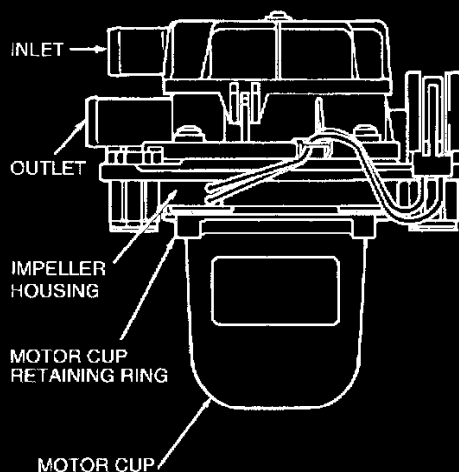


Note, Schematics and Connectors

Secondary Air Injection (AIR) System

HM

Electric AIR Pump



AA0919-B

Test Steps		Results	→	Action to Take
HM1	DTC P0412: CHECK B+ VOLTAGE TO SOLID STATE RELAY			
	- Disconnect SSR. - Key on, engine off. - Measure voltage of B+ circuit at SSR harness connector and battery negative post. Is voltage greater than 10.5 volts?	Yes	→	Supplied voltage is OK, GO to HM2 .
		No	→	GO to HM6 .
HM2	CHECK EAIR CIRCUIT FOR OPEN IN HARNESS			
	- Key off. - Disconnect AIR bypass solenoid. - Remove Secondary Air Injection System dedicated fuse temporarily. - Disconnect PCM. - Measure resistance of EAIR circuit between PCM harness connector pin and SSR harness connector and AIR bypass harness connector. Is resistance less than 5.0 ohms?	Yes	→	GO to HM3 .
		No	→	REPAIR open circuit.
HM3	CHECK EAIR CIRCUIT FOR SHORT TO POWER AND GROUND WITH DISCONNECTED AIR BYPASS SOLENOID			
	- Measure resistance between EAIR and VPWR circuits at the PCM harness connector. - Measure resistance between EAIR at the PCM harness connector and battery negative post. Is each resistance greater than 10,000 ohms?	Yes	→	The EAIR harness is OK. GO to HM4 .
		No	→	REPAIR short circuit.

Schematic, Test HM1 - HM3

Secondary Air Injection (AIR) System

HM

Test Steps		Results	Action to Take
HM4	CHECK AIR BYPASS SOLENOID RESISTANCE		
	- Disconnect AIR bypass solenoid harness connector. - Measure AIR bypass solenoid resistance. Is resistance between 50 and 100 ohms?	Yes → No →	GO to HM5 . REPLACE AIR bypass solenoid.
HM5	CHECK EAIR CIRCUIT FOR SHORT TO POWER AND GROUND WITH SOLID STATE RELAY RECONNECTED		
	- AIR bypass solenoid disconnected. - Reconnect solid state relay. - Measure resistance of EAIR circuit between VPWR and PWR GND circuits at the PCM harness connector. Is each resistance greater than 10,000 ohms?	Yes → No →	If DTC P0411 is present: GO to HM9 . All others: GO to HM16 . REPLACE solid state relay.
HM6	CHECK B+ CIRCUIT FOR OPEN IN HARNESS		
	- Measure resistance of B+ circuit between solid state relay harness connector and Secondary Air Injection System dedicated fuse. Is resistance less than 5.0 ohms?	Yes → No →	CHECK VPWR circuit for short to ground. REPLACE fuse. GO to HM8 to check electric AIR pump. RECONNECT solid state relay. REPAIR open circuit. RECONNECT solid state relay and fuse.
HM7	DTC P0411: VISUALLY INSPECT ELECTRIC AIR PUMP HOSES AND AIR SILENCER (9H467)		
	- Visually inspect electric AIR pump hoses from the electric AIR pump to the AIR diverter valves. - Visually inspect for damaged exhaust system. - Inspect air hose for cracks, binding, obstructions, water or ice. - Inspect Air silencer (9H467) for obstructions. Are electric AIR pump hoses and Air silencer (9H467) OK?	Yes → No →	GO to HM8 . DRAIN all water from hoses or REPLACE damaged parts.
HM8	CHECK ELECTRIC AIR PUMP OPERATION		
	- Key on, engine off. - Enter output test mode Does the pump run?	Yes → No →	KEY OFF. GO to HM17 to check electric AIR pump for water contamination. KEY OFF. Possible intermittent concern. GO to Z2 . If OK, GO to HM13 . CAUTION: RUNNING OUTPUT TEST MODE LONGER THAN TWO MINUTES MAY OVERHEAT/DAMAGE AIR PUMP.

HM4 - HM8

Secondary Air Injection (AIR) System

HM

Test Steps		Results	→	Action to Take
HM9	CHECK FOR VACUUM AT AIR DIVERTER VALVES	Yes No	→ →	GO to HM10. GO to HM32.
	- Connect a vacuum gauge to the control vacuum hose at the AIR diverter valve(s). - Apply 53kPa (16in-HG) of vacuum at the intake manifold side of the AIR bypass solenoid vacuum supply hose. - Key on, engine off. - Enter output test mode Is vacuum present at the AIR Diverter valve(s)?			
HM10	CHECK AIR DIVERTER VALVE(S) INTEGRITY	Yes No	→ →	KEY OFF. INSPECT the exhaust tubes from the AIR diverter valve to the exhaust manifold(s). If OK, GO to HM11. KEY OFF. INSPECT hose from electric AIR pump to AIR diverter valve(s). If OK, REPLACE the appropriate AIR diverter valve(s).
	CAUTION: Caution must be observed while performing this test. Note: On a two valve system make sure that air is flowing from both valves. - Disconnect air tube from AIR diverter valve(s) outlet side. - Inspect AIR diverter valve(s) outlets for damage from hot exhaust gases. Repair as necessary. - Apply 53kPa (16in-HG) of vacuum to the AIR diverter valve(s). - Key on, engine off. - Enter output test mode. Is air present from the AIR diverter valve(s)?			
HM11	CHECK MANIFOLD VACUUM WITH EXHAUST MANIFOLD DISCONNECTED FOR INDICATION OF A RESTRICTION	Yes No	→ →	The exhaust system restriction is downstream of the exhaust manifold. RECONNECT exhaust system at exhaust manifold. GO to HM12. 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.
	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. - Observe the rate of speed the vacuum gauge needle rises, while maintaining 2000 rpm. Note: 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. Did the vacuum needle QUICKLY rise above 54 kPa (16 inches-Hg) with the engine speed at 2000 rpm?			

HM9 - HM11

Secondary Air Injection (AIR) System

HM

Test Steps		Results	Action to Take
HM12	CHECK MANIFOLD VACUUM WITH MUFFLER/TAILOPIPE ASSEMBLY DISCONNECTED FOR INDICATION OF A RESTRICTION		
	- Disconnect muffler/tailpipe assembly from the catalytic converter. - GO to HM11 to repeat the vacuum measurement. - 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. There is a restriction in the catalytic converter. REPLACE the catalytic converter. INSPECT the muffler to be certain converter debris has not entered.
HM13	CHECK VOLTAGE ON EAIR MONITOR CIRCUIT		
	- Disconnect electric AIR pump. - Key on, engine off. - Enter output test mode. - Measure voltage of EAIR monitor circuit between electric AIR pump harness connector and battery negative post. - Is voltage greater than 10.5 volts?	Yes → No →	GO to HM15 . GO to HM14 .
HM14	CHECK ELECTRIC AIR PUMP GROUND CIRCUIT FOR OPEN IN HARNESS		
	- Measure resistance of EAP ground circuit between electric AIR pump harness connector and battery negative post. - Is resistance less than 5 ohms?	Yes → No →	GO to HM21 . REPAIR open circuit.
HM15	CHECK AIR HOSE TO ELECTRIC AIR PUMP		
	- Disconnect inlet air hose. - Visually inspect inlet air hose for binding, obstructions, water or ice to the electric AIR pump. - Is the hose integrity or orientation OK?	Yes → No →	GO to HM17 . DRAIN all water from air hose. REPLACE or RE-ORIENT hose as appropriate. GO to HM17 .
HM16	CHECK SOLID STATE RELAY OUTPUT		
	- Reconnect AIR bypass solenoid. - Connect PCM. - Key on, engine off. - Enter output test mode. - Access AIR PID. - Access AIRM PID. - Compare AIR and AIRM PIDs. - Were both PIDs on?	Yes → No →	REPLACE solid state relay. Possible intermittent concern. GO to Z2 . If no problem is found, REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

Secondary Air Injection (AIR) System

HM

Test Steps		Results	→	Action to Take
HM17	CHECK AIR PUMP FOR WATER			
	Note: Water ingested in the electric AIR pump will reduce the life of the pump. • Disconnect electric AIR pump connector and air hoses. • Carefully tilt electric AIR pump in various positions to verify if any water is present. • Is any water present?	Yes No	→ →	REPLACE electric AIR pump. If fuse was replaced, GO to HM6 , Testing is complete. All others, GO to HM9 .
HM19	DTC P1413: CHECK B+ CIRCUIT VOLTAGE TO SOLID STATE RELAY			
	• Disconnect solid state relay. • Key on. • Measure voltage of B+ circuit between solid state relay harness connector and chassis ground. • Is voltage greater than 10.5 volts?	Yes No	→ →	GO to HM20 . GO to HM26 .
HM20	CHECK VPWR VOLTAGE TO SOLID STATE RELAY			
	• Key on, engine off. • Measure VPWR circuit voltage at the solid state relay harness connector. • Is voltage greater than 10.5 volts?	Yes No	→ →	GO to HM21 . For LS6 : GO to B5 . All others: REPAIR open VPWR circuit between the solid state relay and Electronic Engine Control power relay.
HM21	CHECK VOLTAGE ON EAIR MONITOR CIRCUIT			
	• Reconnect solid state relay. • Disconnect electric AIR pump. • Key on, engine off. • Enter output test mode. • Access AIRM PID. • Is PID on?	Yes No	→ →	GO to HM25 . REMAIN in output test mode. If DTC P0411 is present, REPLACE electric AIR pump. GO to HM22 . REMAIN in output test mode.
HM22	CHECK EAIR MONITOR VOLTAGE TO PCM			
	• Key on, engine off. • Access AIRM PID. • Is PID on?	Yes No	→ →	KEY OFF. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). KEY OFF. GO to HM23 .

Secondary Air Injection (AIR) System

HM

Test Steps		Results	Action to Take
HM23	CHECK EAIR DRIVER AND EAIR MONITOR CIRCUITS FOR OPEN IN HARNESS		
	- Disconnect solid state relay. - Measure resistance of EAIR driver circuit between PCM harness connector and solid state relay harness connector. - Measure resistance of EAIR monitor circuit between PCM harness connector and solid state relay harness connector. - Measure resistance of EAIR monitor circuit between the solid state relay harness connector and the electric AIR pump harness connector. Is each resistance less than 5.0 ohms?	Yes → No →	GO to HM24 . REPAIR open circuit.
HM24	CHECK EAIR MONITOR CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Measure resistance between EAIR monitor and PWR GND circuit at the PCM harness connector. Is resistance greater than 10,000 ohms?	Yes → No →	REPLACE solid state relay. REPAIR short circuit.
HM25	CHECK EAIR MONITOR VOLTAGE TO PCM		
	- Reconnect electric AIR pump. - Reconnect PCM. - Key on, engine off. - Access AIRM PID. Is PID on?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open EAIR circuit.
HM26	CHECK B+ CIRCUIT FOR OPEN IN HARNESS		
	- Measure resistance of B+ circuit between solid state relay harness connector and dedicated fuse B+ circuit. Is resistance less than 5 ohms?	Yes → No →	REPLACE solid state relay dedicated fuse. REPAIR open circuit.
HM27	DTCP1414: CHECK EAIR MONITOR CIRCUIT FOR OPEN IN HARNESS		
	- Disconnect solid state relay. - Disconnect PCM. - Disconnect electric AIR pump. - Measure resistance of EAIR monitor circuit between PCM harness connector and electric AIR pump harness connector. Is resistance less than 5 ohms?	Yes → No →	GO to HM28 . REPAIR open circuit.
HM28	CHECK ELECTRIC AIR PUMP FOR OPEN		
	- Measure electric AIR pump resistance. Is resistance between 0.5-5.0 ohms?	Yes → No →	GO to HM29 . REPLACE electric AIR pump.

Secondary Air Injection (AIR) System

HM

Test Steps		Results	Action to Take
HM29	CHECK EAIR MONITOR CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Key on. - Measure voltage between PCM harness connector and chassis ground. Is voltage greater than 10.5 volts?	Yes → No →	REPAIR short circuit. EAIR Monitor circuit is OK. GO to HM30 .
HM30	CHECK SOLID STATE RELAY OUTPUT		
	- Reconnect AIR bypass solenoid. - Connect PCM. - Key on, engine off. - Enter output test mode. - Access AIR PID. - Access AIRM PID. - Compare AIR and AIRM PIDs. Were both PIDs on?	Yes → No →	REPLACE solid state relay. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
HM32	CHECK VACUUM HOSE INTEGRITY		
	- Key off. - Check vacuum hose between Intake manifold and AIR diverter valve(s). - Check for blockage and restrictions. - Check for leaks and cracks. - Check for kinks or disconnects. Are the above checks OK?	Yes → No →	GO to HM33 . REPLACE damaged vacuum hose.
HM33	CHECK AIR BYPASS SOLENOID ELECTRICAL OPERATION		
	- Key on, engine off. - Access Output Test Mode. - Disconnect AIR bypass solenoid. - Connect digital multimeter to AIR bypass solenoid vehicle harness connector. - Turn the outputs on, then turn outputs off while observing digital multimeter. Does EAIR circuit voltage cycle greater than 0.5 volt?	Yes → No →	REMAIN in Output Test Mode. GO to HM34 . Key off. GO to HM35 .
HM34	CHECK AIR BYPASS SOLENOID FOR MECHANICAL OPERATION		
	- Reconnect AIR bypass solenoid. - Disconnect source vacuum hose from AIR bypass solenoid. - Apply 53 kPa (16 in-Hg) of vacuum to source side of AIR bypass solenoid. - Turn the outputs on, then turn outputs off. Was vacuum released?	Yes → No →	REPAIR vacuum hose from manifold vacuum tree to AIR bypass solenoid. If OK, GO to Z2 . REPLACE AIR bypass solenoid.
HM35	CHECK AIR BYPASS SOLENOID RESISTANCE		
	- Disconnect AIR bypass solenoid harness connector. - Measure AIR bypass solenoid resistance. Is resistance between 50 and 100 ohms?	Yes → No →	GO to HM36 . REPLACE AIR bypass solenoid.

HM29 - HM35

Secondary Air Injection (AIR) System**HM**

Test Steps		Results →	Action to Take
HM36	CHECK VPWR CIRCUIT FOR OPEN IN HARNESS		
	• Key on, engine off. • Measure VPWR circuit voltage at the AIR bypass solenoid harness connector. • Is voltage greater than 10.5 volts?	Yes → No →	GO to HM37 . REPAIR open VPWR circuit (and dedicated fuse on LS6).
HM37	CHECK EAIR CIRCUIT FOR OPEN IN HARNESS		
	• Disconnect solid state relay. • Disconnect PCM. • Measure resistance of EAIR circuit between PCM harness connector and the AIR bypass solenoid harness connector and at the solid state relay harness connector. • Is resistance less than 5.0 ohms?	Yes → No →	GO to HM38 . REPAIR open EAIR circuit.
HM38	CHECK EAIR CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	• Measure resistance between EAIR and PWR GND circuits at the PCM harness connector. • Is resistance greater than 10,000 ohms?	Yes → No →	GO to HM39 . REPAIR short to ground.
HM39	CHECK EAIR CIRCUIT FOR SHORT TO POWER IN HARNESS		
	• Measure resistance between EAIR and PWR GND circuits at the PCM harness connector. • Is each resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short to power.

HM36 - HM39

Test HU: Intake Air Systems

Intake Air Systems

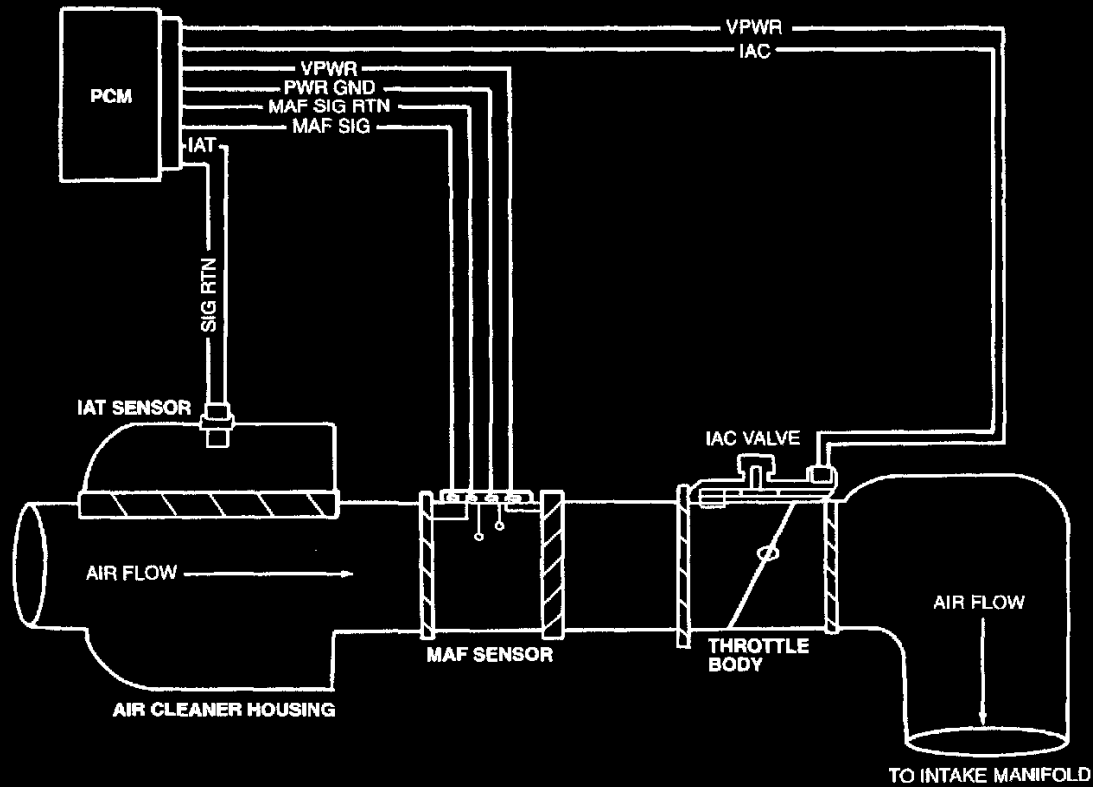
HU

Note

This Pinpoint Test is intended to diagnose the following:

- Throttle body assembly (9E926)
- Speed control cable (9A825)
- Accelerator cable linkage to throttle body (9C799)
- Air cleaner assembly (including air cleaner element)
- Air inlet tube
- Clean air tube hose and resonator (9R504)(9F593)
- Intake manifold runner control housing assembly (IMRC) (9U531) (9U524) and (9J447)
- IMRC actuator assembly (9J559)
- IMSC actuator assembly (9L492)
- Harness circuits: IMRC/IMSC, IMRC/IMSC Monitor, SIG RTN, PWR GND, VREF, VPWR
- Intake manifold tuning valve (IMT Valve) electric (9L490)
- Powertrain control module (PCM) (12A650)

Test Note

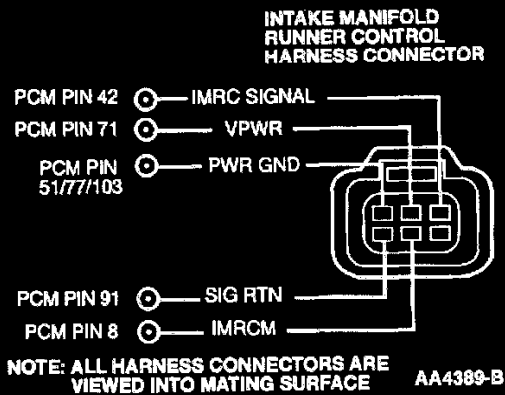
Intake Air Systems**HU****Pinpoint Test Schematics and Connectors****Intake Air System**

AA0844-A

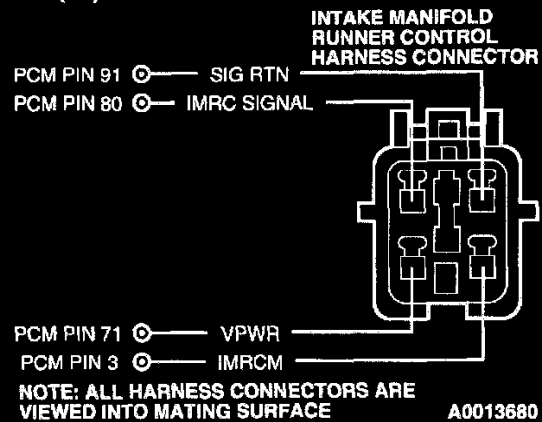
Intake Air Systems

HU

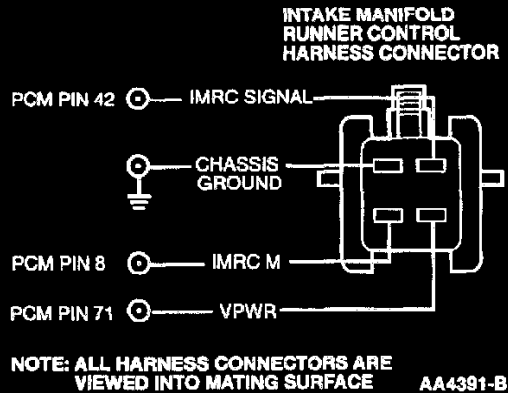
2.5L Cougar



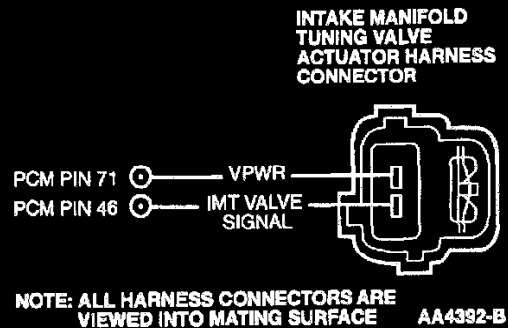
2.0L (2V) Focus/Escort



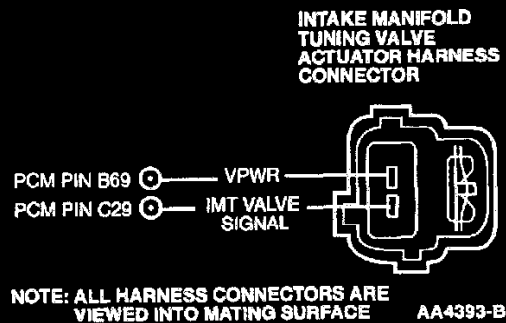
3.8L Mustang/Windstar, 4.2L E/F-Series



4.6L Expedition/F-Series, 5.4L E-Series, 4V Expedition/Navigator



3.0L LS6

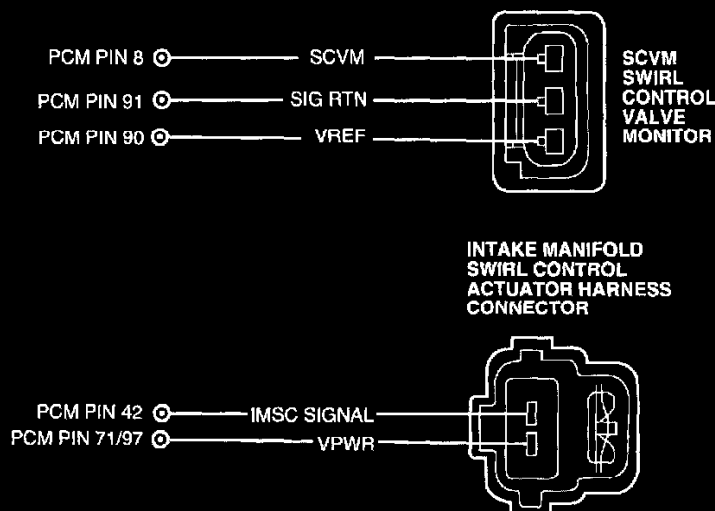


Test Schematic

Intake Air Systems

HU

2.3L (4V) Ranger



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0028390

Test Steps		Results →	Action to Take
HU1	CHECK FOR INCORRECT IDLE SPEED		
Note: Vehicle must be at operating temperature and at idle for a minimum of one minute. If here for a part throttle symptom, GO to HU4 .		Yes →	For a high idle concern, be sure throttle arm contacts return stop, then GO to HU6 . For other idle speed concerns, GO to HU7 .
• Key on, engine running. • Determine if idle speed is incorrect. Refer to the Typical Reference Value Charts in Reference Values, if necessary. • Read the vehicle tachometer (if equipped) or connect the scan tool to the data link connector (DLC) and view the rpm PID. • Is vehicle idle speed incorrect?		No →	KEY OFF. GO to HU2 .
HU2	CHECK FOR STICKING/BINDING CONDITION		
• Gently cycle throttle from fully closed to fully open and back to fully closed. Check for binding/sticking in travel. • Is a stick or bind condition present?		Yes →	GO to HU3 .
		No →	GO to HU4 .

Schematic, Test HU1 - HU2

Intake Air Systems

HU

Test Steps		Results	→	Action to Take
HU3	ISOLATE BINDING/STICKING CONCERN			
	- Disconnect accelerator cable and speed control cable from throttle body linkage. CAUTION: Do not attempt to clean the throttle bore and plate area. Cleaning will damage the throttle body assembly. Note: Sticking or binding condition can either be within cables or throttle body assembly. - Rotate throttle body linkage. Does the throttle body rotate freely without a sticking, binding or grabbing condition?	Yes	→	REPAIR cable(s) causing the concern.
		No	→	REPLACE throttle body assembly.
HU4	CHECK FUNCTIONALITY OF THE THROTTLE POSITION SENSOR			
	- Key on. - View TP V PID with the scan tool. - From closed throttle, slowly begin to press accelerator to wide open throttle. Did the TP V PID display a smooth reading during accelerator movement?	Yes	→	KEY OFF. GO to HU5 .
		No	→	REPLACE throttle position sensor.
HU5	CHECK FOR AIR CLEANER ELEMENT AND INLET FOR RESTRICTIONS			
	- Remove air cleaner element. Check for a plugged or dirty element. - Check for any restrictions along the air inlet path from the air inlet back to the throttle body. Are any restrictions present?	Yes	→	REPLACE air cleaner element or clear any restrictions.
		No	→	REINSERT original air cleaner element. GO to HU6 .
HU6	CHECK FOR A POSITIVE CRANK VENTILATION CONCERN			
	Note: A high idle may indicate incorrect PCV valve size or vacuum leak. - Inspect PCV valve connections for leaks or cracks. - Remove PCV valve and inspect for plugging or an incorrect valve. Is a PCV concern present?	Yes	→	REPLACE PCV valve or REPAIR leak or crack.
		No	→	For high idle, GO to HU9 , otherwise, RECONNECT PCV valve. GO to HU7 .
HU7	CHECK FOR IDLE AIR CONTROL VALVE RESPONSE			
	- Key on, engine running. - With vehicle at operating temperature and at idle for a minimum of one minute, disconnect the IAC valve harness connector. Did engine idle speed drop or nearly stall?	Yes	→	GO to HU8 .
		No	→	For a high idle with no idle speed drop when disconnecting IAC, GO to HU9 . For a low idle with no idle speed drop when disconnecting IAC, REPLACE the IAC valve.

Intake Air Systems

HU

Test Steps		Results →	Action to Take
HU8	INSPECT THROTTLE BODY PLATE HOLE FOR PLUGGING		
	Note: Only some applications have a throttle plate hole. If not equipped, return to symptom charts. • Detach resonator from throttle body assembly. • Inspect throttle plate hole for any restrictions. • Is the throttle plate hole restricted?	Yes → No →	CLEAR throttle plate hole. Return to Symptom Charts.
HU9	CHECK FOR VACUUM LEAKS		
	• Listen for vacuum leaks. • Inspect entire air intake 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. • Are any leaks detected?	Yes → No →	KEY OFF. REPAIR any leaks. REPLACE IAC valve if idle speed does not drop when disconnecting harness connector otherwise, KEY OFF. GO to HU10.
HU10	CHECK THROTTLE BODY FOR EXCESSIVE WEAR		
	• Remove throttle body assembly • Hold throttle body up to a light source. • Rotate the throttle lever to wide open throttle and inspect bore for excessive wear or grooving. • Rotate the throttle lever to closed throttle position while inspecting for misaligned or worn plate. Look for excessive gap between bore and plate area. • Is a concern detected?	Yes → No →	REPLACE throttle body. RETURN to Symptom Charts.

Intake Air Systems

HU

Test Steps		Results	→	Action to Take
HU15	DTCS P1516, P1517, P1518, P1519, P1520, P1537, P1538 VISUAL INSPECTION			
	Note: Refer to the PCM connector pin numbers in the beginning of the pinpoint test. - View linkage or cable routing. Check for any binding or improper routing. Cable core wire (if applicable) at IMRC/IMSC housing attachment must have slack and lever must contact close plate stop screw. For Focus, Escort, 2.3L Ranger and 4.2L E/F Series, a visual inspection may not be appropriate. GO to HU17. Refer to the IMRC/IMSC system description in Description and Operation, Intake Air and Throttle Body, for illustrations. Note: The IMRC/IMSC return springs are strong. Make sure the return springs operate properly and plates open and close fully. On vacuum operated systems engine must run for 20 seconds then return to KOEO for testing. - Manually open and close IMRC/IMSC plates at intake manifold and feel for sticking/binding. Is concern indicated?	Yes No	→ →	GO to HU16. GO to HU17.
HU16	PERFORM IMRC/IMSC PHYSICAL TEST			
	- Disconnect IMRC/IMSC linkage or cables(s) from runner(s) or remove actuator assembly for Focus/Escort. Note: IMRC/IMSC return springs are strong. - Rotate IMRC/IMSC lever(s) fully open to fully closed without obstruction and contacting closed stop screw. - Feel for sticking or binding during rotation and spring tension of approximately .34 to .45 Nm (3 to 4 lb-in). Is concern indicated?	Yes No	→ →	CLEAN or REPAIR runners. GO to HU38. REPLACE IMRC/IMSC actuator. GO to HU38.

Intake Air Systems

HU

Test Steps		Results	Action to Take
HU17	PERFORM IMRC/IMSC FUNCTIONAL TEST		
	- Connect scan tool to data link connector (DLC). - Key on, engine off. Note: All except Focus and 2.3L Ranger, if the IMRC/IMSC plates open immediately when the key is turned on with engine off, GO to HU23. For Focus and 2.3L Ranger, monitor IMRCM/SCVM PID or voltage. GO to HU23 if PID displays less than 1 volt. - Access Output Test Mode (OTM) (refer to Diagnostic Methods). WARNING: KEEP FINGERS CLEAR OF IMRC/IMSC LEVER/CABLE MECHANISM. - Turn all outputs on. - When IMRC/IMSC 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. For Focus/Escort and 2.3L Ranger, listen for IMRC/IMSC to actuate. Did the IMRC/IMSC lever(s) cycle from fully closed and remain fully open while all outputs were on?	Yes → No →	GO to HU25. GO to HU18.
HU18	CHECK IMRC/IMSC ACTUATOR VPWR CIRCUIT FOR AN OPEN IN HARNESS		
	- Disconnect IMRC/IMSC actuator harness connector. - Measure VPWR circuit voltage at the IMRC/IMSC actuator harness connector. Is IMRC/IMSC VPWR voltage greater than 10.5 volts?	Yes → No →	GO to HU19. For Focus/Escort, GO to HU20. KEY OFF. REPAIR open circuit. GO to HU38.
HU19	CHECK IMRC/IMSC GROUND CIRCUIT FOR OPEN IN HARNESS		
	- Measure voltage between ground and VPWR circuits at the IMRC/IMSC actuator harness connector. Is voltage greater than 10.5 volts?	Yes → No →	GO to HU20. REPAIR open circuit. GO to HU38.
HU20	VERIFY DRIVER CIRCUIT FUNCTION		
	- Access Output Test Mode (OTM) (refer to Diagnostic Methods). - Place a test lamp between VPWR and the IMRC/IMSC signal circuit at the IMRC/IMSC actuator harness connector. - Turn all outputs on. Did the test lamp cycle from off to on?	Yes → No →	KEY OFF. GO to HU32. KEY OFF. GO to HU21.

Intake Air Systems

HU

Test Steps		Results	Action to Take
HU21	CHECK IMRC/IMSC DRIVER CIRCUIT FOR OPEN IN HARNESS		
	- Disconnect PCM. - Measure resistance of IMRC/IMSC signal circuit between PCM harness connector and the IMRC/IMSC actuator harness connector. Is resistance less than 5 ohms?	Yes → No →	GO to HU22 . REPAIR open circuit. GO to HU38 .
HU22	CHECK IMRC/IMSC DRIVER CIRCUIT FOR SHORT TO VPWR IN HARNESS		
	- Key on, engine off. - Measure voltage between IMRC/IMSC signal circuit at the IMRC/IMSC actuator harness connector and ground. Is voltage less than 10.5 volts?	Yes → No →	Possible intermittent concern. GO to Z1 . REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)) after determining concern is not intermittent. GO to HU38 . REPAIR short circuit. GO to HU38 .
HU23	CHECK IMRC/IMSC DRIVER CIRCUIT FOR SHORT TO GROUND OR SHORT TO MONITOR CIRCUIT WITH PCM CONNECTED		
	- Key off. - Measure resistance between the IMRC/IMSC driver circuit to PWR GND and then to SIG RTN and then to the monitor circuit at the IMRC/IMSC harness connector. Are all resistances greater than 10,000 ohms?	Yes → No →	REPLACE IMRC/IMSC. GO to HU38 . GO to HU24 .
HU24	CHECK IMRC/IMSC DRIVER CIRCUIT FOR SHORT TO GROUND OR SHORT TO MONITOR CIRCUIT WITH PCM DISCONNECTED		
	- Disconnect PCM harness connector. - Measure the resistance between the IMRC/IMSC driver circuit to PWR GND and then to SIG RTN and then to the monitor circuit at the IMRC/IMSC harness connector. Are all resistances greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). GO to HU38 . REPAIR the appropriate circuit for short. GO to HU38 .
HU25	VIEW IMRC/IMSC MONITOR PID TO DETERMINE PATH FOR POSSIBLE SHORT		
	Note: All vehicles will display VREF for IMRCM/SCVM PID except 3.8L and 4.2L which will display approximately 2.5 volts. - With the scan tool, monitor the IMRCM/SCVM PID or voltage. Is the IMRCM/SCVM PID displaying either VREF or approximately 2.5 volts?	Yes → No →	GO to HU26 . GO to HU30 .

Intake Air Systems

HU

Test Steps		Results	→	Action to Take
HU26	CHECK IMRC/IMSC MONITOR PID TO DETERMINE A SHORT TO VPWR			
	- With the scan tool, monitor the IMRC/IMSC PID or voltage while in Output Test Mode. - Turn all output on. Is the IMRC/IMSC PID displaying less than 1 volt with all outputs on?	Yes	→	GO to HU27 .
		No	→	GO to HU32 .
HU27	CHECK IMRC/IMSC MONITOR CIRCUIT FOR SHORT TO VPWR AT IMRC/IMSC HARNESS CONNECTOR			
	- Disconnect IMRC/IMSC actuator harness connector. - Key on, engine off. - Measure voltage between monitor circuit at the IMRC/IMSC actuator harness connector and ground. Is voltage greater than 10.5 volts?	Yes	→	KEY OFF. GO to HU28 .
		No	→	KEY OFF. GO to HU29 .
HU28	CHECK IMRC/IMSC MONITOR CIRCUIT FOR SHORT TO POWER WITH PCM DISCONNECTED			
	- Key on, engine off. - Disconnect PCM. - Measure voltage between monitor circuit at the IMRC/SCVM harness connector and ground. Is voltage greater than 10.5 volts?	Yes	→	KEY OFF. REPAIR short circuit. GO to HU38 .
		No	→	KEY OFF. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). GO to HU38 .
HU29	CHECK MONITOR CIRCUIT FOR SHORT TO VPWR AT IMRC/IMSC ACTUATOR			
	- Measure actuator resistance between the monitor circuit and VPWR. Is resistance greater than 10,000 ohms?	Yes	→	Possible intermittent concern. GO to Z1 . REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)) after determining fault is not intermittent. GO to HU38 .
		No	→	REPLACE IMRC/IMSC actuator. GO to HU38 .
HU30	CHECK IMRC/IMSC MONITOR CIRCUIT SHORT TO GROUND			
	- Access the IMRCM/SCVM PID. - While viewing PID, disconnect the IMRC/SCVM harness connector. Did voltage change from less than 1 volt to VREF when disconnecting the IMRC/SCVM harness connector?	Yes	→	KEY OFF. REPLACE IMRC/IMSC actuator. GO to HU38 .
		No	→	KEY OFF. GO to HU31 .

Intake Air Systems

HU

Test Steps		Results	Action to Take
HU31	CHECK IMRC/IMSC MONITOR CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	• Disconnect PCM. • Measure resistance between IMRC/IMSC monitor and ground (if applicable) and SIG RTN pins at the IMRC actuator harness or SCVM harness connector. • Is resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). GO to HU38 . REPAIR short circuit. GO to HU38 .
HU32	CHECK MONITOR CIRCUIT RESPONSE		
	• Disconnect IMRC actuator or SCVM harness connector. • With the scan tool, monitor the IMRCM/SCVM PID or voltage. • Connect a jumper lead from the IMRC/IMSC monitor pin to ground at the harness connector. • Did the IMRCM/SCVM PID voltage cycle from VREF to less than 1 volt when inserting the jumper?	Yes → No →	KEY OFF. GO to HU33 . KEY OFF. GO to HU36 .
HU33	CHECK SIG RTN OR CHASSIS GROUND CIRCUIT CONTINUITY WITH PCM CONNECTED		
	• Measure resistance of SIG RTN or chassis ground circuit between IMRC/IMSC actuator harness or SCVM harness connector and B-. • Is resistance less than 5 ohms?	Yes → No →	GO to HU34 . GO to HU35 .
HU34	CHECK MONITOR CIRCUIT FOR INTERMITTENT OPEN		
	• Measure resistance of monitor line while wiggling and bending harness from IMRC/SCVM harness connector to PCM harness connector. • Is the resistance fluctuating while checking the harness?	Yes → No →	REPAIR intermittent open circuit. GO to HU38 . REPLACE IMRC actuator or IMSC actuator. GO to HU38 .
HU35	CHECK SIG RTN OR CHASSIS GROUND CIRCUIT CONTINUITY WITH PCM DISCONNECTED		
	• Disconnect PCM from harness connector. • Measure resistance of SIG RTN or chassis ground circuit between PCM harness connector and IMRC/IMSC actuator harness connector. • Is resistance less than 5 ohms?	Yes → No →	Possible intermittent concern. GO to Z1 . REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)) after determining concern is not intermittent. GO to HU38 . REPAIR open circuit. GO to HU38 .

Intake Air Systems

HU

Test Steps		Results	Action to Take
HU36	CHECK MONITOR CIRCUIT FOR OPEN IN HARNESS		
	- Disconnect PCM from harness connector. - Measure resistance of IMRC/IMSC monitor circuit between PCM harness connector and IMRC actuator or SCVM harness connector. Is resistance less than 5 ohms?	Yes → No →	GO to HU37 . REPAIR open circuit. GO to HU38 .
HU37	CHECK MONITOR CIRCUIT FOR INTERMITTENT OPEN		
	- Measure resistance of monitor line while wiggling and bending harness from IMRC/SCVM harness connector to PCM harness connector. Is the resistance fluctuating while checking the harness?	Yes → No →	REPAIR intermittent open. GO to HU38 . REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). GO to HU38 .
HU38	IMRC/IMSC REPAIR VERIFICATION DRIVE CYCLE		
	- Key on, engine off. - Connect scan tool to data link connector (DLC) - Complete PCM reset. - Access IMRC/IMSC and IMRCM/SCVM PIDs or voltage. - Drive vehicle, obeying all traffic and safety laws. - Safely perform three accelerations from stop to more than 3500 rpm. - Watch for PIDs or voltage to change. - Perform Quick Test (refer to Powertrain Diagnostic Trouble Code (DTC) Charts). Are any DTCs received?	Yes → No →	GO to Powertrain Diagnostic Trouble Code (DTC) Charts. PASSED IMRC/IMSC Drive cycle. No IMRC/IMSC concern is present at this time.
HU65	DTC P1549: PERFORM VISUAL INSPECTION		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Inspect IMT Valve System. Check to be sure the harness is intact and the connector is firmly in place. Is fault indicated?	Yes → No →	REPAIR as necessary. VERIFY a symptom no longer exists. Passed visual inspection. GO to HU66 .

Intake Air Systems

HU

Test Steps		Results	Action to Take
HU66	CHECK PCM DRIVER COMMAND		
Note: Vehicle must be driven if rev limiter does not allow 3500 rpm in the bay. • Connect scan tool to data link connector (DLC). • Key on, engine running. • Access IMTV PID. • Increase engine speed slowly to about 4000 rpm while observing IMTV PID. • Does PID read 100% then drop to 50% while rpm was above 3500?		Yes	→ KEY OFF. Passed test. GO to HU67 .
		No	→ REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). VERIFY a symptom no longer exists.
HU67	CHECK IMT VALVE ACTUATOR VPWR CIRCUIT FOR OPEN IN HARNESS		
• Disconnect harness connector from the actuator. • Key on, engine off. • Measure VPWR circuit voltage at the harness connector. • Was the voltage greater than 10.5 volts?		Yes	→ KEY OFF. Passed check. GO to HU69 .
		No	→ REPAIR IMT valve actuator VPWR circuit for open. VERIFY a symptom no longer exists.
HU69	CHECK FOR OPEN SIGNAL CIRCUIT BETWEEN PCM AND IMT VALVE ACTUATOR		
• Disconnect PCM. • Measure resistance of Circuit between PCM test pin 46 and actuator harness connector. • Is the resistance less than 5.0 ohms?		Yes	→ Passed test. GO to HU70 .
		No	→ REPAIR IMT Valve Actuator Signal Circuit open. VERIFY a symptom no longer exists.
HU70	CHECK IMT VALVE ACTUATOR 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	→ Passed check. GO to HU71 .
		No	→ REPAIR IMT Valve actuator signal circuit for short to PWR GND. VERIFY a symptom no longer exists.
HU71	CHECK IMT VALVE ACTUATOR SIGNAL CIRCUIT FOR SHORT TO VPWR		
• Key on, engine off. • Measure voltage between PCM test pin 46 and 77 or 103. • Is the voltage less than 1 volt?		Yes	→ KEY OFF. Passed check. GO to HU72 .
		No	→ REPAIR IMT Valve actuator signal circuit for short to VPWR. VERIFY a symptom no longer exists.

Intake Air Systems**HU**

Test Steps		Results	→	Action to Take
HU72	CHECK PCM DRIVER FOR IMT VALVE ACTUATOR			
	- Reconnect PCM. - Connect test lamp 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) (Refer to scan tool instruction manual). - Command all outputs on. Was the test lamp off before commanding all outputs on and on with all outputs on?	Yes	→	KEY OFF. Passed test. GO to HU73 .
		No	→	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). VERIFY a symptom no longer exists.
HU73	CHECK IMT VALVE SHUTTER FOR DAMAGE			
	Remove IMT Valve	Yes	→	Damaged shutter. REPLACE IMT valve. VERIFY a symptom no longer exists.
	- Visually inspect IMT valve shutter for damage. - Rotate shutter by hand. Does the shutter bind or appear damaged?	No	→	Passed test. Leave IMT Valve disassembled. GO to HU74 .
HU74	CHECK IMT VALVE ACTUATOR FOR COIL DAMAGE			
	- Reconnect IMT valve harness connector. - Key on, engine off. - Access Output Test Mode (OTM) (Refer to scan tool instruction manual). - Command all outputs on. Did the IMT valve shutter rotate when commanding all outputs on?	Yes	→	Passed check. Fault is intermittent. GO to Z1 .
		No	→	REPLACE IMT valve actuator. VERIFY a symptom no longer exists.

HU72 - HU74

Test HX: Evaporative Emission (EVAP) Monitor and System

Evaporative Emission (EVAP) Monitor and System

HX

Note

Enter this Pinpoint Test only when directed here.

The use of a soap solution, such as SNOOP, around the fuel filler cap or the use of the hydrocarbon emission analyzer to determine an evaporative emission system leak is not recommended. The mandatory Rotunda Evaporative Emission System Leak Tester for OBD II (including the ultra-sonic tester) and the Rotunda Vacutec 522 Leak Detector Smoke Machine are the only devices to be used at this time for evaporative emission system leak detection.

This Pinpoint Test is intended to diagnose the following:

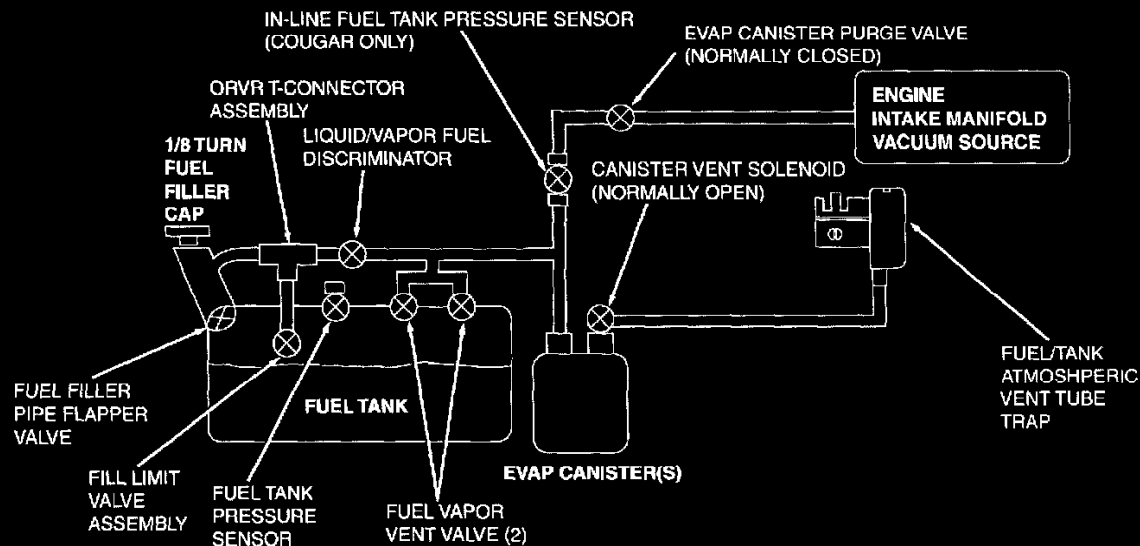
- Canister vent (CV) solenoid (9F945)
- Fuel filler cap (9030)
- Fuel tank pressure (FTP) sensor (9C052)
- In-line fuel tank pressure (FTP) sensor (9C052)
- EVAP canister purge valve (9C915)
- Harness circuits: CV, FLI, FTP, EVAP Canister Purge Valve, SIG RTN, vehicle power (VPWR), reference voltage (VREF) and power ground (PWR GND)
- Powertrain control module (PCM) (12A650)

Test Note

Evaporative Emission (EVAP) Monitor and System

HX

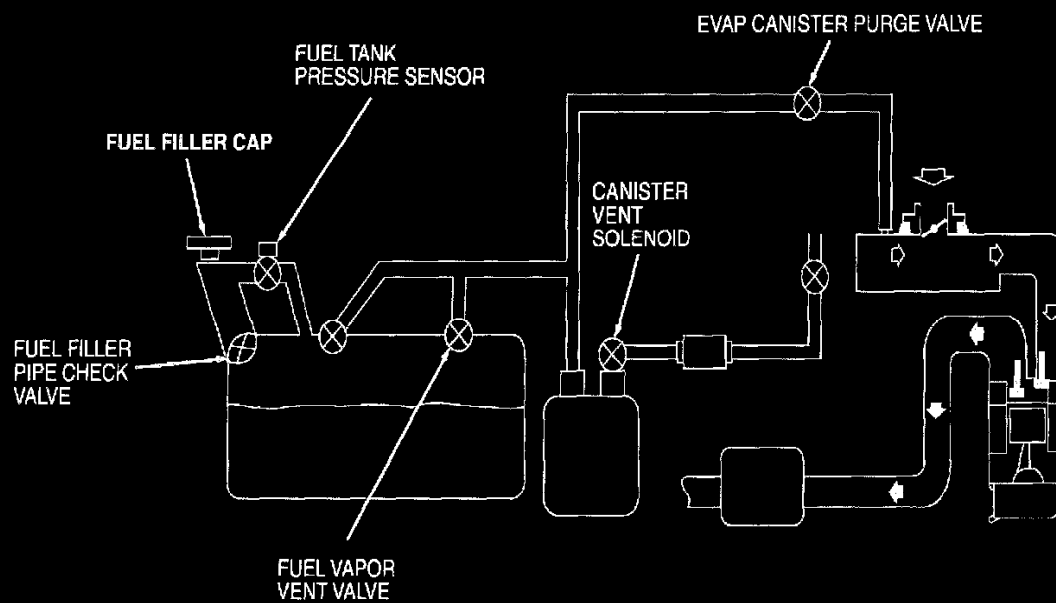
Pinpoint Test Schematics and Connectors

Focus, Escort, Cougar

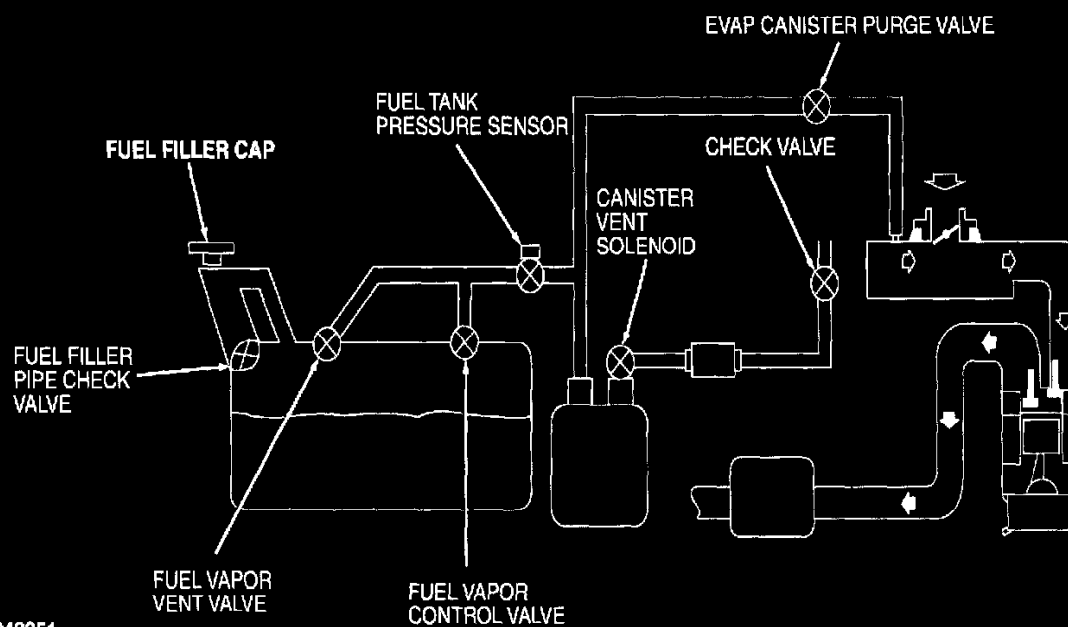
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0041359

Evaporative Emission (EVAP) Monitor and System

HX**Escape 2.0L****A0042253****Test Schematic**

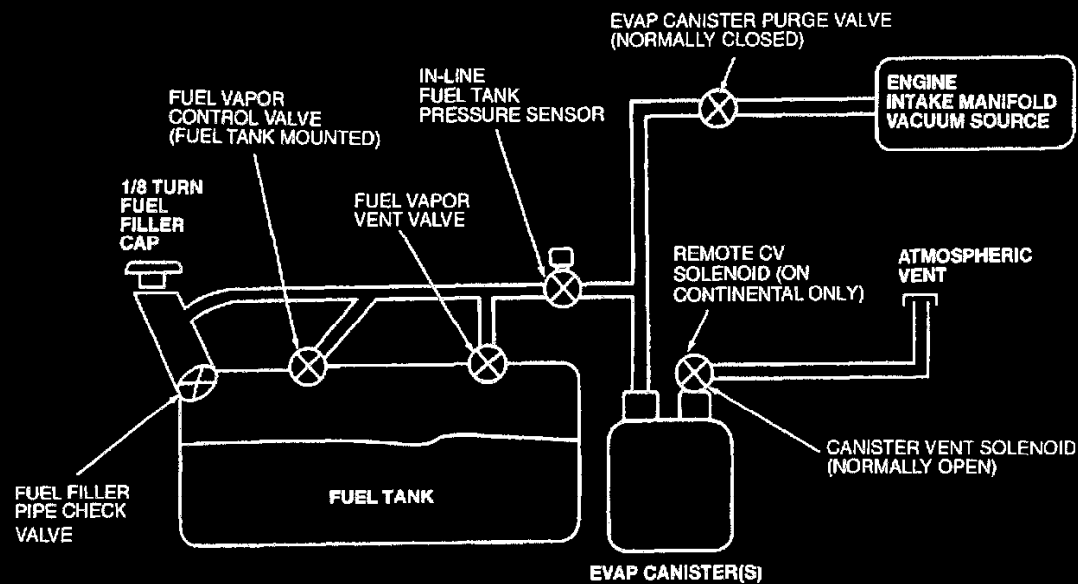
Evaporative Emission (EVAP) Monitor and System

HX**Escape 3.0L**

A0042251

Test Schematic

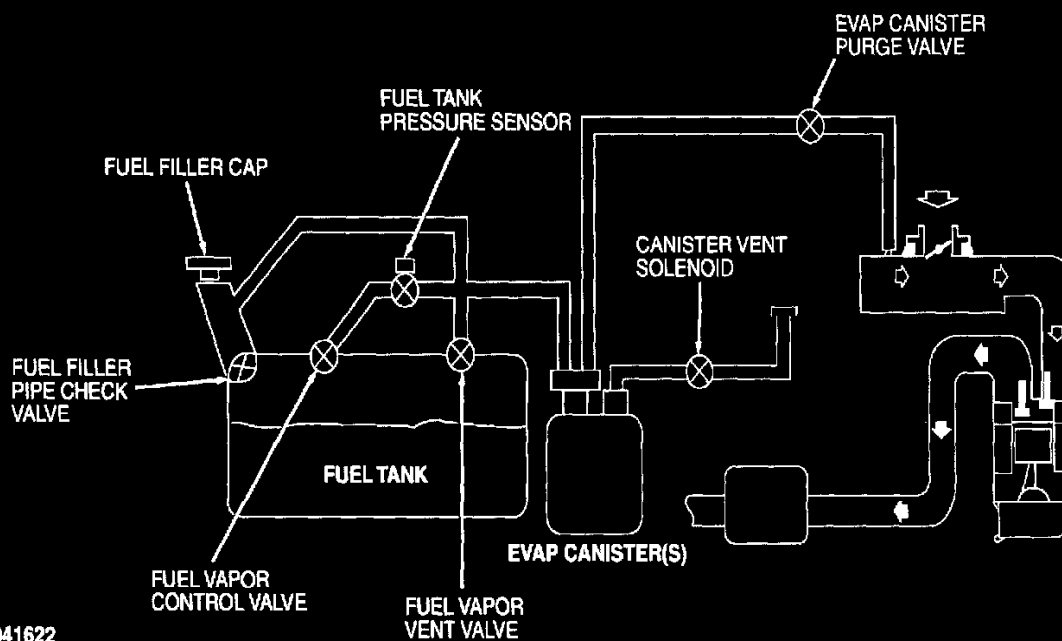
Evaporative Emission (EVAP) Monitor and System

HX**Mustang, Taurus/Sable, Crown Victoria/Grand Marquis, Town Car**

AA4841-A

Test Schematic

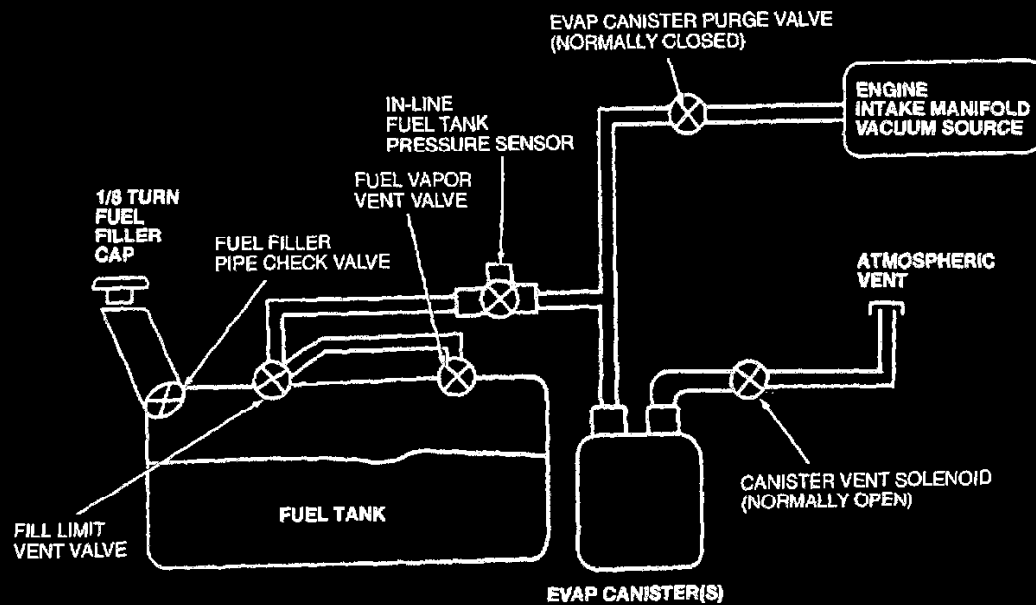
Evaporative Emission (EVAP) Monitor and System

HX**Continental**

A0041622

Test Schematic

Evaporative Emission (EVAP) Monitor and System

HX**LS6/LS8, Thunderbird**

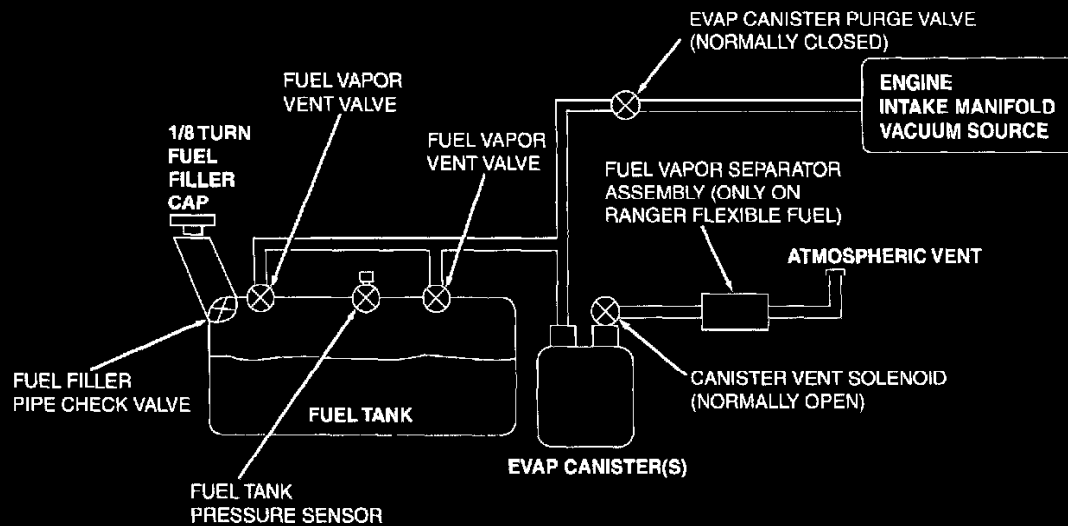
AA4836-A

Test Schematic

Evaporative Emission (EVAP) Monitor and System

HX

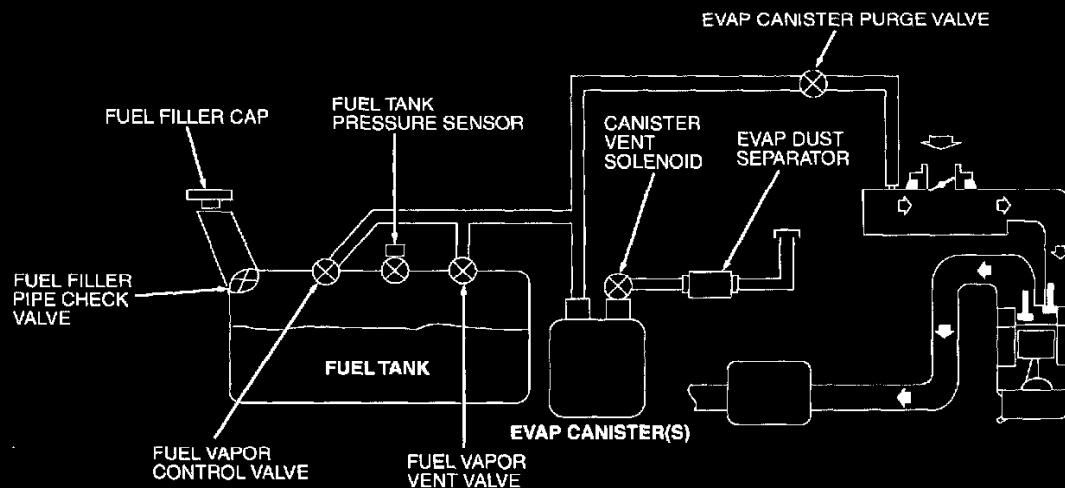
Ranger, Explorer Sport/Sport Trac, F-Series, E-Series/Club Wagon, Expedition/Navigator/Blackwood, Excursion



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0041358

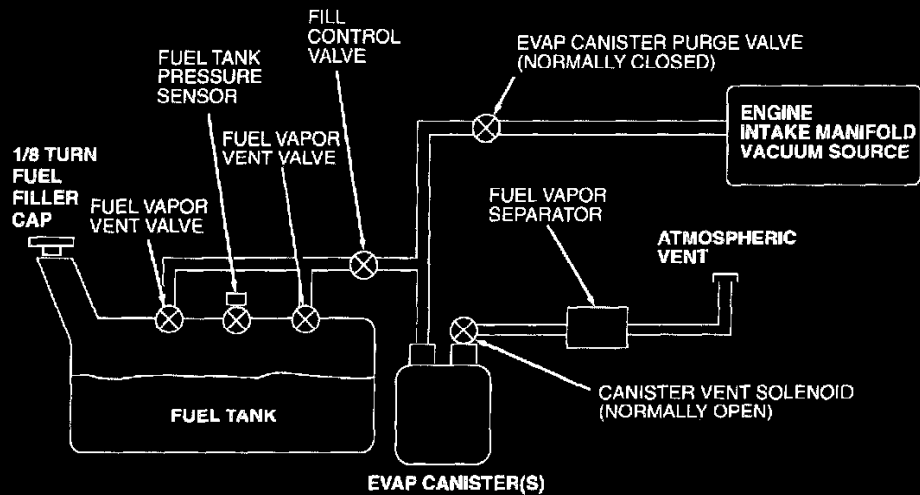
Explorer/Mountaineer



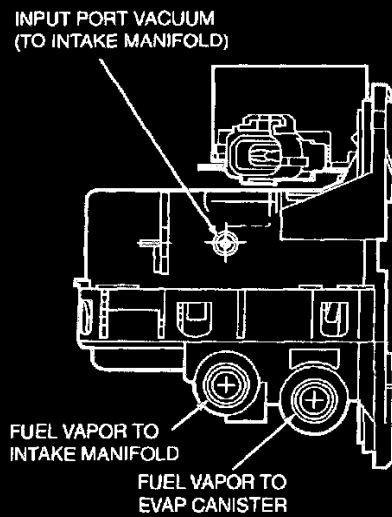
A0041623

Test Schematic

Evaporative Emission (EVAP) Monitor and System

HX**Windstar**

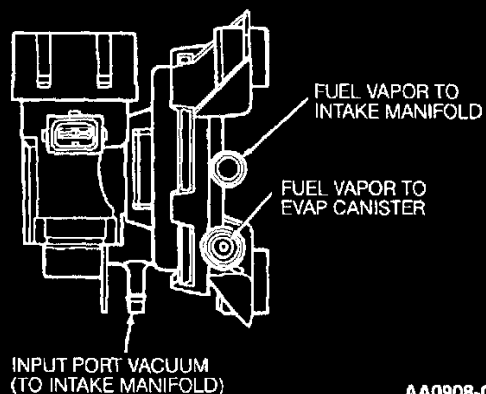
A0018470

Focus, 2.0L (4V) Escort, Taurus/Sable, Mustang, LS6/LS8, Thunderbird

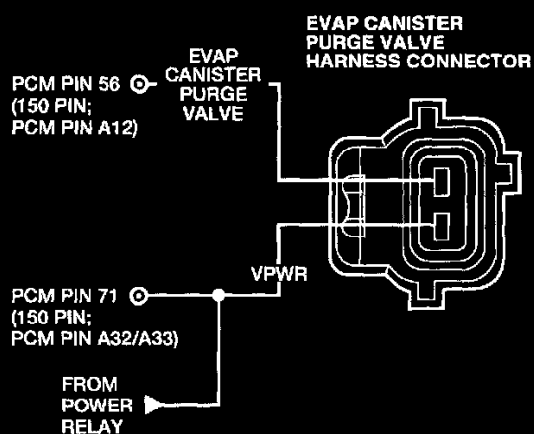
AA4837-A

Test Schematic

Evaporative Emission (EVAP) Monitor and System

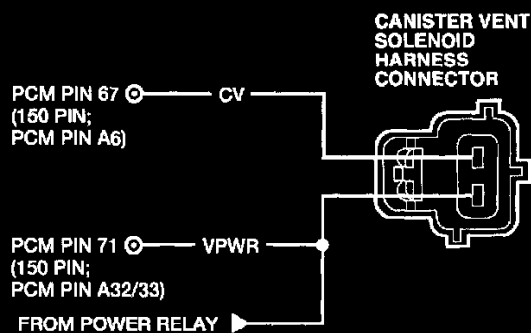
HX**All Others**

AA0908-C



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0027486

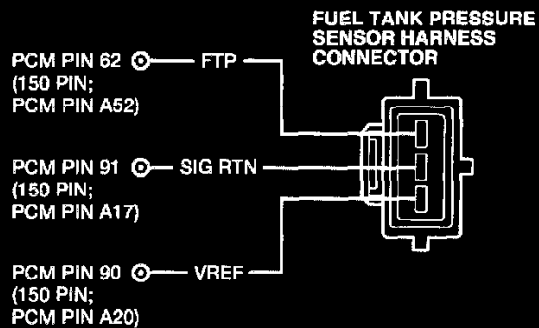


NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

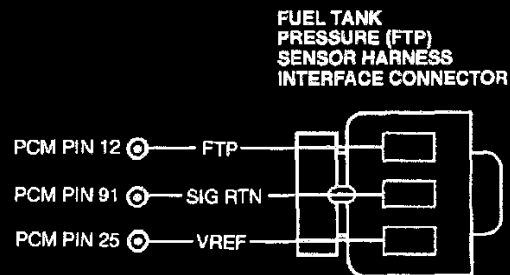
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Test Schematic

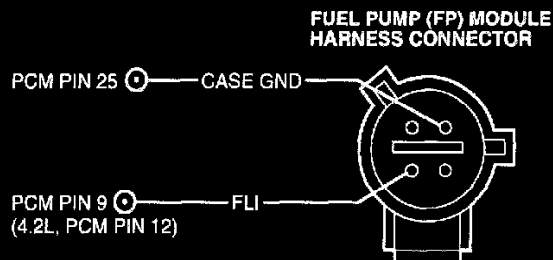
Evaporative Emission (EVAP) Monitor and System

HX

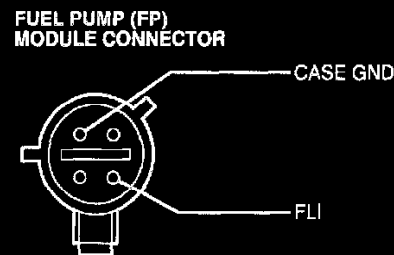
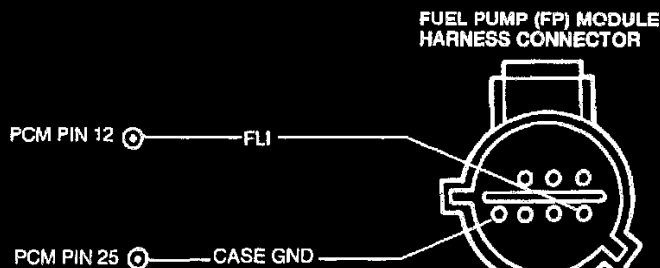
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
A0030342

Escort

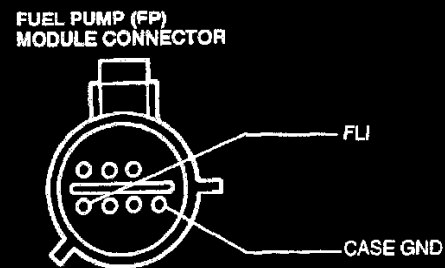
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
AA4831-A

E-Series

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
A0042273

**3.0L Ranger FFV**

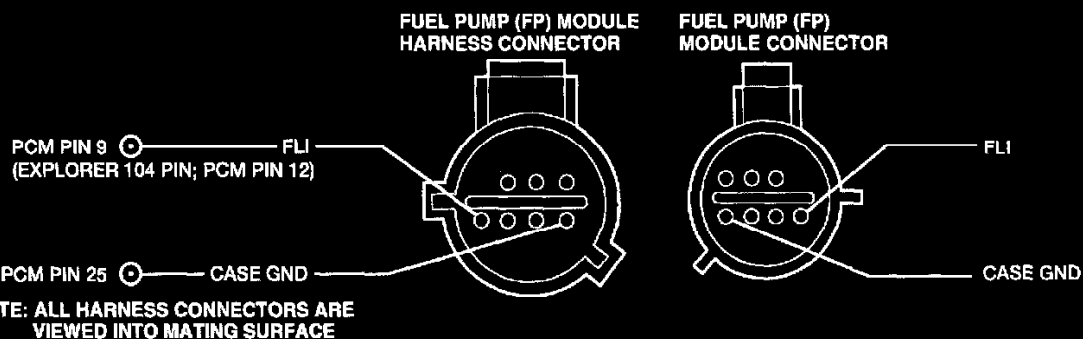
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE



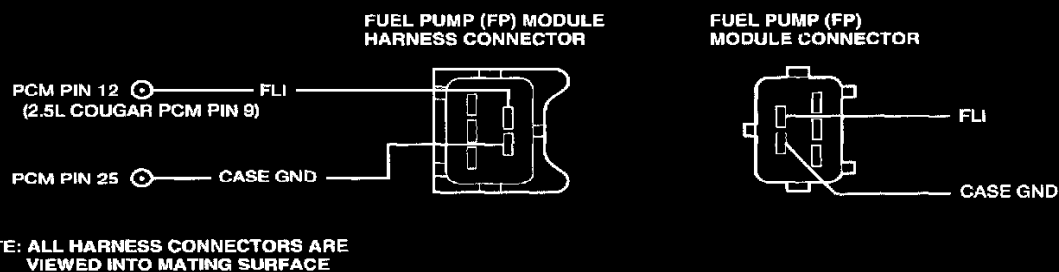
AA0917-C

Test Schematic

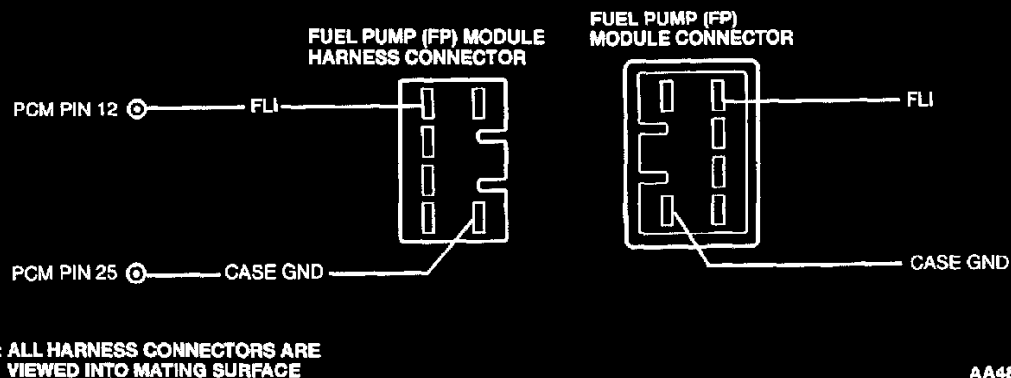
Evaporative Emission (EVAP) Monitor and System

HX**Taurus/Sable, Crown Victoria/Grand Marquis, Continental, Explorer Sport/Sport Trac, Ranger**

A0027493

Cougar

A0027485

Escort

AA4840-A

Test Schematic

Evaporative Emission (EVAP) Monitor and System

HX

Charts and Tables

Fuel Cap Off Indicator Lamp PCM Pin Number Table

Applications	PCM Pin
Focus	46
Escort	79
Taurus/Sable, Explorer Sport/Sport Trac, Ranger	82
Crown Victoria/Grand Marquis	20
F150 (except Lightning)	70

Test Steps		Results	Action to Take
HX1	DTC P0443: INSPECT EVAP CANISTER PURGE VALVE CIRCUIT FOR INTERMITTENT FAILURE		
	• 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 Z1. If OK REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). GO to HX2.
HX2	DTC P0443: CHECK VPWR VOLTAGE TO EVAP CANISTER PURGE VALVE		
	• 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. • Is voltage greater than 10.5 volts?	Yes → No →	KEY OFF. GO to HX3. REPAIR open circuit.
HX3	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 resistance. • Is resistance between 30 and 38 ohms?	Yes → No →	GO to HX4. REPLACE damaged EVAP canister purge valve. COMPLETE an Evaporative Emission Leak Check Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).

Evaporative Emission (EVAP) Monitor and System

HX

Test Steps		Results	Action to Take
HX4	CHECK EVAP CANISTER PURGE VALVE CIRCUIT FOR OPEN IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Disconnect PCM. - Measure resistance of EVAP canister purge valve circuit between PCM harness connector pin and EVAP canister purge valve harness connector. Is resistance less than 5.0 ohms?	Yes → No →	GO to HX5. REPAIR open circuit.
HX5	CHECK EVAP CANISTER PURGE VALVE CIRCUIT FOR SHORT TO PWR GND IN HARNESS		
	- Disconnect scan tool from DLC. - Measure resistance between EVAP canister purge valve circuit at the EVAP canister purge valve harness connector and battery negative post. Is resistance greater than 10,000 ohms?	Yes → No →	GO to HX6. REPAIR short circuit.
HX6	CHECK EVAP CANISTER PURGE VALVE CIRCUIT FOR SHORT TO VPWR IN HARNESS		
	- Key on, engine off. - Measure voltage between EVAP canister purge valve circuit at the EVAP canister purge valve harness connector and battery negative post. Is voltage greater than 10.5 volts?	Yes → No →	REPAIR short circuit. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
HX18	DTCP1450: CHECK FOR VISUAL CAUSES OF EXCESSIVE FUEL TANK VACUUM		
	Note: If the EVAP canister-CV solenoid and fuel tank assemblies are not accessible during this pinpoint test step, GO to Evaporative Emissions System for removal instructions. - 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.

HX4 - HX18

Evaporative Emission (EVAP) Monitor and System

HX

Test Steps		Results	Action to Take
HX19	CHECK FUEL TANK PRESSURE SENSOR VOLTAGE		
	- Connect scan tool. - Key on, engine off. - Access FTP V PID. Is the FTP V PID between 2.40 to 2.80 volts with the fuel filler cap on?	Yes →	A possible intermittent condition on the FTP sensor circuit can cause the DTC P1450. GO to Z1. If circuit is OK, REFER to Evaporative Emissions System, Diagnostic Trouble Code/Symptom Chart for a blocked (plugged) EVAP system condition.
		No →	KEY OFF. GO to HX20.
HX20	CHECK FUEL TANK PRESSURE SENSOR VOLTAGE WITH FUEL FILLER CAP REMOVED		
	- Remove the fuel filler cap. - Key on, engine off. - Access FTP V PID. Is the FTP V PID between 2.40 to 2.80 volts with fuel filler cap off?	Yes →	REFER to Evaporative Emissions System for a blocked (plugged) EVAP system condition.
		No →	KEY OFF. GO to HX21.
HX21	CHECK FOR OTHER DTCS PRESENT		
	- Check for other three wire sensor DTCS (KOEO, KOER or Continuous Memory) present with the DTC P1450. Are other DTCS present?	Yes →	RETURN to Diagnostic Subroutines, for direction in addressing the other DTCS.
		No →	KEY OFF. GO to HX22.
HX22	CHECK VREF FROM PCM TO FTP SENSOR		
	- Disconnect FTP sensor. - Key on, engine off. - Measure voltage between VREF and SIG RTN circuits at the FTP sensor harness connector. Is voltage between 4.0 and 6.0 volts?	Yes →	KEY OFF. REPLACE damaged FTP sensor. CLEAR Continuous Memory DTCS. FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE an Evaporative Emission Leak Check Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). RETRIEVE Continuous Memory DTCS. If DTC P1450 is still present, REFER to Evaporative Emissions System, Diagnostic Trouble Code/Symptom Chart.
		No →	KEY OFF. GO to HX23.

HX19 - HX22

Evaporative Emission (EVAP) Monitor and System

HX

Test Steps		Results	Action to Take
HX23	CHECK FOR OPEN VREF AND SIG RTN CIRCUITS BETWEEN PCM AND FTP SENSOR		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Disconnect PCM. • Measure resistance of VREF circuit between PCM harness connector pin and FTP sensor harness connector. • Measure resistance of SIG RTN circuit between PCM harness connector pin and FTP sensor harness connector. • Is each resistance less than 5.0 ohms?	Yes → No →	REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuit.
HX26	DTC P0452: CHECK FOR FTP SENSOR CONNECTOR CONTAMINATION		
	• Key off. • Visually check for liquid fuel contamination of the FTP sensor electrical connector. • Check for completely submerged FTP sensor (tank mounted type only) 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. GO to HX27.
HX27	CHECK FOR LOW FTP SENSOR VOLTAGE		
	• 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. • Connect scan tool. • Key on, engine off. • Access FTP V PID. • If FTP V PID is not present on the scan tool, measure voltage between FTP and SIG RTN circuits at the PCM harness connector with PCM connected. • Is measured voltage or FTP V PID reading less than 0.22 volt?	Yes → No →	KEY OFF. GO to HX28. The fault that produced the DTC P0452 is intermittent. GO to Z1.

Evaporative Emission (EVAP) Monitor and System

HX

Test Steps		Results	→	Action to Take
HX34	CHECK FTP CIRCUIT FOR SHORT TO POWER	Yes No	→ →	KEY OFF. The FTP is indicating a short to VPWR. GO to HX35 . KEY OFF. GO to HX36 .
	- Disconnect FTP sensor. - Key on, engine off. - Measure voltage between FTP circuit at the FTP sensor harness connector and battery negative post. Is the voltage greater than 10.5 volts?			
HX35	CHECK FTP CIRCUIT FOR SHORT TO VPWR IN HARNESS	Yes No	→ →	REPAIR short circuit. REPLACE PCM. (REFER to Diagnostic Methods, Flash EEPROM.)
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Disconnect PCM. - Key on, engine off. - Measure the voltage between FTP circuit at the PCM harness connector and battery negative post. Is voltage greater than 10.5 volts?			
HX36	CHECK OPPOSITE INDUCED LOW FTP SIGNAL	Yes No	→ →	REMOVE jumper. GO to HX37 . Unable to induce opposite signal. KEY OFF. GO to HX39 .
	- 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 to HX41. - Access FTP V PID. - If FTP V PID is not present on the scan tool, measure voltage between FTP and SIG RTN circuits at the PCM harness connector with PCM connected. Is measured voltage or FTP V PID reading less than 0.10 volt?			
HX37	CHECK FOR IN RANGE VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS AT FTP SENSOR	Yes No	→ →	KEY OFF. GO to HX38 . VREF voltage is out of range. GO to C1 .
	- Key on, engine off. - Measure voltage between VREF and SIG RTN circuits at the FTP sensor vehicle harness connector. Is voltage between 4.0 and 6.0 volts?			

HX34 - HX37

Evaporative Emission (EVAP) Monitor and System

HX

Test Steps		Results	Action to Take
HX38	CHECK FTP CIRCUIT FOR SHORT TO VREF IN SENSOR OR HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Disconnect PCM. • Measure resistance between FTP and VREF circuits at the PCM harness connector. (For 150PIN PCM, measure to both VREF pins.) • Is the resistance greater than 10,000 ohms?	Yes → No →	REPLACE FTP sensor. RESTORE vehicle. FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE an Evaporative Emission Leak Check Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). REPAIR short circuit.
HX39	CHECK FTP CIRCUIT FOR OPEN IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Disconnect PCM. • Measure resistance of FTP circuit between PCM harness connector pin and FTP sensor harness connector. • Is resistance less than 5.0 ohms?	Yes → No →	GO to HX40. REPAIR open circuit.
HX40	CHECK FOR OPEN SIG RTN CIRCUIT BETWEEN PCM AND FTP SENSOR		
	• Measure resistance of SIG RTN circuit between PCM harness connector pin and FTP sensor harness connector. • Is resistance less than 5.0 ohms?	Yes → No →	GO to HX41. REPAIR open circuit.
HX41	CHECK FTP CIRCUIT FOR SHORT TO VREF IN PCM		
	• PCM disconnected. • Measure resistance between FTP and VREF circuits at the PCM harness connector. (For 150 PIN PCM, measure to both VREF pins.) • Is the resistance greater than 10,000?	Yes → No →	REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.

HX38 - HX41

**Evaporative Emission (EVAP) Monitor
and System****HX**

Test Steps		Results	Action to Take
HX43	DTC P0457: CHECK FOR MISSING OR LEAKING FUEL FILLER CAP		
• Check for missing fuel filler cap. • Check for a loose fuel filler cap. • Check for possible cross-thread fuel filler cap condition. • Is a concern present with the proper installation of the fuel filler cap?		Yes	→ REPLACE cross-threaded or damaged fuel filler cap. RECONNECT and TIGHTEN the fuel filler cap only one-eighth turn so that the cap initially clicks by sound or touch. COMPLETE PCM KAM Reset to clear DTCs and adaptive memory. (REFER to Diagnostic Methods). COMPLETE an Evaporative Emission Leak Check Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). RERUN Quick Test. If DTC P0455 is present, REFER to Evaporative Emissions System, Diagnostic Trouble Code/Symptom Chart.
		No	→ COMPLETE PCM KAM Reset to clear DTCs and adaptive memory. (REFER to Diagnostic Methods). COMPLETE an Evaporative Emission Leak Check Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). RERUN Quick Test. If DTC P0455 is present, REFER to Evaporative Emissions System, Diagnostic Trouble Code/Symptom Chart. Otherwise, INFORM the vehicle owner that it is important and necessary to immediately install the fuel filler cap after every refueling event.

HX43

Evaporative Emission (EVAP) Monitor and System

HX

Test Steps		Results	Action to Take
HX65	DTC P1451: CHECK VPWR VOLTAGE TO CV SOLENOID		
	• Key off. • Disconnect canister vent (CV) solenoid. • Connect a non-powered test lamp between CV and VPWR circuits at the CV solenoid harness connector. • Key on, engine off. • Attempt to close and open CV solenoid driver in PCM by accessing Output Test Mode. • Select ALL OFF mode. • Cycle START button ON and OFF, and observe the test lamp. • Does the test lamp cycle on and off (light up and turn off)?	Yes → No →	KEY OFF. GO to HX66 . For test lamp always off: GO to HX67 . For test lamp always on: KEY OFF. GO to HX70 .
HX66	CHECK CV SOLENOID RESISTANCE		
	• Measure CV solenoid resistance. • Is resistance between 48 and 65 ohms?	Yes → No →	Unable to identify fault at this time. GO to Z1 . REPLACE damaged CV solenoid. COMPLETE an EVAP system leak test at the evaporative test port to VERIFY that a leak did not occur during component replacement. FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE an Evaporative Emission Leak Check Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
HX67	CHECK FOR OPEN VPWR CIRCUIT BETWEEN CV SOLENOID AND POWER RELAY		
	• Measure voltage between VPWR circuit at the CV solenoid harness connector and battery negative post. • Is voltage greater than 10.5 volts?	Yes → No →	KEY OFF. GO to HX68 . KEY OFF. REPAIR open circuit.
HX68	CHECK VPWR CIRCUIT FOR OPEN IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Disconnect PCM. • Measure resistance of VPWR circuit between PCM harness connector pin (or for 150 PIN PCM, the VPWR fuse to the power relay) and CV solenoid harness connector. • Is resistance less than 5.0 ohms?	Yes → No →	GO to HX69 . REPAIR open circuit.

Evaporative Emission (EVAP) Monitor and System

HX

Test Steps		Results	Action to Take
HX69	CHECK CV CIRCUIT FOR OPEN IN HARNESS		
	- Measure resistance of CV circuit between PCM harness connector pin and CV solenoid harness connector. Is resistance less than 5.0 ohms?	Yes → No →	KEY OFF. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuit.
HX70	CHECK CV CIRCUIT FOR SHORT TO PWR GND IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Disconnect PCM. - Disconnect scan tool from DLC. - Measure resistance between CV circuit at the CV solenoid harness connector and battery negative post. Is resistance greater than 10,000 ohms?	Yes → No →	RECONNECT scan tool. GO to HX71 . REPAIR short circuit.
HX71	CHECK CV CIRCUIT FOR SHORT TO PWR OR CHASSIS GND IN HARNESS		
	- Key on, engine off. - Measure voltage between CV circuit at the PCM harness connector and chassis ground. Is voltage less than 1.0 volt?	Yes → No →	KEY OFF. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). KEY OFF. REPAIR short circuit to VPWR, VREF or chassis ground.
HX76	DTC P0460: CHECK FUEL TANK LEVEL		
	Note: For Focus, Escape, Mustang, LS6/LS8, Thunderbird, Town Car, Windstar, Explorer/Mountaineer, 4.6L/5.4L E-Series, F-Series, Expedition/Navigator, Excursion and Blackwood applications, go to Instrument Panel, Gauges and Warning Indicators. - Key on, engine off. - Observe and record fuel gauge reading. - Access fuel level input (FLI) PID. Are both the fuel gauge and the FLI PID indicating between slightly above one-third (33% on FLI PID) and three quarters (75% on the FLI PID) filled?	Yes → No →	GO to HX78 . KEY OFF. INSPECT fuel tank for leaks. REPAIR fuel tank if necessary. CHECK for a damaged fuse for the fuel pump (FP) to fuel gauge circuit. For a damaged fuse without a DTC P0460: CHECK for CASE GND short to VPWR circuit. GO to B1 or GO to X1 (CCRM applications). For fuel gauge inoperative without a DTC P0460: REFER to Instrument Panel, Gauges and Warning Indicators. For DTC P0460: GO to HX77 .

Evaporative Emission (EVAP) Monitor and System

HX

Test Steps		Results	Action to Take
HX77	CHECK FOR INADEQUATE FUEL LEVEL		
	- Key on, engine off. - Observe both the fuel gauge and FLI PID. - If fuel level is under one third (33% on FLI PID), add fuel (7.57 to 11.36 liters) to the fuel tank. - If fuel level is greater than three quarters (75% on FLI PID), drain (7.57 to 11.36 liters) fuel from the fuel tank. - Did either the fuel gauge or FLI PID indicate a movement upward or downward as the fuel is either added or drained?	Yes → No →	DRIVE vehicle and RERUN Quick Test for DTCs. If DTC P0460 is still present, GO to HX78. KEY OFF. GO to HX79.
HX78	CHECK FLI CIRCUIT VOLTAGE		
	- Key on, engine running. - Access FLI V PID. - Is voltage or FLI V PID reading between 1.23 and 2.25 volts?	Yes → No →	KEY OFF. For Continental: GO to HX87. For All others: GO to HX86. KEY OFF. GO to HX79.
HX79	CHECK FUEL PUMP MODULE RESISTANCE		
	- Disconnect fuel pump (FP) module (refer to FP module pigtail connector at the beginning of this pinpoint test). - Measure resistance between FLI and CASE GND pins on the FP module (at pigtail). - Is resistance between 15 and 160 ohms?	Yes → No →	GO to HX80. CHECK for stuck fuel level float on fuel pump (FP) module. REPAIR as necessary. If free movement is present, REPLACE fuel pump module assembly.
HX80	CHECK FLI CIRCUIT VOLTAGE AT FP MODULE		
	- Disconnect the instrument cluster connector to the fuel gauge. (For Blackwood application, refer to Instrument Panel, Gauges and Warning Indicators; for all other applications, refer to Instrument Panel, Gauges and Warning Indicators or Vehicle/Diagrams for cluster connector configuration.) - Key on, engine off. - Measure voltage between FLI circuit at the FP module harness connector and battery negative post. - Is voltage greater than 5 volts?	Yes → No →	KEY OFF. GO to HX81. KEY OFF. GO to HX82.
HX81	CHECK FLI CIRCUIT FOR SHORT TO VPWR IN HARNESS		
	- Disconnect PCM. - Key on, engine off. - Measure voltage between FLI circuit at the FP module harness connector and battery negative post. - Is voltage greater than 10.5 volts?	Yes → No →	REPAIR short circuit. REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

HX77 - HX81

Evaporative Emission (EVAP) Monitor and System

HX

Test Steps		Results	Action to Take
HX82	CHECK FLI CIRCUIT FOR SHORT TO PWR GND IN HARNESS		
	- Disconnect PCM. - Measure resistance between FLI circuit at the PCM harness connector and battery negative post. Is resistance greater than 10,000 ohms?	Yes → No →	For Continental: GO to HX84 . For All others: GO to HX83 . REPAIR short circuit.
HX83	CHECK FLI CIRCUIT FOR SHORT TO CASE GND IN HARNESS		
	- Measure resistance between FLI and CASE GND circuits at the PCM harness connector. Is resistance greater than 10,000 ohms?	Yes → No →	GO to HX85 . REPAIR short between FLI and CASE GND circuits.
HX84	CHECK FLI CIRCUIT FOR SHORT TO CASE GND IN HARNESS ON CONTINENTAL		
	- Measure resistance between fuel level input Pin 4 and fuel level return Pin 28 at the virtual image instrument cluster harness connector at the fuel gauge. (Refer to the Vehicle/Diagrams, fuel pump module to fuel gauge.) - Measure resistance between fuel level input Pin 4 and fuel logic ground Pin 27 at the virtual image instrument cluster harness connector at the fuel gauge. (Refer to the Vehicle/Diagrams, PCM to fuel gauge.) Is each resistance greater than 10,000 ohms?	Yes → No →	GO to HX85 . REPAIR short between FLI and fuel level return circuits or FLI and fuel logic ground circuits.
HX85	CHECK FLI CIRCUIT FOR OPEN IN HARNESS		
	- Measure resistance of FLI circuit between PCM harness connector and fuel pump (FP) module (pigtail) harness connector. - Measure resistance of FLI circuit between PCM harness connector and the instrument cluster fuel gauge harness connector. Is each resistance less than 10.0 ohms?	Yes → No →	For Continental: GO to HX87 . For All others: GO to HX86 . REPAIR open circuit.

HX82 - HX85

Evaporative Emission (EVAP) Monitor and System

HX

Test Steps		Results	→	Action to Take
HX86	CHECK CASE GND CIRCUIT FOR OPEN IN HARNESS			
	- Measure resistance of CASE GND circuit between PCM harness connector and FP module (pigtail) harness connector. - Measure resistance between the CASE GND circuit at the PCM harness connector and the fuel gauge ground at the instrument cluster fuel gauge harness connector. Is each resistance less than 10.0 ohms?	Yes	→	For Blackwood application and for all other applications, REFER to Instrument Panel, Gauges and Warning Indicators (reference: Vehicle/Diagrams) for fuel gauge diagnosis. REPLACE fuel gauge or REPAIR as necessary. Then RERUN Quick Test. If DTC P0460 is still present, REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
		No	→	REPAIR open circuit.
HX87	CHECK CASE GND CIRCUIT FOR OPEN IN HARNESS ON CONTINENTAL			
	- Measure resistance of CASE GND circuit between PCM harness connector Pin 25 and virtual image instrument cluster harness connector Pin 27 at the fuel gauge. - Measure resistance between CASE GND pin at FP module (pigtail) harness connector and virtual image instrument cluster harness connector Pin 28 at the fuel gauge. Is each resistance less than 10,000 ohms?	Yes	→	For Blackwood application and for all other applications, REFER to Instrument Panel, Gauges and Warning Indicators (reference: Vehicle/Diagrams) for fuel gauge diagnosis. REPLACE fuel gauge or REPAIR as necessary. Then RERUN Quick Test. If DTC P0460 is still present, REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
		No	→	REPAIR open circuit.

Evaporative Emission (EVAP) Monitor and System

HX

Test Steps		Results	→	Action to Take
HX88	CHECK FUEL CAP LAMP ALWAYS ON W/O DTCS			
	• Disconnect PCM. • Key on, engine off. • Is the Check Fuel Cap Indicator Lamp OFF with the PCM disconnected?	Yes	→	KEY OFF. REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
		No	→	The PCM has not attempted to ground the circuit between the Check Fuel Cap Indicator Lamp and corresponding PCM pin. This has not turned the indicator lamp ON. For Blackwood application and for all other applications, REFER to Instrument Panel, Gauges and Warning Indicators.
HX89	CHECK FUEL CAP LAMP ALWAYS OFF W/O DTCS			
	• Key off. • Disconnect the Check Fuel Cap Indicator Lamp harness connector at the instrument cluster. • Disconnect PCM. • Measure resistance between PCM harness connector pin (refer to Fuel Cap Off Indicator Lamp PCM Pin Table at the beginning of this pinpoint test for correct pin number) and Check Fuel Cap circuit at the indicator lamp harness connector. • Is resistance less than 5.0 ohms?	Yes	→	For Blackwood application and for all other applications, REFER to Instrument Panel, Gauges and Warning Indicators to diagnose instrument cluster and Check Fuel Cap Bulb. If OK, REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). VERIFY repair by turning key to ON position (lamp will turn OFF in 3 seconds).
		No	→	REPAIR open circuit. VERIFY repair by turning key to ON position (lamp will turn OFF in 3 seconds).

HX88 - HX89

Test HY: Generator/Regulator System

Generator/Regulator System

HY

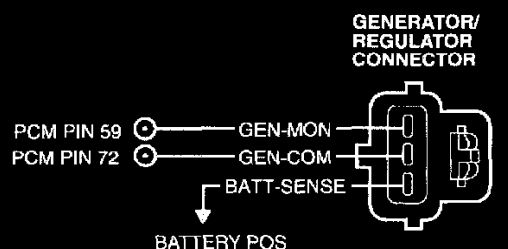
Note

This Pinpoint Test is intended to diagnose the following:

- Generator/Regulator
- Generator/Regulator harness circuits: GEN-MON, GEN-COM, BATT-SENSE
- PCM

Pinpoint Test Schematics and Connectors

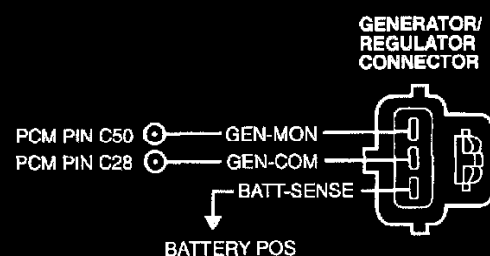
Focus, 2.0L Escape



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0014026

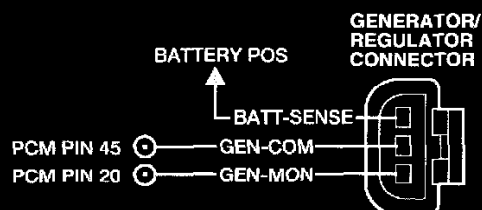
LS6/LS8, Thunderbird



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

AA4843-A

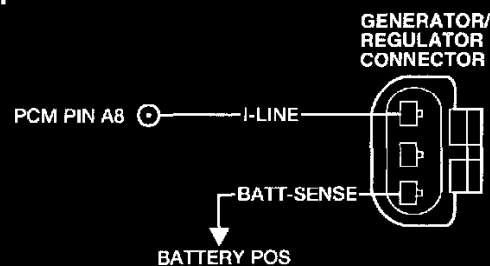
Taurus/Sable, Windstar



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0041619

Explorer



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0041620

Note, Schematics and Connectors

Generator/Regulator System**HY**

Test Steps		Results →	Action to Take
HY1	DTC P1246: VERIFY GENERATOR DRIVE FUNCTION		
	• Check generator drive belt condition. • Check generator drive belt tension. • Start engine, verify generator turning. • Does generator turn?	Yes → No →	GO to HY2 . REFER to Charging System.
HY2	VERIFY CHARGING SYSTEM IS EEC CONTROLLED		
	• Key off. • Disconnect battery terminals at battery. • Disconnect generator harness connector and measure resistance between battery-sense and gen-com pin at the generator. • Is resistance between 950 and 1050 ohms?	Yes → No →	GO to HY3 . REPLACE generator/regulator assembly.
HY3	CHECK BATTERY-SENSE VOLTAGE AT BATTERY		
	• Reconnect generator. • Reconnect battery. • Is battery voltage at battery-sense circuit pin at the generator/regulator harness connector within plus or minus 0.5 volt of battery voltage?	Yes → No →	GO to HY4 . REPAIR battery-sense circuit.
HY4	CHECK GENERATOR FAILURE MODE		
	• All electrical load off. • Access the GFSF PID. • Increase engine speed to 2,000 rpm. • Perform wiggle test. • Is a failure indicated?	Yes → No →	GO to HY5 . REFER to Charging System.
HY5	CHECK GEN-MON AND GEN-COM CIRCUIT FOR SHORT TO POWER		
	• Key off. • PCM and generator/regulator disconnected. • Key on. • Measure voltage between gen-com signal pin at the PCM harness connector and chassis ground. • Measure voltage between gen-mon signal pin at the PCM harness connector and chassis ground. • Is each voltage greater than 0.5 volt?	Yes → No →	KEY OFF. REPAIR short circuit. KEY OFF. GO to HY6 .
HY6	CHECK GEN-MON AND GEN-COM CIRCUIT FOR SHORT TO GROUND		
	• Measure resistance between the gen-com signal pin at the PCM harness connector and chassis ground. • Measure resistance between the gen-mon signal pin at the PCM harness connector and chassis ground. • Is resistance greater than 10,000 ohms?	Yes → No →	GO to HY7 . REPAIR short circuit.

HY1 - HY6

Generator/Regulator System**HY**

Test Steps		Results	Action to Take
HY7	CHECK GEN-MON AND GEN-COM CIRCUIT FOR OPEN		
	- Measure resistance of the gen-com circuit between the generator/regulator harness connector and the PCM harness connector. - Measure resistance of the gen-mon circuit between the generator/regulator connector and the PCM harness connector. Is each resistance less than 5.0 ohms?	Yes → No →	GO to HY8 . REPAIR open circuit.
HY8	CHECK GENERATOR MONITOR SIGNAL		
	- Engine idling. - Access GFS PID. Is duty cycle between 6-98%?	Yes → No →	GO to HY9 . REPLACE generator/regulator assembly.
HY9	CHECK GENERATOR COMMUNICATOR SIGNAL		
	- Access GENFDC PID. - Engine idling. - Toggle load on and off (headlights). Does PID switch within 0-99% range?	Yes → No →	Generator function is OK. GO to Pinpoint Test Z, intermittent circuit failure diagnosis. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

HY7 - HY9

Test JB: Secondary Ignition

Secondary Ignition

JB

Note

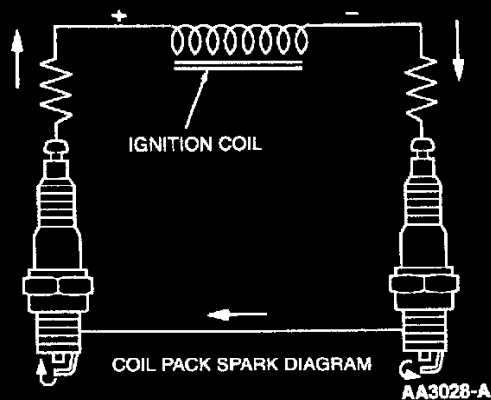
This Pinpoint Test is intended to diagnose the following:

- Spark plugs (12405)
- Spark plug wires (12280, 12281)

Caution

A malfunctioning ignition system may cause high catalyst temperatures. Check components next to the catalyst and muffler for heat damage.

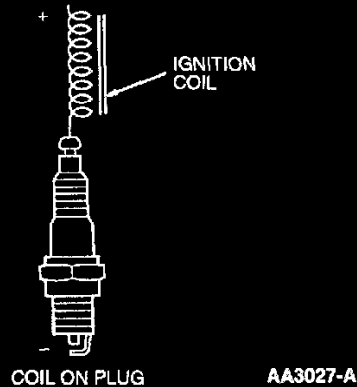
Escort, Focus, 2.0L Escape, Cougar,
Taurus/Sable, 3.8L Mustang, Ranger,
Windstar, 4.0L Explorer/Mountaineer, 4.2L
E/F-Series



Note, Caution and Schematic

Secondary Ignition**JB**

3.0L Escape, 4.6L Mustang, Crown
Victoria/Grand Marquis, Thunderbird,
LS6/LS8, Town Car, Continental, 4.6L
Explorer/Mountaineer, Expedition,
Navigator/Blackwood, Excursion,
4.6L/5.4L/6.8L E/F-Series

**Tables**

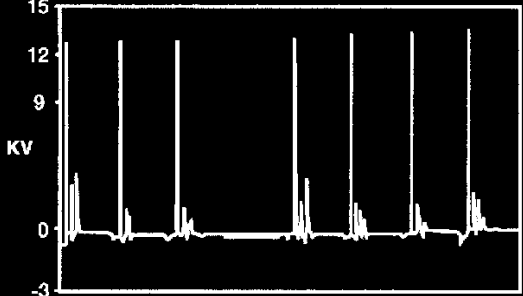
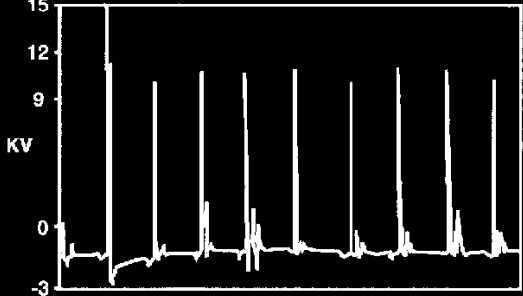
Firing Order for Coil Pack Applications	
4 Cylinder Applications	1 3 4 2
6 Cylinder Applications	1 4 2 5 3 6

Firing Order for Coil On Plug Applications	
LS6, 3.0L Escape	1 4 2 5 3 6
LS8, Thunderbird	1 5 4 2 6 3 7 8
8 Cylinder Applications	1 3 7 2 6 5 4 8
10 Cylinder Applications	1 6 5 10 2 7 3 8 4 9

Schematic, Tables

Secondary Ignition

JB

Test Steps		Results	Action to Take
JB6	CHECK FOR ONE MISSING SPARK PATTERN Observe pattern on scope.  A0027510	Yes No	→ INSPECT spark plug wire and spark plug for missing cylinder. MEASURE resistance of spark plug wire. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). MEASURE resistance of spark plug. REPLACE if lower than 2000 or higher than 20000 ohms. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). → GO to JB7.
JB7	CHECK FOR HIGH SPARK PLUG FIRING VOLTAGE Check the spark plug firing voltage average pattern.  A0027511	Yes No	→ Conditions affect all cylinders. INSPECT spark plug wires and spark plugs. MEASURE resistance of spark plug wires. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). CHECK spark plug gaps. MEASURE resistance of spark plugs. REPLACE if lower than 2000 or higher than 20000 ohms. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). → GO to JB8.
	Is spark pattern missing from one cylinder?		
	Is the average value of spark plug firing voltage greater than 15KV?		

JB6 - JB7

Secondary Ignition

JB

Test Steps		Results	Action to Take
JB8	CHECK FOR LOW SPARK PLUG FIRING VOLTAGE		
Check the spark plug firing voltage average pattern.  A0027512		Yes	→ INSPECT spark plug wire and spark plugs. MEASURE resistance of spark plug wires. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). MEASURE resistance of spark plugs. REPLACE if lower than 2000 or higher than 20000 ohms. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
Is there consistently low spark plug firing voltage or sloping spark line on one or more cylinders?		No	→ GO to JB9.
JB9	CHECK FOR EVENNESS BETWEEN CYLINDERS		
Check the spark plug firing voltage average pattern.  A0027513		Yes	→ Inspect spark plug wires and spark plugs. MEASURE resistance of spark plug wires. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). CHECK for damaged spark plugs or narrow spark plug gaps. MEASURE resistance of spark plugs. REPLACE if lower than 2000 or higher than 20000 ohms. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
Is the evenness of spark plug firing voltage greater than 6KV?		No	→ GO to Z1.
JB15	DTC P0301 THROUGH P0310: MISFIRE ON CYLINDERS 1 THROUGH 10		
Are any of the above listed DTCs present?		Yes	→ GO to JB16.
		No	→ GO to JB17.

Secondary Ignition

JB

Test Steps		Results	→	Action to Take
JB16	CHECK FOR SPARK AT CYLINDER(S) INDICATED BY DTC(S)	Yes No	→	KEY OFF. GO to JB18.
• Disable inertia switch. • Disconnect ignition coil(s) from spark plug(s). • Connect a Spark Tester 303-D037 (D81P-6666-A) or equivalent to a coil. • Check for spark while cranking engine. • Is the bluish-white spark present?			→	KEY OFF. INSPECT coil boot(s) for missing cylinder(s). REPLACE if necessary. INSPECT spark plug(s) for missing cylinder(s). MEASURE resistance of spark plug(s). REPLACE if lower than 2000 or higher than 20000 ohms. GO to JF1.
JB17	CHECK FOR SPARK AT ALL CYLINDERS	Yes No	→	KEY OFF. GO to JB18.
• Disable inertia switch. • Disconnect ignition coil(s) from spark plug(s). • Connect a Spark Tester 303-D037 (D81P-6666-A) or equivalent to a coil. • Check for spark at each cylinder while cranking engine. • Is the bluish-white spark consistent between all cylinders?			→	KEY OFF. INSPECT coil boot(s) for missing cylinder(s). REPLACE if necessary. INSPECT spark plug(s) for missing cylinder(s). MEASURE resistance of spark plug(s). REPLACE if lower than 2000 or higher than 20000 ohms. Record cylinders with inconsistent spark and GO to JF1.
JB18	CHECK SPARK PLUGS	Yes No	→	GO to JB19.
• Remove and check plugs for damage, wear, carbon deposits and proper plug gap. • Are plugs OK?			→	REPAIR plugs. ADJUST gap or REPLACE as necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).

JB

Test Steps		Results	Action to Take
JB19	CHECK SPARK PLUG RESISTANCE		
	- Measure spark plug resistance. - Is resistance between 2000 and 20000 ohms?	Yes → No →	Intermittents: GO to Z1. All others: If you were directed to this Pinpoint Test from Symptom Charts, RETURN to Symptom Charts. If you were directed to this Pinpoint Test from Pinpoint Test Step HD3, GO to HD4. If you were directed to this Pinpoint Test from Pinpoint Test Step A6, GO to A6. REPLACE spark plugs. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
JB20	DTC P0301 THROUGH DTC P0308: MISFIRE ON CYLINDERS 1 THROUGH 8		
	Are any of the above listed DTCs present?	Yes → No →	GO to JB21. GO to JB22.
JB21	CHECK FOR SPARK AT CYLINDER(S) INDICATED BY DTC(S)		
	- Disable inertia switch. - Disconnect spark plug wire(s) from spark plug(s). - Connect a Spark Tester 303-D037 (D81P-6666-A) or equivalent to a spark plug wire. - Check for spark while cranking engine. - Is the bluish-white spark present?	Yes → No →	KEY OFF. GO to JB23. KEY OFF. INSPECT spark plug wires for missing cylinders. MEASURE resistance of spark plug wires. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). If spark plug wires are OK, GO to JE1.
JB22	CHECK FOR SPARK AT ALL CYLINDERS		
	- Disable inertia switch. - Disconnect spark plug wire(s) from spark plug(s). - Connect a Spark Tester 303-D037 (D81P-6666-A) or equivalent to a spark plug wire. - Check for spark at each cylinder while cranking engine. - Is the bluish-white spark consistent between all cylinders?	Yes → No →	KEY OFF. GO to JB23. KEY OFF. INSPECT spark plug wires for missing cylinders. MEASURE resistance of spark plug wires. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). If spark plug wires are OK, GO to JE1.

Secondary Ignition**JB**

Test Steps		Results →	Action to Take
JB23	CHECK SPARK PLUGS		
	- Remove and check plugs for damage, wear, carbon deposits and proper plug gap. Are plugs OK?	Yes → No →	GO to JB24 . REPAIR plugs. ADJUST gap or REPLACE as necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
JB24	CHECK SPARK PLUG RESISTANCE		
	- Measure spark plug resistance. Is resistance between 2000 and 20000 ohms?	Yes → No →	Intermittents: GO to Z1 . All others: If you were directed to this Pinpoint Test from Symptom Charts, RETURN to Symptom Charts. If you were directed to this Pinpoint Test from Pinpoint Test Step HD3 , GO to HD4 . If you were directed to this Pinpoint Test from Pinpoint Test Step A6 , GO to A6 . REPLACE spark plugs. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).

JB23 - JB24

Test JD: Crankshaft Position (CKP) Sensor

Crankshaft Position (CKP) Sensor

JD

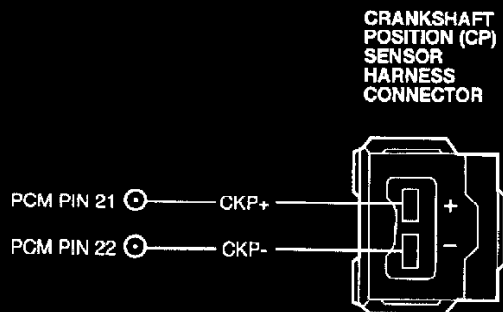
Note

This pinpoint test is intended to diagnose the following:

- Crankshaft position (CKP) sensor (6C315)
- Harness Circuits: CKP(+) and CKP(-)
- Powertrain control module (PCM) (12A650)

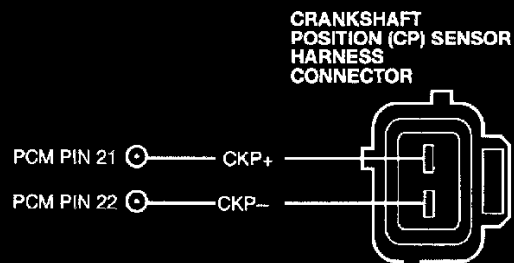
Pinpoint Test Schematics and Connectors

2.0L (2V) Escort, 4.0L SOHC Explorer



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE AA4564-B

Escort (4V), 2.0L Cougar, Ranger 2.3L



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE AA4565-B

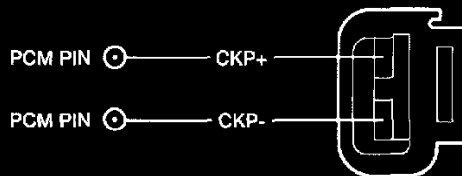
Note, Schematics and Connectors

Crankshaft Position (CKP) Sensor

JD

2.0L (2V) Focus, LS6, Explorer/Mountaineer, Expedition/Navigator, Ranger 3.0L

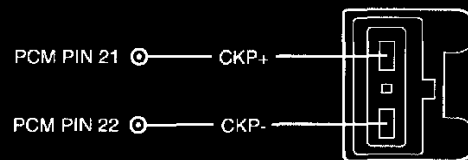
CRANKSHAFT POSITION
(CP) SENSOR
HARNESS CONNECTOR



A0041629

2.0L (4V) Focus

CRANKSHAFT POSITION
(CP) SENSOR
HARNESS CONNECTOR



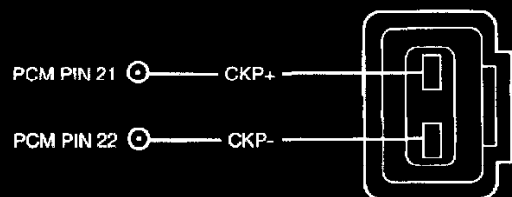
A0013927

PCM CONNECTOR PIN NUMBERS

PCM TYPE	CKP(+)	CKP(-)
104	21	22
122	30	40
150	55	56

2.5L Cougar

CRANKSHAFT
POSITION (CP)
SENSOR
HARNESS
CONNECTOR

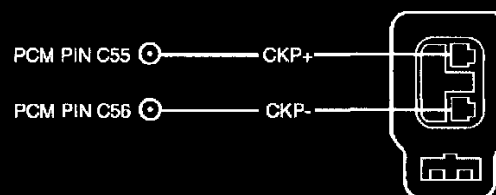


NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AA4566-B

LS8, Thunderbird

CRANKSHAFT
POSITION (CP)
SENSOR
HARNESS
CONNECTOR



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

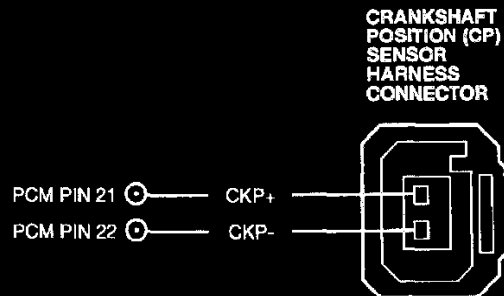
AA4567-B

Test Schematic

Crankshaft Position (CKP) Sensor

JD

All Others



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE AA4568-B

Test Steps		Results	→	Action to Take
JD1	CHECK CKP(+) CKP(-) CONTINUITY	Yes No	→ →	REPAIR open circuit. GO to JD2.
Note: Refer to the PCM connector pin numbers in the beginning of this Pinpoint Test. • Disconnect the CKP sensor and PCM. • Measure resistance of CKP(+) and CKP(-) circuits between the PCM harness connector and the CKP harness connector. • Is resistance greater than 5 ohms?				
JD2	CHECK FOR CKP(+) BIAS VOLTAGE FAULT	Yes No	→ →	GO to JD3. Bias fault. GO to JD19.
• Reconnect the PCM. • Key on, engine off. • Measure voltage between CKP(+) at the CKP harness connector and battery negative post. • Key off. • Was voltage greater than 1.0 volt but less than 2.0 volts?				
JD3	CHECK FOR CKP(-) BIAS VOLTAGE FAULT	Yes No	→ →	KEY OFF. GO to JD10. Bias fault. GO to JD4.
• Key on, engine off. • Measure voltage between CKP(-) circuit at the CKP harness connector and battery negative post. • Was voltage between 1.0 and 2.0 volts?				
JD4	DETERMINE IF BIAS HIGH OR BIAS LOW FAULT	Yes No	→ →	Bias low fault. GO to JD5. Bias high fault. GO to JD6.
• Was bias voltage reading in test step JD3 less than 1.0 volt?				

Schematic, Test JD1 - JD4

Crankshaft Position (CKP) Sensor**JD**

Test Steps		Results	Action to Take
JD5	CHECK CKP(-) CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect PCM. - Measure resistance of CKP(-) circuit at the PCM harness connector and battery negative post. Is each resistance greater than 10K ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
JD6	CHECK CKP(-) CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Disconnect PCM. - Key on, engine off. - Measure voltage of CKP(-) circuit at the PCM harness connector and battery negative post. Is voltage less than 0.5 volt?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
JD10	CHECK CKP SENSOR AMPLITUDE AT PCM		
	- Key off. - Reconnect CKP sensor. - Disconnect PCM. - Measure voltage between CKP(+) and CKP(-) at the PCM harness connector when cranking engine. Was settled ac voltage reading greater than 0.4 volt?	Yes → No →	CKP circuit is OK. GO to JD11 . Amplitude fault. GO to JD12 .
JD11	CHECK CKP(+) CIRCUIT FOR SHORT TO GROUND AT SENSOR		
	- Measure resistance between CKP(+) and battery negative post. Is the resistance greater than 10K ohms?	Yes → No →	GO to JB1 . GO to JD17 .
JD12	CHECK CKP CIRCUIT RESISTANCE FOR AMPLITUDE FAULT		
	- Measure resistance between CKP(+) and CKP(-) at the PCM harness connector. Is resistance between 290 and 800 ohms (900 and 1300 for LS6/LS8)?	Yes → No →	GO to JD16 . GO to JD13 .
JD13	DETERMINE IF RESISTANCE HIGH OR RESISTANCE LOW FAULT		
	Was the resistance from test step JD12 less than 290 ohms?	Yes → No →	Low resistance fault. GO to JD14 . REPLACE CKP sensor and RESET KAM (5 minute battery disconnect).
JD14	CHECK CKP(+) FOR SHORT TO CKP(-)		
	- Disconnect CKP sensor. - Measure resistance between the CKP(+) and CKP(-) at the harness connector. Is resistance less than 5 ohms?	Yes → No →	REPAIR short. REPLACE CKP sensor and RESET KAM (5 minute battery disconnect).

JD5 - JD14

Crankshaft Position (CKP) Sensor**JD**

Test Steps		Results	Action to Take
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 and RESET KAM (5minutes battery disconnect). REPAIR or REPLACE damaged parts.
JD17	CHECK FOR OPEN OR SHORT IN PCM		
	- Disconnect the CKP sensor and connect the PCM. - Key off. - Measure the resistance between the CKP(+) and CKP(-) at the CKP harness connector. Is the resistance between 16K and 24K ohms?	Yes → No →	GO to JD18 . REPLACE the PCM.
JD18	CHECK CKP(+) CIRCUIT FOR SHORT TO CKP(-) CIRCUIT IN HARNESS		
	- Disconnect PCM. - Measure resistance between CKP(+) and CKP(-) at the PCM harness connector. Is resistance greater than 1000 ohms?	Yes → No →	REPLACE CKP sensor and RESET KAM (5minutes battery disconnect). REPAIR short circuit.
JD19	DETERMINE IF BIAS VOLTAGE HIGH OR BIAS VOLTAGE LOW FAULT		
	Was bias voltage reading in test step JD2 less than 1.0 volt?	Yes → No →	Low bias voltage fault. GO to JD20 . High bias voltage fault. GO to JD21 .
JD20	CHECK CKP(+) CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect PCM. - Measure resistance between CKP(+) and battery negative post. Is resistance greater than 10K ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
JD21	CHECK CKP(+) CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Disconnect PCM. - Key on, engine off. - Measure voltage of CKP(+) and battery negative post. Is voltage less than 0.5 volt?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.

Crankshaft Position (CKP) Sensor**JD**

Test Steps		Results →	Action to Take
JD22	P1336 CONTINUOUS MEMORY CODE: CHECK CKP CIRCUIT HARNESS Shield Ground		
Note: The shield must be grounded at one end (near the PCM) only.		Yes →	The CKP circuit is not the source of electrical noise. GO to Pinpoint Test HD
• Key off. • Reconnect PCM. • Measure the resistance between battery negative and shield of CKP harness. • Is resistance less than 5 ohms?		No →	REPAIR open circuit or poor ground connection.

JD22

Test JE: Integrated Ignition Coil Pack A, B OR C Failure

Integrated Ignition Coil Pack A, B or C Failure

JE

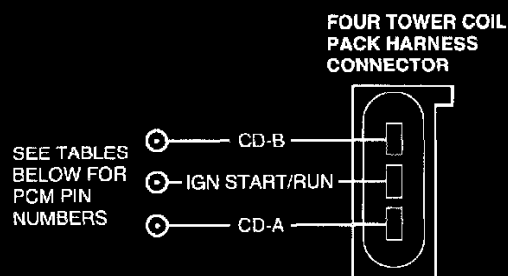
Note

This Pinpoint Test is intended to diagnose the following:

- Ignition coil packs (12029)
- Ignition coil harness
- Ign start/run circuit to coil packs
- Powertrain control module (PCM)(12A650)

Pinpoint Test Schematics and Connectors

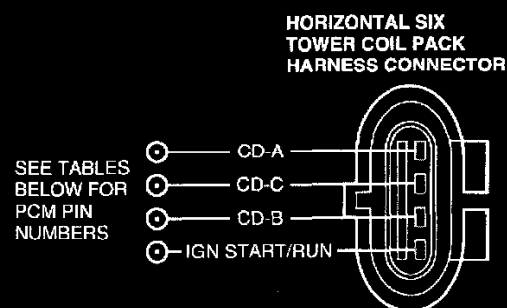
Escort, Focus, 2.0L Cougar, 2.0L Escape, 2.3L Ranger



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0040144

4.0L Ranger, 4.0L Explorer Sport/Sport Trac, 4.0L SOHC Explorer/Mountaineer



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0040145

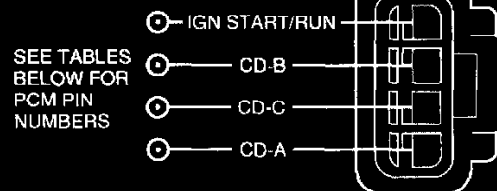
Note, Schematics and Connectors

Integrated Ignition Coil Pack A, B or C Failure

JE

2.5L Cougar, Taurus/Sable, 3.8L Mustang,
3.0L Ranger, Windstar, 4.2L E/F Series

SERIES 5 IGNITION COIL PACK



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0040146

Tables

IGNITION COIL TO CYLINDER CORRELATION

Cylinder Number	Ignition Coil	Coil Driver (CD)	PCM Pin	Related DTC
4 Cylinder Applications				
1	A	A	26	P0351
3	B	B	52	P0352
4	A	A	26	P0351
2	B	B	52	P0352
6 Cylinder Applications				
1	A	A	26	P0351
4	B	B	52	P0352
2	C	C	78	P0353
5	A	A	26	P0351
3	B	B	52	P0352
6	C	C	78	P0353
4.0L Explorer/Mountaineer				
1	A	A	C31	P0351
4	B	B	C23	P0352
2	C	C	C13	P0353
5	A	A	C31	P0351
3	B	B	C23	P0352
6	C	C	C13	P0353

Schematic, Table

Integrated Ignition Coil Pack A, B or C Failure

JE

Test Steps		Results	Action to Take
JE1	DETERMINE WHICH COIL IS NOT FIRING PROPERLY		
	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 properly using information from Pinpoint Test JB or DTC and the table at the beginning of this pinpoint test. - Record cylinder, coil and PCM pin number from the table. Have the cylinder number, coil driver and PCM pin number been recorded.	Yes → No →	GO to JE2 . To obtain required information, REPEAT GO to JE1 .
JE2	DTC P0351, P0352, P0353: CHECK IGN START/RUN VOLTAGE TO COIL PACK		
	- Disconnect suspect coil (determined from the table). - Key on, engine off. - Measure voltage between IGN START/RUN circuit at coil pack harness connector and ground. Is voltage greater than 10.0 volts?	Yes → No →	KEY OFF. GO to JE5 . IGN START/RUN circuit fault. KEY OFF. 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 (REFER to Diagnostic Methods, Drive Cycles).
JE5	CHECK FUNCTIONALITY OF SUSPECT COIL DRIVER (CD) CIRCUIT		
	- Connect incandescent test lamp between IGN START/RUN and suspect CD circuit (determined from the table) at the coil pack harness connector. - Disable fuel pump by disconnecting inertia fuel shutoff switch. - Observe incandescent test lamp while cranking engine. Did test lamp blink consistently?	Yes → No →	KEY OFF. GO to JE12 . KEY OFF. GO to JE6 .
JE6	CHECK SUSPECT CD CIRCUIT FOR OPEN IN HARNESS		
	- Disconnect PCM. - Measure resistance of suspect CD circuit between PCM harness connector pin (determined from the table) and coil pack harness connector. Is resistance less than 5 ohms?	Yes → No →	GO to JE7 . REPAIR open circuit. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).

JE1 - JE6

.JE

Test Steps		Results	Action to Take
JE7	CHECK SUSPECT CD CIRCUIT FOR SHORT TO VPWR IN HARNESS		
	• Key on, engine off. • Measure voltage between suspect CD circuit at the PCM harness connector (determined from the table) and ground. • Is voltage less than 1.0 volt?	Yes → No →	KEY OFF. GO to JE8 . KEY OFF. REPAIR short circuit. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
JE8	CHECK SUSPECT CD CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	• Disconnect the scan tool. • Measure resistance between suspect CD circuit at the PCM harness connector (determined from the table) and ground. • Is resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM. (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). If symptom or DTC is still present GO to JE11 to check for damaged coil, otherwise COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). REPAIR short circuit. If symptom or DTC is still present, GO to JE11 to check for damaged coil, otherwise COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
JE11	CHECK SUSPECT COIL FOR DAMAGE		
	• Remove spark plug wire from suspect coil tower(determined from the table). • Connect an air gap spark tester 303-D037 (D81P-6666-A) or equivalent in series between suspect coil tower and spark plug wire. • Disable fuel pump by disconnecting inertia fuel shutoff switch. • Observe spark tester while cranking engine. • Is the bluish-white spark present?	Yes → No →	KEY OFF. GO to Z1 . REPLACE coil pack. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
JE12	CHECK SUSPECT COIL FOR DAMAGE		
	• Remove spark plug wire from suspect coil tower(determined from the table). • Connect an air gap spark tester 303-D037 (D81P-6666-A) or equivalent in series between suspect coil and spark plug wire. • Reconnect coil harness connector. • Observe spark tester while cranking engine. • Is the bluish-white spark present?	Yes → No →	KEY OFF. GO to Z1 . REPLACE coil pack. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).

.JE7 - .JE12

Test JF: Integrated Ignition Coil On Plug Coil A Through J Failure

Integrated Ignition Coil On Plug Coil A Through J Failure

JF

Note

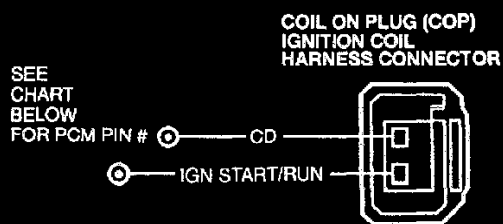
This Pinpoint Test is intended to diagnose the following:

- Ignition coils (12A366)
- Ignition coil harness
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematics and Connectors

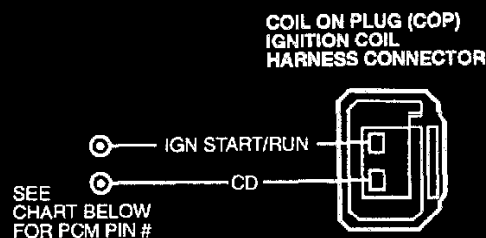
Crown Victoria/Grand Marquis, Town Car, 4.6L
2V Mustang, 4.6L Explorer/Mountaineer, 4.6L
E/F-Series/Expedition, 5.4L
E/F-Series/Expedition, 5.4L Excursion

3.0L Escape, 4.6L 4V Mustang, 3.9L Thunderbird,
3.0L LS6, 3.9L LS8, 4.6L Continental, 5.4L 4V
Navigator/Blackwood, 6.8L E/F-Series, 6.8L
Excursion



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AA0782-C



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AA0783-C

Tables

IGNITION COIL TO CYLINDER CORRELATION

Cylinder Number	Ignition Coil	Coil Driver (CD)	PCMPin	Related DTC
3.0L Escape				
1	A	A	26	P0351
4	D	D	1	P0354
2	B	B	52	P0352
5	E	E	27	P0355
3	C	C	78	P0353

(Continued)

Note, Schematics and Connectors and Correlation Table

Integrated Ignition Coil On Plug Coil A Through J Failure

JF
IGNITION COIL TO CYLINDER CORRELATION

Cylinder Number	Ignition Coil	Coil Driver (CD)	PCM Pin	Related DTC
6	F	F	53	P0356
LS6				
1	A	A	C31	P0351
4	D	B	C12	P0354
2	B	C	C23	P0352
5	E	D	C22	P0355
3	C	E	C13	P0353
6	F	F	C30	P0356
LS8/Thunderbird				
1	A	A	C31	P0351
5	E	B	C23	P0355
4	D	C	C13	P0354
2	B	D	C1	P0352
6	F	E	C12	P0356
3	C	F	C22	P0353
7	G	G	C30	P0357
8	H	H	C38	P0358
4.6L Explorer/Mountaineer				
1	A	A	C31	P0351
3	C	B	C23	P0353
7	G	C	C13	P0357
2	B	D	C1	P0352
6	F	E	C12	P0356
5	E	F	C22	P0355
4	D	G	C30	P0354
8	H	H	C38	P0358
8 Cylinder Applications				
1	A	A	26	P0351
3	C	B	52	P0353
7	G	C	78	P0357
2	B	D	104	P0352
6	F	E	1	P0356
5	E	F	27	P0355
4	D	G	53	P0354
8	H	H	79	P0358
10 Cylinder Applications				
1	A	A	26	P0351
6	F	B	1	P0356
5	E	C	52	P0355

(Continued)

Correlation Table

Integrated Ignition Coil On Plug Coil A Through J Failure

JF

IGNITION COIL TO CYLINDER CORRELATION

Cylinder Number	Ignition Coil	Coil Driver (CD)	PCM Pin	Related DTC
10	J	D	27	P0360
2	B	E	78	P0352
7	G	F	53	P0357
3	C	G	104	P0353
8	H	H	79	P0358
4	D	I	102	P0354
9	I	J	82	P0359

Test Steps		Results	Action to Take
JF1	DETERMINE WHICH COIL IS NOT FIRING PROPERLY		
	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 properly using information from Pinpoint Test JB or DTC and the table at the beginning of this pinpoint test. - Record cylinder, coil and PCM pin number from the table. Have the cylinder number, coil driver and PCM pin number been recorded?	Yes → No →	GO to JF2. To obtain required information, GO to JF1 and REPEAT.
JF2	CHECK FUNCTIONALITY OF SUSPECT COIL DRIVER (CD) CIRCUIT		
	- Disconnect suspect coil (determined from the table). - Connect incandescent test lamp between IGN START/RUN and suspect CD circuit (determined from the table) at the coil on plug harness connector. - Disable fuel pump by disconnecting inertia fuel shutoff switch. - Observe incandescent test lamp while cranking engine. Is the test lamp blinking consistently?	Yes → No →	KEY OFF. GO to JF3. KEY OFF. GO to JF4.
JF3	CHECK FUNCTIONALITY OF SUSPECT COIL		
	- Remove suspect coil (determined from the table) from spark plug. - Connect an air gap spark tester 303-D037 (D81P-6666-A) or equivalent to a suspect coil. - Reconnect suspect coil harness connector. - Observe spark tester while cranking engine. Is the bluish-white spark present?	Yes → No →	KEY OFF. INSPECT spark plug, REPLACE if necessary. GO to Z1. KEY OFF. REPLACE coil. INSPECT spark plug, REPLACE if necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).

Correlation Table, Test JF1 - JF3

Integrated Ignition Coil On Plug Coil A Through J Failure

JF

Test Steps		Results	→	Action to Take
JF4	CHECK IGN START/RUN VOLTAGE TO SUSPECT COIL			
	• Key on, engine off. • Measure voltage between IGN START/RUN circuit at the coil on plug harness connector and ground. • Is voltage greater than 10.0 volts?	Yes No	→ →	KEY OFF. GO to JF5 . KEY OFF. LS6, LS8, Thunderbird : GO to B5 . All others : IGN START/RUN circuit 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 (REFER to Diagnostic Methods, Drive Cycles).
JF5	CHECK SUSPECT CD CIRCUIT FOR OPEN IN HARNESS			
	• Disconnect PCM. • Measure resistance of suspect CD circuit between PCM harness connector pin (determined from the table) and coil on plug harness connector. • Is resistance less than 5 ohms?	Yes No	→ →	GO to JF6 . REPAIR open circuit. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
JF6	CHECK SUSPECT CD CIRCUIT FOR SHORT TO VPWR IN HARNESS			
	• Key on, engine off. • Measure voltage between suspect CD circuit at the PCM harness connector (determined from the table) and ground. • Is voltage less than 1.0 volt?	Yes No	→ →	KEY OFF. GO to JF7 . KEY OFF. REPAIR short circuit. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).

JF4 - JF6

Integrated Ignition Coil On Plug Coil A Through J Failure

JF

Test Steps		Results	Action to Take
JF7	CHECK SUSPECT CD CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool. - Measure resistance between suspect CD circuit at the PCM harness connector (determined from the table) and ground. Is resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM. (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).) If symptom or DTC is still present, GO to JF8 to check for damaged coil, otherwise COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles). REPAIR short circuit. If symptom or DTC is still present, GO to JF8 to check for damaged coil, otherwise COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
JF8	CHECK SUSPECT COIL FOR DAMAGE		
	- Remove suspect coil (determined from the table) from spark plug. - Connect an air gap spark tester 303-D037 (D81P-6666-A) or equivalent to a suspect coil. - Disable fuel pump by disconnecting inertia fuel shutoff switch. - Observe spark tester while cranking engine. Is the bluish-white spark present?	Yes → No →	KEY OFF. INSPECT spark plug, REPLACE if necessary. GO to Z1. KEY OFF. REPLACE coil. INSPECT spark plug, REPLACE if necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).

JF7 - JF8

Tachometer Output Failure

JH

Note

This Pinpoint Test is intended to diagnose the following:

- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematic



AA3023-B

Test Steps		Results	→	Action to Take
JH1	CHECK CTO CIRCUIT FOR SHORT TO POWER IN HARNESS	Yes No	→ →	KEY OFF. GO to JH2 . REPAIR short circuit. VERIFY symptom no longer exists.
	• Disconnect PCM. • Key on, engine off. • Measure voltage of CTO circuit between PCM harness connector pin 48 and ground. • Is the voltage less than 0.5 volt?			
JH2	CHECK CTO CIRCUIT FOR SHORT TO GROUND IN HARNESS	Yes No	→ →	GO to JH3 . REPAIR short circuit. VERIFY a symptom no longer exists.
	• Disconnect instrument cluster connector. • Measure resistance between PCM harness connector pin 48 and battery negative post. • Measure resistance between PCM harness connector pin 48 and chassis ground. • Are both resistances greater than 10,000 ohms?			
JH3	CHECK CTO CIRCUIT FOR OPEN IN HARNESS	Yes No	→ →	GO to JH4 . REPAIR open circuit. VERIFY symptom no longer exists.
	• Measure resistance between PCM harness connector pin 48 and instrument cluster harness pin. • Is the resistance less than 5.0 ohms?			

Note, Schematic and Test JH1 - JH3

Tachometer Output Failure**JH**

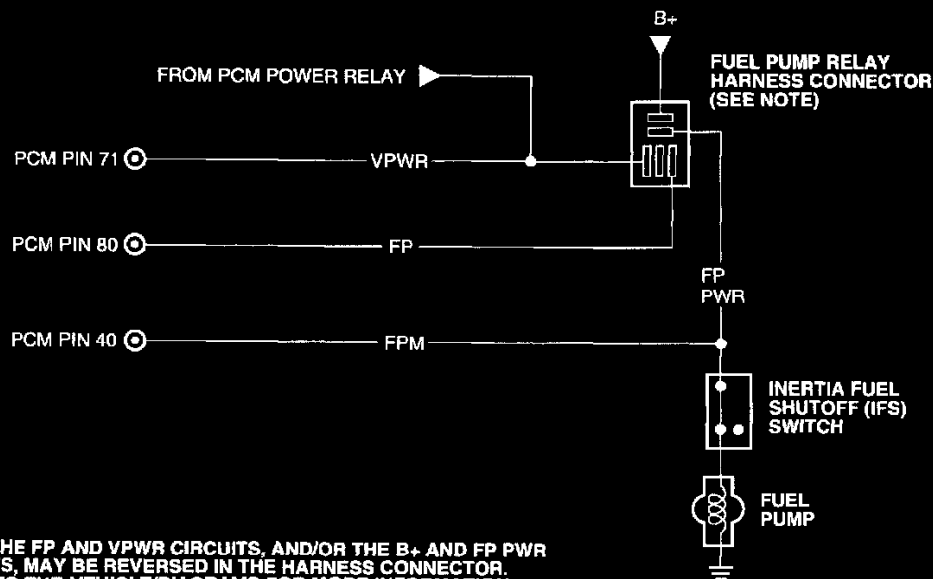
Test Steps		Results	→	Action to Take
JH4	CHECK CTO SIGNAL FROM PCM			
	• Reconnect PCM. • Start engine. • Measure voltage between CTO pin at the instrument cluster and battery negative post. • Is voltage between 3.0 and 9.0 volts?	Yes	→	REFER to the Instrument Panel, Gauges and Warning Indicators, for diagnosis and testing.
		No	→	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

JH4**Test KA: Fuel Pump Relay**

Fuel Pump Relay**KA****Note**

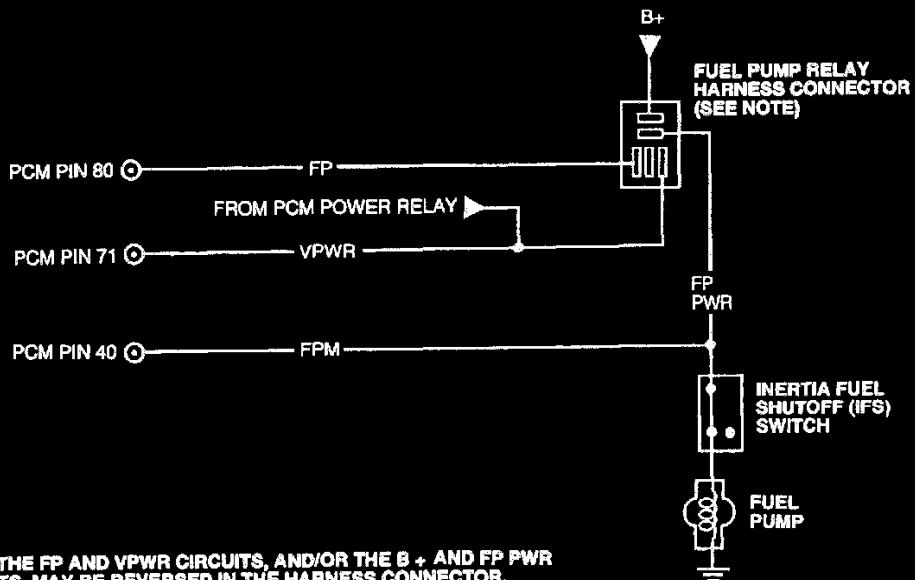
This Pinpoint Test is intended to diagnose the following:

- Fuel pump relay (9345)
- Inertia fuel shutoff (IFS) switch (9341)
- Harness circuits: B+, VPWR, FP, LFP, GND, FPM and FP PWR
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematics and Connectors**Town Car, Excursion**

NOTE: THE FP AND VPWR CIRCUITS, AND/OR THE B+ AND FP PWR CIRCUITS, MAY BE REVERSED IN THE HARNESS CONNECTOR. REFER TO THE VEHICLE/DIAGRAMS FOR MORE INFORMATION.

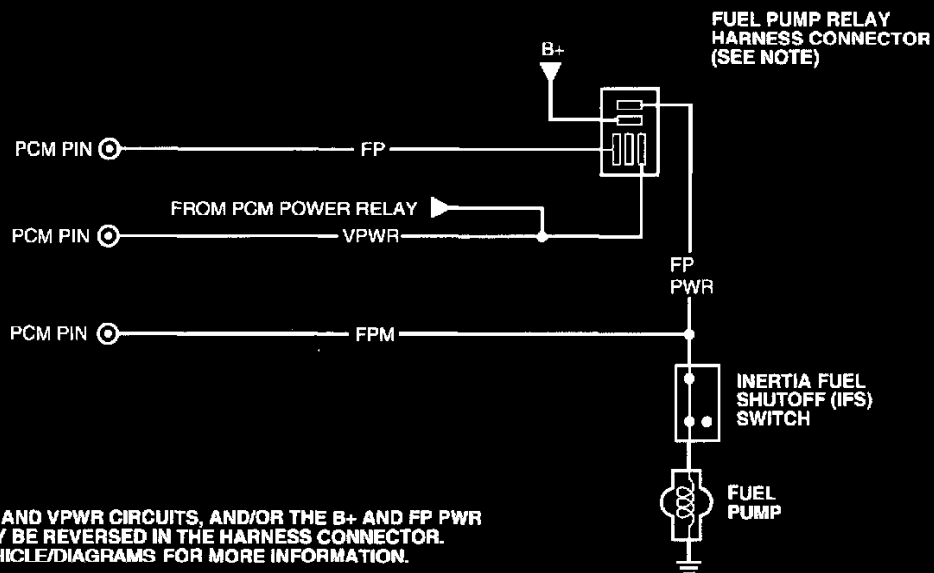
A0013928

Fuel Pump Relay**KA****Windstar, Ranger**

NOTE: THE FP AND VPWR CIRCUITS, AND/OR THE B + AND FP PWR CIRCUITS, MAY BE REVERSED IN THE HARNESS CONNECTOR. REFER TO VEHICLE/DIAGRAMS FOR MORE INFORMATION

AA0936-E

Test Schematic

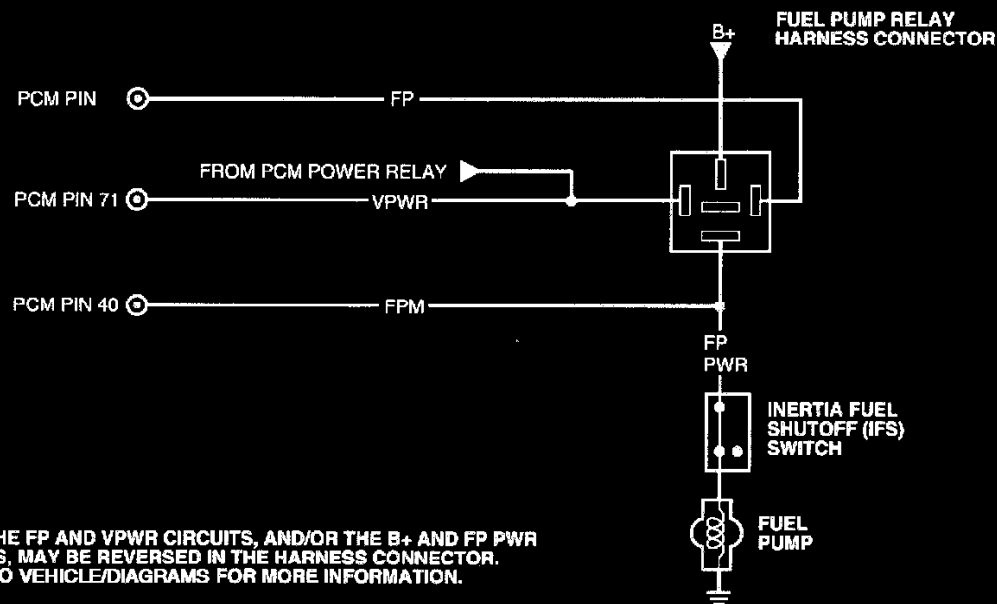
Fuel Pump Relay**KA****Explorer/Mountaineer**

A0039499

PCM CONNECTOR PIN NUMBERS

PCM TYPE	FP	VPWR	FPM
104 PIN	80	71	40
150 PIN	A58	A32/A33	A2

Test Schematic

Fuel Pump Relay**KA****Crown Victoria/Grand Marquis, Escape, E-Series, Expedition/Navigator/Blackwood, F-Series
(Except 5.4L SC)**

A0039500

PCM CONNECTOR PIN NUMBER

Application	FP
2.0L Escape	54
All others	80

Test Schematic

KA

AA4551-A

Test Steps		Results	Action to Take
KA1	DTC P0230: CHECK VPWR VOLTAGE TO FUEL PUMP RELAY		
	• Disconnect fuel pump relay. • Key on, engine off. • Measure VPWR circuit voltage at the fuel pump relay harness connector. • Is voltage greater than 10.5 volts?	Yes → No →	KEY OFF. GO TO KA2 . REPAIR open circuit.

Schematic, Test KA1

Fuel Pump Relay

KA

Test Steps		Results	Action to Take
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.
KA3	CHECK FUEL PUMP (FP) CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Disconnect PCM. - Key on, engine off. - Measure voltage between FP circuit at the fuel pump relay harness connector and ground. Is voltage less than 1.0 volt?	Yes → No →	KEY OFF. GO to KA4 . REPAIR short circuit.
KA4	CHECK FP CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool from DLC. - Measure resistance between FP circuit at the fuel pump relay harness connector and ground. Is resistance greater than 10,000 ohms?	Yes → No →	GO to KA5 . REPAIR short circuit.
KA5	CHECK FP CIRCUIT FOR OPEN IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Measure resistance of FP circuit between fuel pump relay harness connector and PCM harness connector. Is resistance less than 5.0 ohms?	Yes → No →	If Key On Engine Off (KOE0) DTC P0231 or P0232 is also present with the P0230: GO to KA6 . All others: REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuit.
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 monitor the FP circuit and will indicate when a fault is detected. - Reconnect PCM, fuel pump relay and scan tool. - Key on, engine off. - Access FPF PID. Does the FPF PID indicate a fault (or YES)?	Yes → No →	KEY OFF. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). GO to KA7 .

Fuel Pump Relay

KA

Test Steps		Results	Action to Take
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. Does the FPF PID indicate a fault (or YES) during crank?	Yes → No →	KEY OFF. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). KEY OFF. The fuel pump primary circuit is OK in the harness and PCM. If KOEO P0231 is present: KEY OFF. GO to KA20. If KOEO P0232 is present: GO to KA10.
KA10	DTC P0232: DOES ENGINE START?		
	Does the engine start?	Yes → No →	GO to KA11. For 5.4L SC F-Series: GO to KA65. All others: 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). Is fuel pump off with the key on?	Yes → No →	KEY OFF. GO to KA13. KEY OFF. GO to KA12.
KA12	CHECK FOR FUEL PUMP RELAY ALWAYS CLOSED		
	- Disconnect fuel pump relay. - Key on. Is the fuel pump off?	Yes → No →	REPLACE fuel pump relay. REPAIR short to power in FP PWR/FPM circuit.
KA13	CHECK FOR OPEN FPM CIRCUIT		
	- Disconnect PCM. - Disconnect fuel pump relay. - Measure resistance between PCM harness connector pin 40 and FP PWR circuit at the fuel pump relay harness connector. Is resistance less than 5.0 ohms?	Yes → No →	For P0232: GO to KA14. For P0231: REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuit.

KA7 - KA13

Fuel Pump Relay

KA

Test Steps		Results	Action to Take
KA14	CHECK FPM CIRCUIT IN PCM		
	- Reconnect PCM and fuel pump relay. - Key on, engine off. - Access FPM PID. Is the FPM PID OFF?	Yes → No →	Key off. For 5.4L SC F-Series: 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 Symptom Charts, Step 1: Quick Test and CONTINUE diagnosis as directed. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
KA15	CHECK INERTIA FUEL SHUTOFF (IFS) SWITCH		
	- 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 KA16. REPLACE or RESET IFS switch.
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 → No →	RECONNECT fuel pump relay. GO to KA17. REPAIR open in FP PWR circuit between IFS switch and FPM connection to circuit. (REFER to Vehicle/Diagrams to determine IFS switch location in circuit).
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 → No →	GO to KA18. REPAIR open circuit.
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.

KA14 - KA18

Fuel Pump Relay**KA**

Test Steps		Results	→	Action to Take
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	→	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 Symptom Charts, Step 1: Quick Test and CONTINUE diagnosis as directed.
		No	→	REPLACE fuel pump.
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). Does the engine start?	Yes	→	GO to KA13 .
		No	→	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	→	For 5.4L SC F-Series: GO to KA23 .
		No	→	All others: GO to KA22 .
			→	VERIFY integrity of fuse for B+ supply to fuel pump relay. If OK, REPAIR open circuit. If fuse is damaged, CHECK B+ and FP PWR circuits for short to ground before replacing.
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	→	REPLACE fuel pump relay.
		No	→	REPAIR open in FP PWR circuit between FPM splice and fuel pump relay.
KA23	CHECK VPWR AND INERTIA FUEL SHUTOFF (IFS) CIRCUITS TO INERTIA FUEL SHUTOFF SWITCH RELAY			
	- Disconnect inertia fuel shutoff (IFS) switch relay. - Key on, engine off. - Measure voltage between the VPWR and IFS circuits at the IFS switch relay harness connector. Is voltage greater than 10.5 volts?	Yes	→	KEY OFF. GO to KA28 .
		No	→	GO to KA24 .

KA19 - KA23

Fuel Pump Relay**KA**

Test Steps		Results	Action to Take
KA24	CHECK FOR VPWR TO IFS SWITCH RELAY		
	- Measure voltage between the VPWR circuit at the IFS switch relay harness connector and chassis ground. Is voltage greater than 10.5 volts?	Yes → No →	KEY OFF. GO to KA25 . REPAIR open VPWR circuit to IFS switch relay.
KA25	CHECK GROUND CIRCUIT TO IFS SWITCH		
	- Disconnect IFS switch (verify switch is set). - Measure resistance of ground circuit between IFS switch harness connector and chassis ground. Is resistance less than 5.0 ohms?	Yes → No →	GO to KA26 . REPAIR open circuit.
KA26	CHECK IFS SWITCH		
	- Measure resistance between the C and NC pins of the IFS switch. Is resistance less than 5.0 ohms?	Yes → No →	GO to KA27 . REPLACE or RESET IFS switch.
KA27	CHECK FOR OPEN IFS CIRCUIT		
	- Measure resistance of IFS circuit between IFS switch and IFS switch relay harness connectors. Is resistance less than 5.0 ohms?	Yes → No →	No fault is detected. DISREGARD DTC P0232 at this time. RETURN to Symptom Charts, Step 1: Quick Test and continue diagnosis as directed. REPAIR open circuit.
KA28	CHECK FP PWR CIRCUIT CONTINUITY BETWEEN FUEL PUMP RELAY AND IFS SWITCH RELAY		
	- Measure resistance of FP PWR circuit between the fuel pump relay and the IFS switch relay harness connectors. Is resistance less than 5.0 ohms?	Yes → No →	GO to KA29 . REPAIR open circuit.
KA29	CHECK OPERATION OF IFS SWITCH RELAY AND FUEL PUMP RELAY		
	- Using jumper wires, energize the IFS switch relay by connecting B+ to pin 86 and battery ground to pin 85 of the relay (pin numbers molded on relay). - With relay energized, measure resistance between pins 30 and 87 of the relay. Resistance should be less than 5.0 ohms. - Repeat test using the fuel pump relay. Are both relays OK?	Yes → No →	REPAIR open in FP PWR circuit between FPM splice and IFS switch relay. REPLACE applicable relay.

Fuel Pump Relay**KA**

Test Steps		Results	→	Action to Take
KA30	CONTINUOUS MEMORY DTC P0232: CHECK FUEL PUMP SECONDARY CIRCUITS			
Note: (1) If Continuous Memory (DTC) P0230 is also present, GO to KA40 . (2) Be aware that P0232 could be set if the inertia fuel shutoff (IFS) switch was tripped then reset, or if power was supplied to the FP PWR circuit when the PCM expected the fuel pump to be off (i.e. fuel pump prime procedure). • Key on, engine off. • Access FPM PID. • Observe the FPM PID for an indication of a fault while completing 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 SC F-Series, disconnect low speed fuel pump relay and note FPM PID. • Key off. • Was a fault indicated/found?		Yes	→	For 5.4L SC F-Series: 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. Otherwise, GO to "All others" Action to Take. All others: ISOLATE fault and REPAIR as necessary.
		No	→	Unable to duplicate or identify fault at this time. GO to Z1 .

KA30

Fuel Pump Relay**KA**

Test Steps		Results →	Action to Take
KA35	CONTINUOUS MEMORY DTC P0231: CHECK HARNESS CIRCUITS		
• Disconnect PCM. • Install a jumper wire between PCM harness connector pin 80 (FP) and ground. • Connect a digital multimeter between PCM harness connector pin 40 (FPM) and ground. • 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 completing 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. — For 5.4L SC F-Series, also shake, wiggle and bend the circuits connected to the inertia fuel shutoff (IFS) switch relay. Lightly tap the IFS switch and IFS switch relay. • Key off. • Inspect the fuel pump relay connector for corrosion and damaged pins. • Is a fault indicated?		Yes →	ISOLATE fault and REPAIR as necessary.
		No →	Unable to duplicate or identify fault at this time. GO to Z1.

KA35

Fuel Pump Relay

KA

Test Steps		Results	Action to Take
KA40	CONTINUOUS MEMORY DTC P0230: CHECK FUEL PUMP PRIMARY CIRCUITS		
	• Key on, engine off. Wait 5 seconds. • Access FPF PID. The FPF PID will indicate no fault (or 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 completing the following (the FPF PID will indicate a fault (or YES), when an open is detected). — Shake, wiggle, bend the Fuel Pump (FP) circuit between the PCM 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. Unable to duplicate or identify fault at this time. GO to Z1.
KA45	DTC P1232: CHECK VPWR VOLTAGE TO LOW SPEED FUEL PUMP RELAY		
	• 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 →	KEY OFF. GO to KA46. REPAIR open in VPWR circuit between the Electronic Engine Control power relay and the low speed fuel pump relay.
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 100 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.
KA47	CHECK LOW FUEL PUMP (LFP) CIRCUIT FOR SHORT TO POWER IN HARNESS		
	• Disconnect PCM. • Key on. • Measure voltage between LFP circuit at low fuel pump relay harness connector and ground. • Is voltage less than 1.0 volt?	Yes → No →	KEY OFF. GO to KA48. REPAIR short circuit.

KA40 - KA47

Fuel Pump Relay

KA

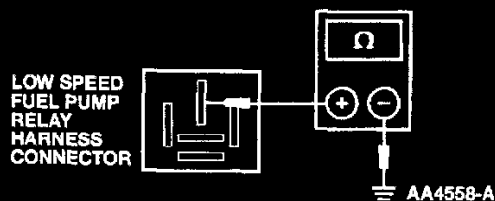
Test Steps		Results	→	Action to Take
KA48	CHECK LFP CIRCUIT FOR SHORT TO GROUND IN HARNESS	Yes No	→ →	GO to KA49 . REPAIR short circuit.
	- Disconnect scan tool from DLC. - Measure resistance between LFP circuit at low fuel pump relay harness connector and ground. - Is resistance greater than 10,000 ohms?			
KA49	CHECK FOR OPEN LFP CIRCUIT	Yes No	→ →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuit.
	- Measure resistance of LFP circuit between PCM harness connector pin 19 and the low speed fuel pump relay harness connector. - Is resistance less than 5.0 ohms?			
KA55	CHECK FOR OPEN FUEL PUMP GROUND CIRCUIT THROUGH RESISTOR	Yes No	→ →	KEY OFF. No fault is detected. DISREGARD DTC P0232 at this time. RETURN to Symptom Charts, Step 1: Quick Test 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.
	- Disconnect low speed fuel pump relay. - Key on, engine off. - Again, access FPM PID. - Is the FPM PID off?			

KA48 - KA55

Fuel Pump Relay

KA

Test Steps		Results	Action to Take
KA60	CONTINUOUS MEMORY DIAGNOSTIC TROUBLE CODE (DTC) P1232: CHECK LOW SPEED FUEL PUMP PRIMARY CIRCUITS		
	• Key on, engine off. Wait 5 seconds. • Access LFPF PID. The LFPF PID will indicate no fault (or 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 completing the following (the LFPF PID will indicate a fault (or YES) if a fault is detected). — Shake, wiggle, bend the LFP circuit between the PCM 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 No	→ ISOLATE fault and REPAIR as necessary. → Unable to duplicate or identify fault at this time. GO to Z1.
KA65	CHECK RESISTANCE OF FUEL PUMP GROUND CIRCUIT THROUGH RESISTOR		
	• Disconnect low speed fuel pump relay. • Measure resistance of ground circuit through resistor between low speed fuel pump relay harness connector and chassis ground. • Is resistance less than 7.0 ohms?	Yes No	→ GO to KA66. → VERIFY condition of fuel pump ground circuit resistor. If OK, REPAIR open circuit.

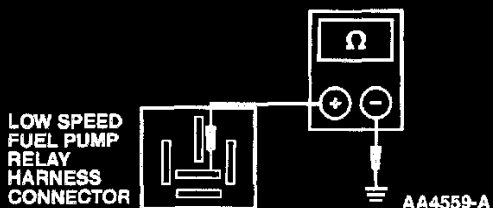


KA60 - KA65

Fuel Pump Relay

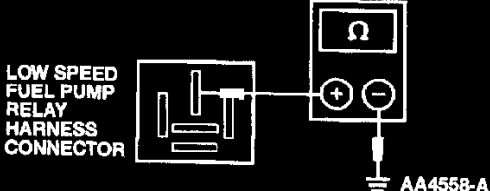
KA

Test Steps		Results	Action to Take
KA66	CHECK FOR OPEN GROUND CIRCUIT BETWEEN LOW SPEED FUEL PUMP RELAY AND FUEL PUMPS		
	- Disconnect fuel pumps. - Measure resistance of ground circuit between one of the fuel pumps and the low speed fuel pump relay harness connectors (same relay pin as one used in previous step). - Repeat same check except check ground to other fuel pump. Are both resistances less than 5.0 ohms?	Yes → No →	GO to KA67. REPAIR open circuit(s).
KA67	CHECK INTERNAL RESISTANCES OF EACH FUEL PUMP		
	- Measure internal resistance of one fuel pump between FP PWR pin and ground pin of the fuel pump. - Repeat test for other fuel pump. Are both resistances less than 10.0 ohms?	Yes → No →	GO to KA68. REPLACE appropriate fuel pump(s).
KA68	CHECK FOR OPEN FP PWR CIRCUIT BETWEEN FPM SPLICE AND FUEL PUMPS		
	- Disconnect inertia fuel shutoff (IFS) switch relay. - Measure resistance of FP PWR circuit between IFS switch relay and one of the fuel pump's harness connectors. - Repeat test for other fuel pump. Are both resistances less than 5.0 ohms?	Yes → No →	No fault is detected. DISREGARD DTC P0232 at this time. RETURN to Symptom Charts, Step 1: Quick Test and continue diagnosis as directed. REPAIR open FP PWR circuit between fuel pump and FPM circuit splice to circuit.
KA70	HARD START/LACKS POWER: CHECK GROUND CIRCUIT USED FOR HIGH SPEED FUEL PUMP OPERATION BETWEEN LOW SPEED FUEL PUMP RELAY AND CHASSIS		
	- Disconnect low speed fuel pump relay. - Measure resistance of ground circuit between low speed fuel pump relay harness connector and chassis ground. Is resistance less than 5.0 ohms?	Yes → No →	GO to KA71. REPAIR open ground circuit.



KA66 - KA70

Fuel Pump Relay**KA**

Test Steps		Results	Action to Take
KA71	MEASURE RESISTANCE OF FUEL PUMP GROUND CIRCUIT THROUGH THE RESISTOR TO CHASSIS GROUND		
	- Measure resistance of fuel pump ground circuit through resistor between low speed fuel pump relay harness connector and chassis ground. Is resistance less than 7.0 ohms?  LOW SPEED FUEL PUMP RELAY HARNESS CONNECTOR AA4558-A	Yes → No →	GO to KA72. REPAIR open circuit between low speed fuel pump relay and splice to ground circuit that goes through resistor.
KA72	CHECK NORMALLY CLOSED CONTACTS OF LOW SPEED FUEL PUMP RELAY		
	- Measure resistance between pin 30 and pin 87A of the low speed fuel pump relay (pin numbers molded on relay). Is resistance less than 5.0 ohms?	Yes → No →	High speed fuel pump circuits OK. RETURN to Symptom Charts to continue diagnosis. REPLACE low speed fuel pump relay.

KA71 - KA72

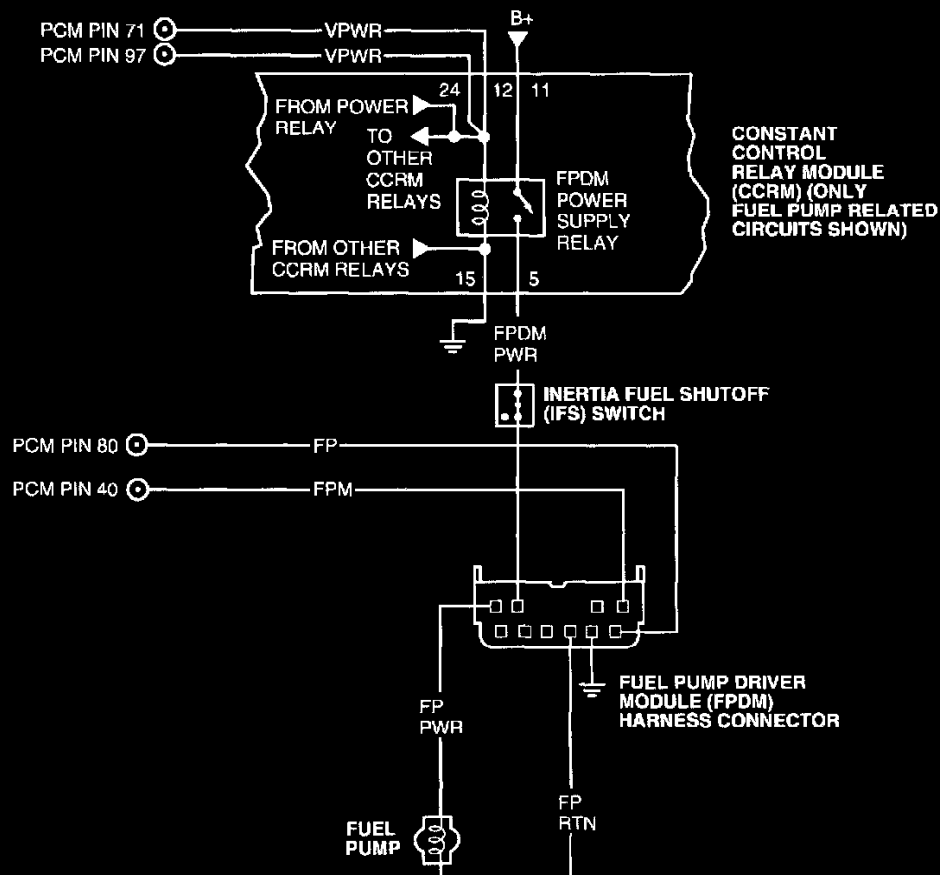
Test KB: Fuel Pump Driver Module (FPDM)

Fuel Pump Driver Module (FPDM)**KB****Note**

This Pinpoint Test is intended to diagnose the following:

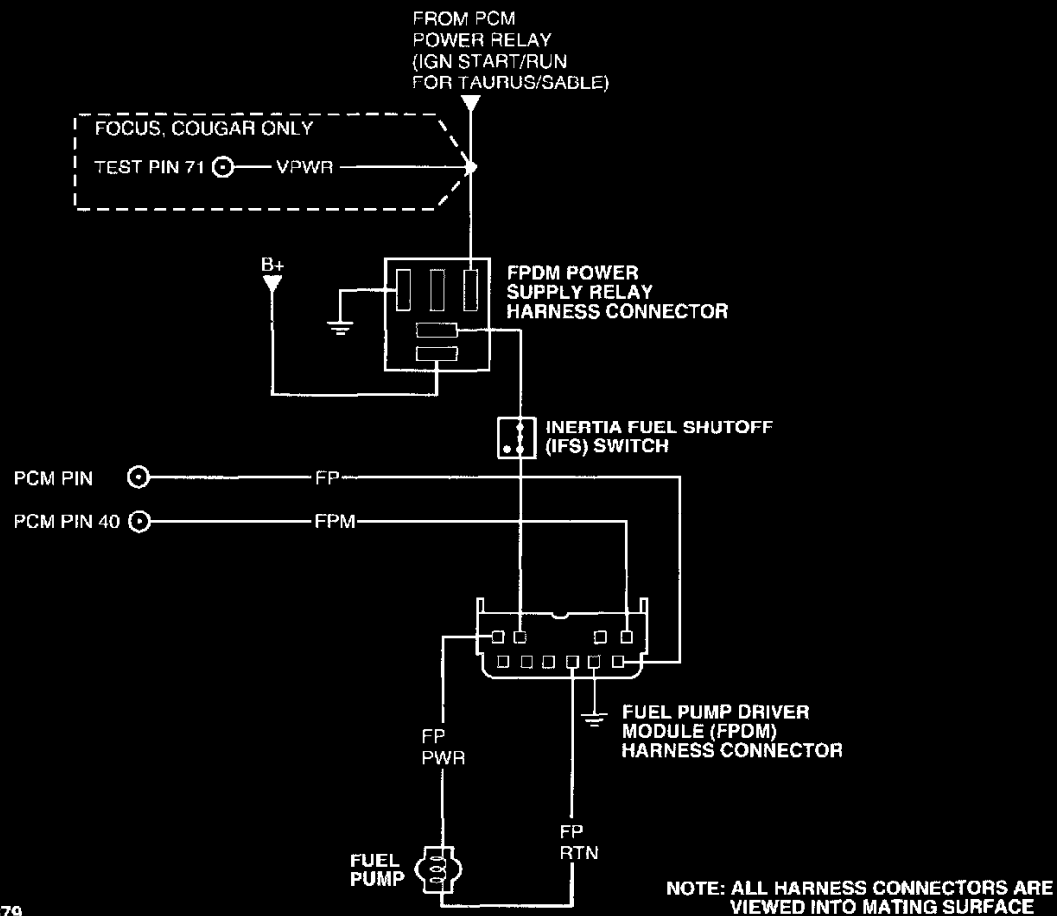
- Harness circuits: VPWR, GND and B+ to FPDM power supply relay; GND to FPDM; FPM; FP; FP PWR; FP RTN: FPDM PWR
- Inertia fuel shutoff (IFS) switch (9341)
- Fuel pump driver module (FPDM) (9D370)
- FPDM power supply relay
- Powertrain control module (PCM) (12A650)

Test Note

Fuel Pump Driver Module (FPDM)**KB****Pinpoint Test Schematics and Connectors****Escort**

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0013934

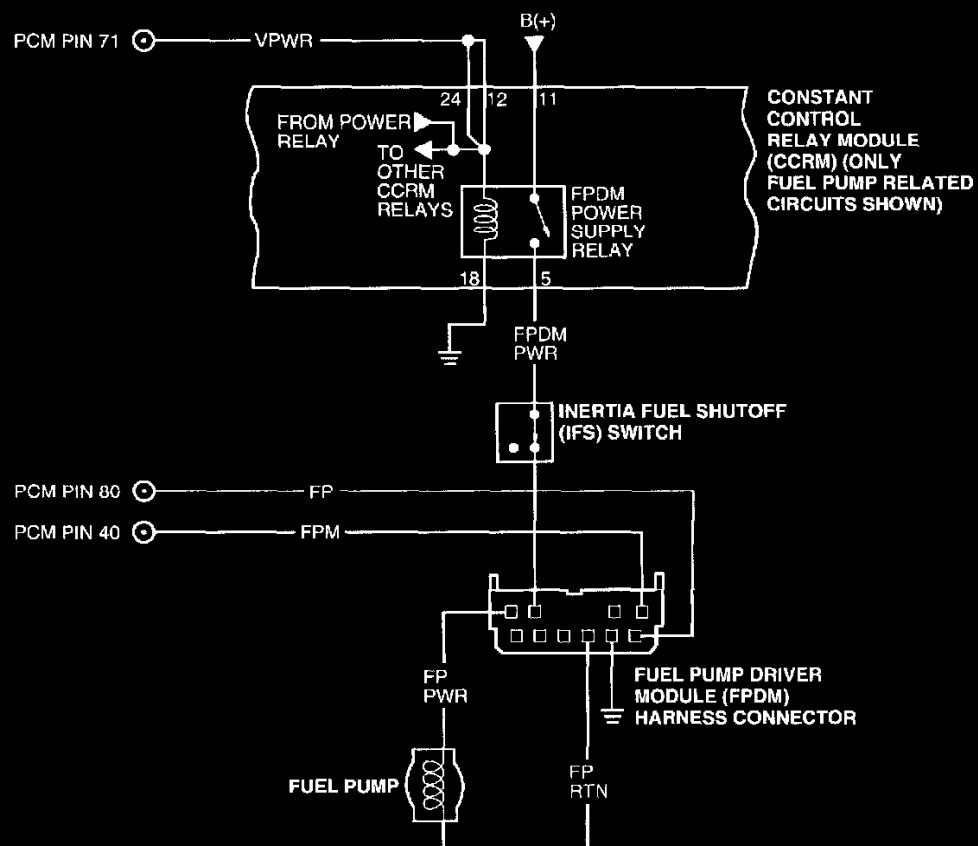
Fuel Pump Driver Module (FPDM)**KB****Focus, Cougar, Taurus/Sable**

A0038679

PCM CONNECTOR PIN NUMBER

Application	FP
Focus, Cougar	54
Taurus/Sable	80

Test Schematic

Fuel Pump Driver Module (FPDM)**KB****Mustang**

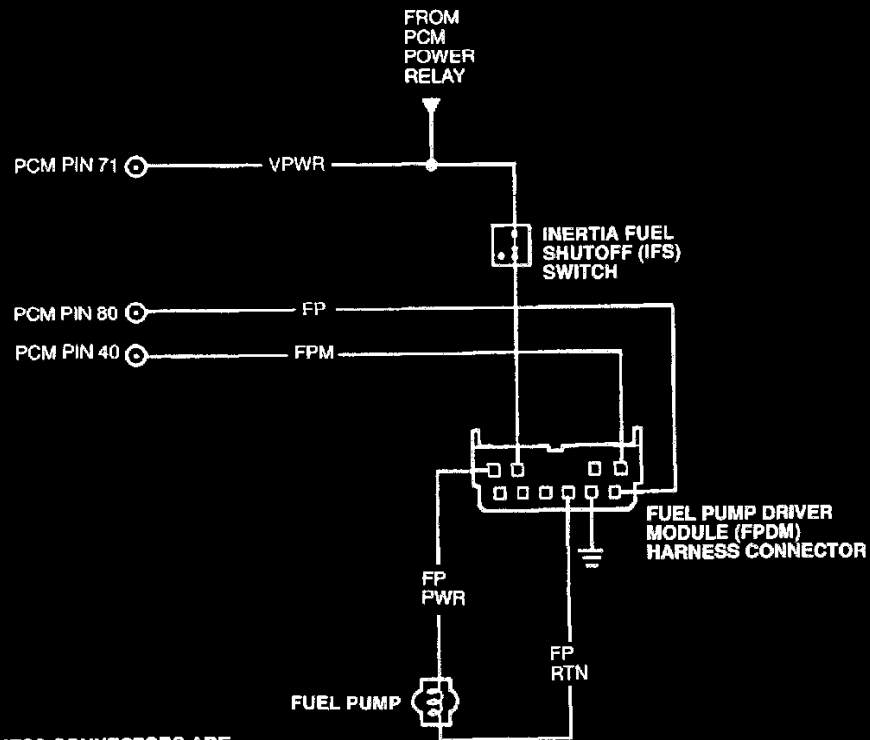
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0015025

Test Schematic

Fuel Pump Driver Module (FPDM)**KB**

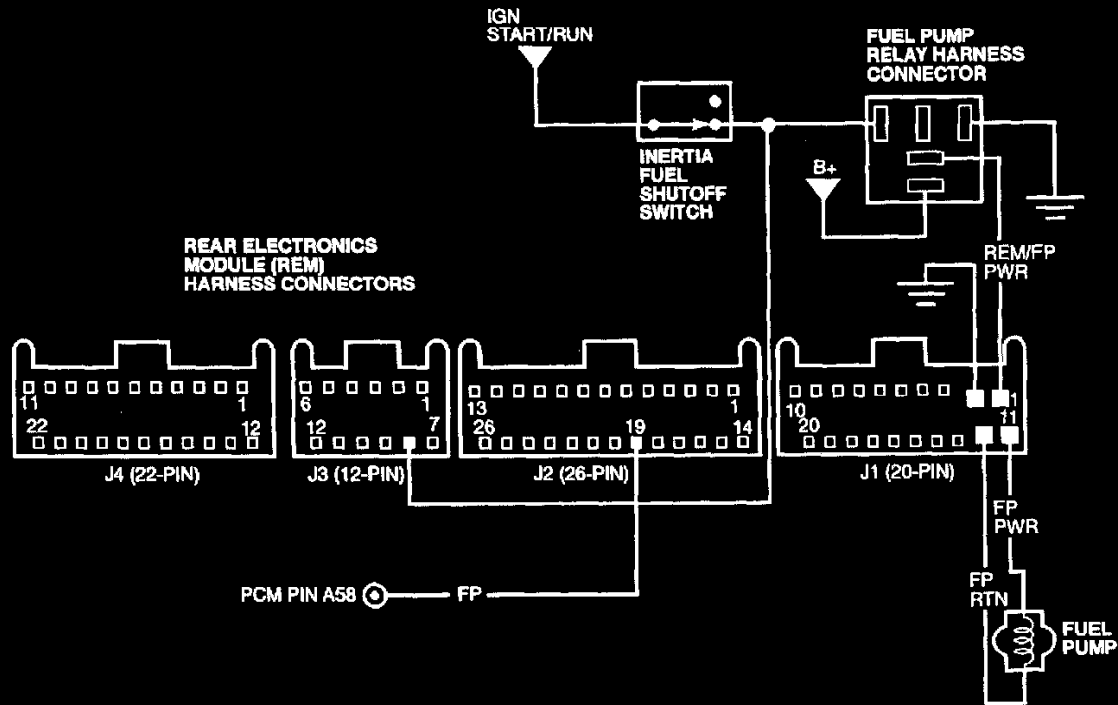
Continental



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

AA0794-E

Test Schematic

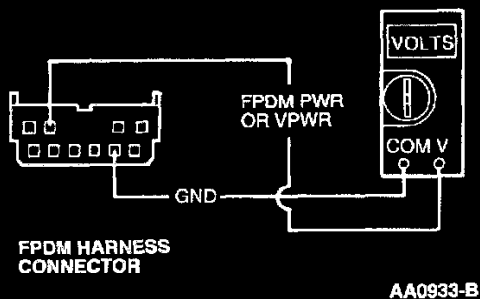
Fuel Pump Driver Module (FPDM)**KB****LS6/LS8, Thunderbird****NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE****AA4847-B**

Test Schematic

Fuel Pump Driver Module (FPDM)

KB

Test Steps		Results	Action to Take
KB1	DTC P1233 OR P1234: IS DTC P1233 OR P1234 PRESENT IN KEY ON ENGINE OFF SELF-TEST		
	Is DTC P1233 or P1234 present in Key On Engine Off Self-Test?	Yes → No →	A hard fault is present. GO to KB2 . The PCM is now receiving a signal from the FPDM. One possible cause of the DTC P1233 or P1234 is that the IFS switch was tripped, then reset. If engine is now a no start: Disregard the DTC P1233 or P1234 at this time. RETURN to Symptom Charts and CONTINUE as directed. After servicing the no start, to diagnose intermittent causes of the DTC P1233 or P1234, RETURN to GO to KB25 . If engine will start: GO to KB25 to diagnose intermittent condition.
KB2	DOES THE ENGINE START?		
	Does the engine start?	Yes → No →	GO to KB15 (to check the FPM circuit). VERIFY IFS switch is set (button depressed). If OK, GO to KB3 .
KB3	CHECK POWER AND GROUND CIRCUITS TO FPDM		
	- Disconnect FPDM. - Key on, engine off. - Measure voltage between the FPDM PWR pin (VPWR for Continental) and ground pin at the FPDM harness connector. - Is voltage greater than 10.5 volts?	Yes → No →	Key off. REPLACE FPDM. GO to KB4 .


KB1 - KB3

Fuel Pump Driver Module (FPDM)

KB

Test Steps		Results	Action to Take
KB4	CHECK POWER TO FPDM - Key on, engine off. - Measure voltage between the FPDM PWR pin (VPWR for Continental) at the FPDM harness connector and chassis ground. Is voltage greater than 10.5 volts?  AA1856-A	Yes → No →	REPAIR open ground circuit to FPDM. KEY OFF. No power to FPDM. For Escort, Mustang: GO to KB5. For Continental: GO to KB14. All Others: GO to KB8.
KB5	CHECK B+ VOLTAGE TO CCRM PIN 11 (FPDM POWER SUPPLY RELAY) - Disconnect CCRM. - Measure B+ circuit voltage at Pin 11 of the CCRM harness connector. Is voltage greater than 10.5 volts?	Yes → No →	For Mustang: GO to KB6. For Escort: GO to KB7. VERIFY integrity of related fuse. If OK, REPAIR open B+ circuit. If fuse is damaged, CHECK B+ and FPDM PWR circuits for short to ground before replacing.
KB6	CHECK GROUND CIRCUIT TO CCRM PIN 18 - Measure resistance of ground circuit between CCRM harness connector Pin 18 and chassis ground. Is resistance less than 5.0 ohms?	Yes → No →	GO to KB7. SERVICE open ground circuit.
KB7	CHECK FOR OPEN FPDM PWR CIRCUIT - Measure resistance of FPDM PWR circuit between CCRM harness connector (pin 5) and FPDM harness connector. Is resistance less than 5.0 ohms?	Yes → No →	REPLACE CCRM. The FPDM PWR circuit is open. GO to KB13 to help isolate fault.

Fuel Pump Driver Module (FPDM)

KB

Test Steps		Results	Action to Take
KB8	CHECK B+ VOLTAGE TO FPDM POWER SUPPLY RELAY		
	- Disconnect FPDM power supply relay. - Measure B+ circuit voltage at the FPDM power supply relay harness connector. Is voltage greater than 10.5 volts?	Yes → No →	GO to KB9 . VERIFY integrity of related fuse. If OK, REPAIR open B+ circuit. If fuse is damaged, CHECK B+ and FPDM PWR circuits for short to ground before replacing.
KB9	CHECK FOR GROUND TO FPDM POWER SUPPLY RELAY		
	- Disconnect scan tool from DLC. - Measure resistance of ground circuit between FPDM power supply relay harness connector and battery negative post. Is resistance less than 5.0 ohms?	Yes → No →	GO to KB10 . REPAIR open circuit.
KB10	CHECK FOR OPEN FPDM PWR CIRCUIT		
	- Measure resistance of FPDM PWR circuit between FPDM power supply relay harness connector and FPDM harness connector. Is resistance less than 5.0 ohms?	Yes → No →	RECONNECT FPDM. GO to KB11 . The FPDM PWR circuit is open. GO to KB13 to help isolate fault.
KB11	CHECK VPWR CIRCUIT VOLTAGE (IGN START/RUN for Taurus/Sable) TO FPDM POWER SUPPLY RELAY		
	- Key on, engine off. - Measure VPWR circuit voltage (IGN START/RUN for Taurus/Sable) at the FPDM power supply relay harness connector. Is voltage greater than 10.5 volts?	Yes → No →	REPLACE FPDM power supply relay. REPAIR open VPWR (or IGN START/RUN) circuit.
KB13	ISOLATE OPEN IN FPDM PWR CIRCUIT		
	- Disconnect IFS switch. - Measure resistance of FPDM PWR circuit between IFS switch harness connector and FPDM power supply relay harness connector (for Escort, CCRM harness connector). - Measure resistance of FPDM PWR circuit between FPDM harness connector and IFS switch harness connector. Are both resistances less than 5.0 ohms?	Yes → No →	VERIFY that the IFS switch is set (button depressed). If OK, REPLACE IFS switch. REPAIR open in appropriate area of FPDM PWR circuit.

KB8 - KB13

Fuel Pump Driver Module (FPDM)

KB

Test Steps		Results	Action to Take
KB14	ISOLATE OPEN IN VPWR CIRCUIT TO FPDM		
	- Disconnect Electronic Engine Control (EC) Power Relay. - Disconnect IFS switch. - Measure resistance of VPWR circuit between IFS switch harness connector and electronic EC power relay harness connector. - Measure resistance of VPWR circuit between IFS switch harness connector and FPDM harness connector. Are both resistances less than 5.0 ohms?	Yes → No →	VERIFY that the IFS switch is set (button depressed). If OK, REPLACE IFS switch. REPAIR open in the appropriate area of the VPWR circuit to the FPDM.
KB15	CHECK FOR OPEN FPM CIRCUIT		
	- Disconnect FPDM. - Disconnect PCM. - Measure resistance of FPM circuit between PCM harness connector Pin 40 and the FPDM harness connector. Is resistance less than 5.0 ohms?	Yes → No →	GO to KB16 . REPAIR open circuit.
KB16	CHECK FPM CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Key on, engine off. - Measure voltage between PCM harness connector Pin 40 and ground. Is voltage less than 1.0 volt?	Yes → No →	KEY OFF. GO to KB17 . REPAIR short circuit.
KB17	CHECK FPM CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool from DLC. - Measure resistance between PCM harness connector Pin 40 and ground. Is resistance greater than 10,000 ohms?	Yes → No →	GO to KB18 . REPAIR short circuit.
KB18	CHECK FOR FPM OUTPUT FROM FPDM		
	- Reconnect FPDM. - Key on, engine off. - Measure dc voltage between PCM harness connector Pins 40 and 51. Is voltage between 0.02 and 1.0 volt dc? (It is OK for the voltage to cycle below this range and then return to within range.)	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPLACE FPDM.

Fuel Pump Driver Module (FPDM)

KB

Test Steps		Results	Action to Take
KB25	CHECK CIRCUITS THAT MAY CAUSE AN INTERMITTENT LOSS OF POWER SUPPLY TO THE FPDM. ALSO CHECK FOR INTERMITTENT OPENS OR SHORTS ON THE FPM CIRCUIT. • Key on, engine off. • Access FPM PID. Note: With no fault detected, the FPDM will send a 50% duty cycle signal (all OK) to the PCM on the FPM circuit. Depending on scan tools, the FPM PID may display 50%, or a random value that is fluctuating between 85 and 115%. • Observe FPM PID for an indication of a fault while completing the following (look for the FPM PID to change from the 50% value, or to stop fluctuating): — Shake, wiggle, bend the following circuits: • FPDM ground. • Power supply circuit (VPWR or FPDM PWR) to FPDM. • For Escort and Mustang, the B+ circuit to CCRM pin 11. For Mustang, also the ground circuit to CCRM Pin 18. • For Focus, Cougar and Taurus/Sable, the B+ and ground circuits to FPDM power supply relay. • FPM circuit between the FPDM and the PCM. — Lightly tap on the IFS Switch, FPDM and CCRM or FPDM power supply relay to simulate road shock. • Key off. • Is a fault indicated?	Yes No	→ ISOLATE fault and REPAIR as necessary. → Unable to duplicate or identify fault at this time. GO to Z1.
KB30	DTC P1235 OR P1236: IS DTC P1235 OR P1236 PRESENT IN KEY ON ENGINE OFF OR ENGINE RUNNING SELF TEST? Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. Note: For LS6/LS8 and Thunderbird, the FPDM functions are incorporated in the Rear Electronics Module (REM). In the following steps, if directed to perform an action with the FPDM, complete the action with the REM. Refer to the pin numbers in the beginning of this pinpoint test. • Is DTC P1235 or P1236 present in Key On Engine Off or Engine Running Self-Test?	Yes No	→ A hard fault is present. GO to KB31 to check the FP circuit. → DTC P1235 or P1236 is intermittent. For LS6/LS8 and Thunderbird: GO to KB42. All others: GO to KB45.

KB25 - KB30

Fuel Pump Driver Module (FPDM)

KB

Test Steps		Results	Action to Take
KB31	CHECK FOR OPEN FP CIRCUIT BETWEEN PCM AND FPDM		
	- Disconnect FPDM. - Disconnect PCM. - Measure resistance of FP circuit between PCM harness connector pin and the FPDM harness connector. Is resistance less than 5.0 ohms?	Yes → No →	GO to KB32 . REPAIR open circuit.
KB32	CHECK FP CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Key on, engine off. - Measure voltage between FP circuit at PCM harness connector pin and ground. Is voltage less than 1.0 volt?	Yes → No →	KEY OFF. GO to KB33 . REPAIR short circuit.
KB33	CHECK FP CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool from DLC. - Measure resistance between FP circuit at PCM harness connector pin and ground. Is resistance greater than 10,000 ohms?	Yes → No →	For LS6/LS8 and Thunderbird : GO to KB36 . All others: GO to KB34 . REPAIR short circuit.
KB34	CHECK FP CIRCUIT IN FPDM		
	- Reconnect FPDM. - Key on, engine off. - Measure voltage between FP circuit at PCM harness connector pin and ground. Is voltage between 4.5 and 5.5 volts?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPLACE FPDM.
KB36	CHECK FPF PID		
	- Key on, engine off. - Access the FP and FPF PIDs on the scan tool (the FP PID may be used in the next step). - While viewing the FPF PID for 20 seconds, check if the FPF PID will indicate YES. The FPF PID may read NO in the 20 seconds, but will change back to YES. Does the FPF PID indicate YES within 20 seconds?	Yes → No →	GO to KB40 . GO to KB37 .

Fuel Pump Driver Module (FPDM)**KB**

Test Steps		Results	Action to Take
KB37	CHECK FP PID		
	Does the FP PID indicate between 70 and 80%?	Yes → No →	GO to KB38 . TURN KEY OFF then back ON. Wait 5 seconds. REPEAT test step. If result is now YES, follow YES result. If result is still NO, REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
KB38	ACCESS REM PIDS AND CHECK PWM_DC1 PID		
	- Access the PWM_DC1 PID from the REM menu (the PWM_DC1 PID indicates the signal sent to the REM from the PCM on the FP circuit). - Does the PWM_DC1 PID indicate between 70 and 80%?	Yes → No →	KEY OFF. No fault indicated. Disregard DTC P1235 or P1236. RETURN to Symptom Charts where DTC was received and proceed as directed. REPLACE REM.
KB40	CHECK REM CIRCUITRY VOLTAGE ON FP CIRCUIT AT PCM		
	- Key off. - Disconnect PCM connector A. - Key on, engine off. - Measure voltage between Pin A58 at the PCM harness connector A and ground. - Is voltage greater than 8 volts?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPLACE REM.
KB42	CHECK FP CIRCUIT FOR INTERMITTENT CONCERNS		
	- Key on, engine off. - Access the REM PID access menu on the scan tool. - Access the PWM_DC1 PID from the REM menu (the PWM_DC1 PID indicates the signal sent to the REM from the PCM on the FP circuit). - Observe the PWM_DC1 PID for indication of a fault while completing the following (the PID value will change when a fault is detected): - Shake, wiggle and bend the FP circuit between the PCM (Pin A58) and REM (Pin J2-19). - Is a fault indicated?	Yes → No →	ISOLATE fault and REPAIR as necessary. KEY OFF. Unable to duplicate or identify fault at this time. GO to Z1 with the following data: PWM_DC1 PID (REM menu), FP PID (PCM menu, the FP PID is the signal the PCM is sending to the REM).

Fuel Pump Driver Module (FPDM)

KB

Test Steps		Results	Action to Take
KB45	CHECK FP CIRCUIT FOR INTERMITTENT OPENS OR SHORTS		
	- Key on, engine off. - Access FPM PID. Note: With no fault detected, the FPDM will send a 50% duty cycle signal (all OK) to the PCM on the FPM circuit. Depending on scan tools, the FPM PID may display 50%, or a random value that is fluctuating between 85 and 115%. - Observe the FPM PID for an indication of a fault while completing the following (look for the FPM PID to change from the 50% value, or to stop fluctuating): - Shake, wiggle, bend the FP circuit between FPDM and the PCM. - Lightly tap on the FPDM (to simulate road shock). - Is a fault indicated?	Yes → No →	ISOLATE fault and REPAIR as necessary. KEY OFF. Unable to duplicate or identify fault at this time. GO to Z1.
KB47	DTC P1237 OR P1238: IS DTC P1237 OR P1238 PRESENT IN KEY ON ENGINE OFF OR ENGINE RUNNING SELF TEST		
	Is DTC P1237 or P1238 present in Key On Engine Off or Key On Engine Running Self-Test?	Yes → No →	A hard fault is present. GO to KB48. DTC P1237 or P1238 is possibly intermittent. For LS6/LS8 and Thunderbird: GO to KB67. All others: GO to KB56.
KB48	DOES THE ENGINE START?		
	Does the engine start?	Yes → No →	For LS6/LS8 and Thunderbird: GO to KB80. All others: DISCONNECT FPDM. GO to KB59. For LS6/LS8 and Thunderbird: GO to KB61. All others: GO to KB49 to check fuel pump secondary circuits.

Fuel Pump Driver Module (FPDM)**KB**

Test Steps		Results	Action to Take
KB49	CHECK FP PWR, FP RTN AND INTERNAL FUEL PUMP CIRCUIT RESISTANCE		
	- Disconnect scan tool from DLC. - Disconnect FPDM. - Measure resistance between FP PWR circuit and the FP RTN circuit at the FPDM harness connector. Is resistance less than 10.0 ohms?	Yes No	→ GO to KB50 . → An open secondary circuit exists. GO to KB54 to isolate fault.
KB50	CHECK FP RTN CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Key on, engine off. - Measure voltage between the FP RTN circuit in harness and chassis ground. Is voltage less than 1.0 volt?	Yes No	→ GO to KB51 . → REPAIR short circuit.
KB51	CHECK FP PWR CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect fuel pump. - Measure resistance between the FP PWR circuit in harness and ground. Is resistance greater than 10,000 ohms?	Yes No	→ GO to KB52 . → REPAIR short circuit.
KB52	CHECK FOR VOLTAGE TO FUEL PUMP		
	- Reconnect FPDM. - Reconnect scan tool. - Key on, engine off. - Access Output Test Mode on scan tool. (To complete this test step without a scan tool, the fuel pump can be commanded on for one second by cycling the key from off to on. Repeat as needed.) - Connect digital multimeter between the FP PWR circuit and the FP RTN circuit at the fuel pump harness connector. - While monitoring voltage, command outputs on (this commands the fuel pump on for about 5 seconds). With the fuel pump commanded on, is the voltage greater than 10.0 volts?	Yes No	→ REPLACE fuel pump. → VERIFY vehicle battery was at proper charge during test. VERIFY pump on command did not time-out before voltage check was made. If OK, REPLACE FPDM.
KB54	ISOLATE OPEN CIRCUIT		
	- Disconnect fuel pump. - Measure resistance of the FP PWR circuit between the FPDM and fuel pump harness connectors. - Measure resistance of the FP RTN circuit between the FPDM and fuel pump harness connectors. - Measure internal resistance of the fuel pump. Is each resistance less than 10.0 ohms?	Yes No	→ No fault is detected. VERIFY results of previous test steps. → REPAIR open in appropriate circuit (if open was internal to pump, REPLACE fuel pump).

Fuel Pump Driver Module (FPDM)**KB**

Test Steps		Results	Action to Take
KB56	VERIFY THAT DTC P1237 OR P1238 IS INTERMITTENT		
	Note: When the FPDM is detecting a secondary fuel pump circuit fault (the wires going to the fuel pump), a 75% duty cycle signal will be sent to the PCM on the FPM circuit. On some scan tools, the FPM PID may display the 75% signal as a random value that is fluctuating between 250 and 400%. • Key on, engine off. • Access FPM PID. • Is the FPM PID 75% (or varying between 250 and 400%)?	Yes → No →	A hard fault is present. GO to KB48. DTC P1237 or P1238 is intermittent. GO to KB57.
KB57	CHECK FUEL PUMP SECONDARY CIRCUITS FOR INTERMITTENT OPEN OR SHORT		
	• Key on, engine off. • Access FPM PID. Note: With no fault detected, the FPDM will send a 50% duty cycle signal (all OK) to the PCM on the FPM circuit. Depending on scan tools, the FPM PID may display 50%, or a random value that is fluctuating between 85 and 115%. • Observe the FPM PID for an indication of a fault while completing the following (the FPM PID will change from the normal (all OK) reading when a fault is detected): — Shake, wiggle, bend the FP PWR circuit and FP RTN circuit between the FPDM and the fuel pump. — Lightly tap the fuel pump and the FPDM to simulate road shock. • Is a fault indicated?	Yes → No →	ISOLATE fault and REPAIR as necessary. KEY OFF. GO to KB58.
KB58	CHECK FP PWR CIRCUIT FOR SHORT TO GROUND		
	• Disconnect FPDM. • Connect a non-powered test lamp between the FP PWR circuit and the FPDM PWR circuit at the FPDM harness connector. • Key on. • Observe test lamp for an indication of a fault while completing the following (the test lamp will turn on when a fault is detected, indicating a short to ground): — Shake, wiggle, bend the FP PWR circuit between the FPDM and the fuel pump. • Is a fault indicated?	Yes → No →	ISOLATE fault and REPAIR as necessary. KEY OFF. Unable to duplicate or identify fault at this time. RECONNECT FPDM. GO to Z1.

Fuel Pump Driver Module (FPDM)**KB**

Test Steps		Results →	Action to Take
KB59	CHECK FP PWR CIRCUIT FOR SHORT TO POWER		
	• FPDM disconnected. • Key on, engine off. • Measure voltage between the FP PWR circuit at the FPDM harness connector and chassis ground. • Is voltage less than 1.0 volt?	Yes → No →	GO to KB60 . REPAIR FP PWR circuit short to power.
KB60	CHECK FP RTN CIRCUIT FOR SHORT TO GROUND		
	• FPDM disconnected. • Key on. • Measure voltage between the FPDM PWR (or VPWR) and FP RTN circuits at the FPDM harness connector. • Is voltage less than 1.0 volt?	Yes → No →	REPLACE FPDM. REPAIR FP RTN circuit short to ground.
KB61	CHECK REM/FP PWR AND GROUND CIRCUIT TO REM PINS J1-1, J1-2		
	Note: Verify inertia fuel shutoff (IFS) switch is not tripped. • Disconnect REM connector J1. • Key on. • Measure voltage between pins J1-1 (REM/FP PWR) and J1-2 (GND) at the REM harness connector. • Is voltage greater than 10.5 volts?	Yes → No →	KEY OFF. GO to KB49 (The FPDM functions are incorporated in the Rear Electronics Module (REM). In the following test steps, if directed to complete an action with the FPDM, complete the action with the REM. Refer to the pin numbers in the beginning of this pinpoint test). GO to KB62 .
KB62	CHECK REM/FP PWR CIRCUIT VOLTAGE TO REM USING CHASSIS GROUND AS A REFERENCE		
	• Key on. • Measure voltage between pin J1-1 of the REM harness connector and chassis ground. • Is voltage greater than 10.5 volts?	Yes → No →	REPAIR open ground circuit in harness to pin J1-2 of the REM. KEY OFF. GO to KB63 .
KB63	CHECK FOR B+ TO FUEL PUMP RELAY HARNESS CONNECTOR		
	• 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 KB64 . VERIFY condition of related fuse(s). If OK, REPAIR open circuit. If B+ fuse is damaged, CHECK for B+ short to ground or FP RTN for short to power before replacing fuse.

Fuel Pump Driver Module (FPDM)**KB**

Test Steps		Results	→	Action to Take
KB64	CHECK FOR IGN START/RUN VOLTAGE (THROUGH IFS SWITCH) TO FUEL PUMP RELAY HARNESS CONNECTOR			
	• Disconnect REM connector J3. • Key on. • Measure IGN START/RUN circuit (from IFS switch) voltage at fuel pump relay harness connector. • Is voltage greater than 10.5 volts?	Yes No	→ →	KEY OFF. GO to KB65 . VERIFY condition of related fuse. If fuse is damaged, CHECK for IGN START/RUN circuit short to ground before replacing fuse. If fuse is OK, GO to KB69 (to isolate open circuit).
KB65	CHECK GROUND CIRCUIT TO FUEL PUMP RELAY			
	• Measure resistance of ground circuit between the fuel pump relay harness connector and ground. • Is resistance less than 5.0 ohms?	Yes No	→ →	GO to KB66 . REPAIR open circuit.
KB66	CHECK REM/FP PWR CIRCUIT CONTINUITY			
	• Measure resistance of REM/FP PWR circuit between the fuel pump relay harness connector and the REM harness connector (pin J1-1). • Is resistance less than 5.0 ohms?	Yes No	→ →	REPLACE fuel pump relay. REPAIR open circuit.
KB67	CHECK REM/FP PWR, REM GROUND AND CIRCUITS ASSOCIATED WITH THE FUEL PUMP RELAY FOR INTERMITTENTS			
	• Disconnect REM connector J1. • Connect a non-powered test lamp between pins J1-1 (REM/FP PWR) and J1-2 (GND) of the REM harness connector. • Key on. • Observe test lamp for an indication of a fault while completing the following (the test lamp will go out when a fault is detected): — Shake, wiggle and bend the REM/FP PWR and GND (pin J1-2) circuits to REM. — Shake, wiggle and bend the circuits going to the fuel pump relay (IGN START/RUN, B+ ground). — Lightly tap the fuel pump relay and IFS switch to simulate road shock. • Is a fault detected?	Yes No	→ →	ISOLATE fault and REPAIR as necessary. KEY OFF. GO to KB68 .

Fuel Pump Driver Module (FPDM)

KB

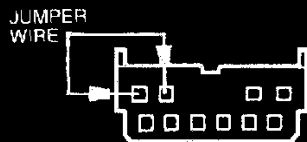
Test Steps		Results	Action to Take
KB68	CHECK FP PWR AND FP RTN CIRCUITS FOR INTERMITTENT CONCERNS		
	- Connect a DVOM (set to measure resistance) between pins J1-11 (FP PWR) and J1-12 (FP RTN). - Observe DVOM for an indication of a fault while completing the following (resistance will change suddenly when a fault is detected): - Shake, wiggle and bend the FP PWR and FP RTN circuits between the fuel pump and REM. - Connect DVOM between pin J1-12 (FP RTN) and ground. - Observe DVOM for an indication of a fault while completing the following (resistance will change suddenly when a short to ground is detected): - Shake, wiggle and bend the FP PWR and FP RTN circuits between the fuel pump and REM. Is a fault indicated?	Yes → No →	ISOLATE fault and REPAIR as necessary. KEY OFF. Unable to duplicate or identify fault at this time. REMOVE DVOM, RECONNECT REM. GO to Z1.
KB69	ISOLATE OPEN IN IGN START/RUN CIRCUIT		
	- Disconnect Inertia Fuel Shutoff (IFS) switch. - Measure resistance across the normally closed contacts of the IFS switch. Note resistance. - Measure resistance of IGN START/RUN circuit between the IFS switch and fuel pump relay harness connectors. Are both resistances less than 5.0 ohms?	Yes → No →	REPAIR open IGN START/RUN circuit to IFS switch. If open was in IGN START/RUN circuit, REPAIR open. If open was in IFS switch, REPLACE switch.
KB70	SENT HERE FROM PINPOINT TEST HC WITH LOW VOLTAGE AT FUEL PUMP AND NO DTCs: CHECK BATTERY VOLTAGE WITH OUTPUTS COMMANDED ON		
	Note: For LS6/LS8 and Thunderbird, verify REM Self-Test has been previously performed. - Scan tool connected. - Fuel pump disconnected. - Key on. - Connect digital multimeter to the battery positive and battery negative posts. - While monitoring battery voltage, command outputs on. Note voltage within 5 seconds. - Command outputs off. Was battery voltage greater than 11.0 volts?	Yes → No →	GO to KB71. Battery voltage is low. REFER to Charging System.

Fuel Pump Driver Module (FPDM)**KB**

Test Steps		Results	Action to Take
KB71	CHECK GROUND CIRCUIT TO FUEL PUMP BY MEASURING VOLTAGE AT FUEL PUMP USING BATTERY NEGATIVE AS A REFERENCE		
	• Connect digital multimeter between the FP PWR circuit at the fuel pump harness connector and the battery negative post. • Key on. • While monitoring voltage, command outputs on. Note voltage within 5 seconds. • Is voltage greater than 10.5 volts?	Yes No	→ Ground fault to fuel pump indicated. CHECK all associated wiring and connections for the fuel pump and FPDM ground circuits. Carefully CHECK the FPDM ground connection to chassis ground. REPAIR as necessary. → KEY OFF. Ground circuit to fuel pump is OK. GO to KB72 .
KB72	CHECK VOLTAGE TO FUEL PUMP DRIVER MODULE (FPDM)		
	Note: For LS6/LS8 and Thunderbird, the FPDM functions are incorporated in the Rear Electronics Module (REM). In the following steps, if directed to complete an action with the FPDM, complete the action with the REM. • Disconnect fuel pump driver module (FPDM). • Key on. • Measure voltage between the FPDM PWR (VPWR for Continental) circuit at the FPDM harness connector and the battery negative post. • Is voltage greater than 10.5 volts?	Yes No	→ KEY OFF. GO to KB73 . → KEY OFF. Improper voltage is being supplied to FPDM. GO to KB75 .

Fuel Pump Driver Module (FPDM)

KB

Test Steps		Results	Action to Take
KB73	CHECK FP PWR CIRCUIT		
- Connect a jumper wire between the FPDM PWR (VPWR for Continental) pin and FP PWR pin at the FPDM harness connector. - Key on. - Measure voltage between the FP PWR circuit at the fuel pump harness connector and the battery negative post. Is voltage greater than 10.5 volts, AND within 0.5 volt of the reading in KB72?		Yes	→ KEY OFF. REMOVE jumper. VERIFY previous test steps. CHECK related connectors for corrosion, etc. If all checks are OK, REPLACE FPDM.
		No	→ KEY OFF. REMOVE jumper. CHECK for causes of high resistance in FP PWR circuit.
 FUEL PUMP DRIVER MODULE (FPDM) HARNESS CONNECTOR AA0797-C			
KB75	CHECK B+ TO ELECTRONIC ENGINE CONTROL (EC) POWER RELAY (CONTINENTAL), CCRM OR FPDM POWER SUPPLY RELAY		
- Disconnect CCRM (Escort, Mustang), electronic EC power relay (Continental) or FPDM power supply relay (all others). - Key on (to put same load on battery as previous steps). - For Escort, Mustang: - Measure voltage between pin 11 (B+) of the CCRM harness connector and the battery negative post. - For Continental: - Measure voltage between the B+ circuit at the electronic EC power relay harness connector and the battery negative post. - For all others: - Measure voltage between the B+ circuit at the FPDM power supply relay harness connector and the battery negative post. Is voltage greater than 10.5 volts?		Yes	→ KEY OFF. GO to KB76 .
		No	→ Improper voltage is being supplied to the CCRM, FPDM power supply relay or electronic EC power relay. CHECK associated wiring, connectors, etc. REPAIR as necessary.

Fuel Pump Driver Module (FPDM)**KB**

Test Steps		Results	Action to Take
KB76	CHECK FPDM PWR CIRCUIT		
- For Escort, Mustang: - Connect a jumper wire between pin 11 (B+) and pin 5 at the CCRM harness connector. - For Continental: - Connect a jumper wire between the B+ and the VPWR circuit at the electronic EC power relay vehicle harness connector. - For all others: - Connect a jumper wire between the B+ and the FPDM PWR circuit at the FPDM power supply relay harness connector. - Key on. - Measure voltage between the FPDM PWR (VPWR for Continental) circuit at the FPDM harness connector and the battery negative post. Is voltage greater than 10.5 volts?		Yes → No →	VERIFY previous test steps. CHECK related connectors for corrosion, etc. If all checks are OK, REPLACE FPDM. CHECK for causes of high resistance in associated connectors and wiring of the FPDM PWR VPWR circuit, including the IFS switch and its connector. REPAIR as necessary.
KB80	CHECK FP RTN CIRCUIT FOR SHORT TO GROUND		
- Disconnect REM connector J1. - Key on. - Measure voltage between pins J1-1 and J1-12 at the REM harness connector. Is voltage less than 1.0 volt?		Yes → No →	GO to KB67 . REPAIR FP RTN circuit short to ground.
KB85	COMPLETE REAR ELECTRONICS MODULE SELF-TEST TO VERIFY IFS SWITCH INPUT TO REM (REM PIN J3-8)		
- Complete Rear Electronics Module Self-Test (refer to Multifunction Electronic Control Modules for directions). Is REM DTC B2172 present?		Yes → No →	GO to KB86 . GO to A1 .

Fuel Pump Driver Module (FPDM)**KB**

Test Steps		Results	Action to Take
KB86	B2172: CHECK IFS SWITCH INPUT CIRCUIT TO REM (REM PIN J3-8)		
• Disconnect REM connector J3. • Key on, engine off. • Measure voltage at pin J3-8 of the REM harness connector. • Is voltage greater than 10.5 volts?		Yes	→ KEY OFF. If engine is a no start and REM DTC B2172 was received in on-demand self-test mode: REPLACE REM. If engine will start or REM DTC B2172 is a continuous memory DTC: DTC is intermittent. If engine is a no start, return to Symptom Charts to continue diagnosis. If engine will start, GO to Z1 (even though PPT Z is designed for PCM intermittents, the diagnostic techniques will help with the REM diagnosis).
		No	→ KEY OFF. VERIFY IFS switch is not open. If OK, REPAIR open circuit between IFS switch and REM pin J3-8.

KB86

Test KC: Fuel Shutoff Valve Relay

Fuel Shutoff Valve Relay

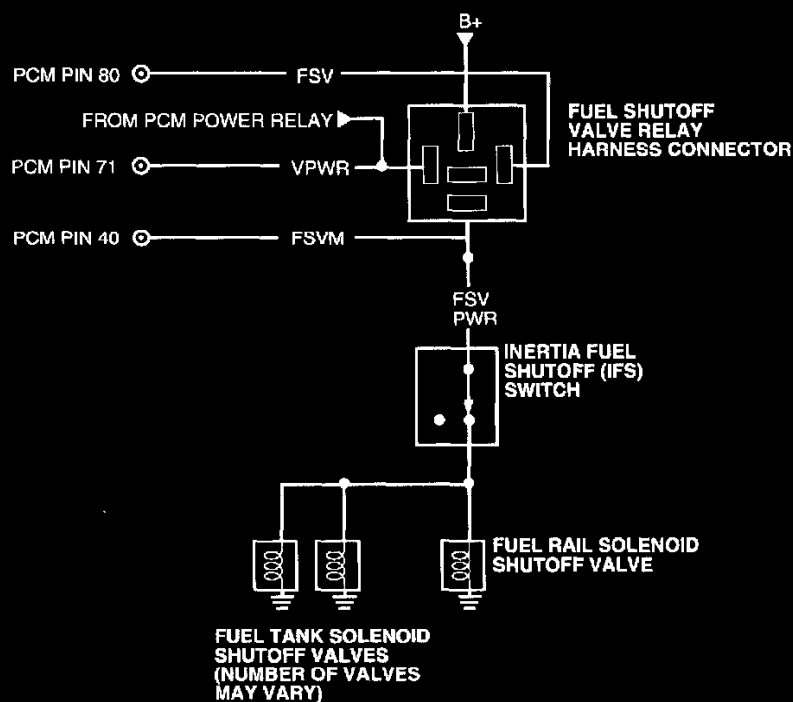
KC

Note

This Pinpoint Test is intended to diagnose the following:

- Fuel Shutoff Valve Relay
- Inertia Fuel Shutoff (IFS) switch (9341)
- Powertrain Control Module (PCM) (12A650)
- Harness circuits: B+, VPWR, Fuel Shutoff Valve (FSV), GND, Fuel Shutoff Valve Monitor (FSVM) and Fuel Shutoff Valves Power (FSV PWR)

Pinpoint Test Schematics and Connectors



NOTE: THE FSV AND VPWR CIRCUITS MAY BE REVERSED IN THE HARNESS CONNECTOR. REFER TO THE VEHICLE/DIAGRAMS FOR MORE INFORMATION.

A0028509

Note, Schematics and Connectors

Fuel Shutoff Valve Relay

KC

Test Steps		Results	Action to Take
KC6	CHECK THE FUEL SHUTOFF VALVE PRIMARY CIRCUIT INSIDE THE PCM		
	Note: The next two test steps will check the FSV circuit in the PCM. To do this the FSVF PID will be monitored. The FSVF PID is able to monitor the FSV circuit and will indicate when a fault is detected.	Yes	→ KEY OFF. REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
	• Reconnect PCM. • Reconnect fuel shutoff valve relay. • Reconnect scan tool to DLC. • Key on, engine off. • Access FSVF PID on scan tool. • Does the FSVF PID indicate a fault (or YES)?	No	→ GO to KC7 .
KC7	CHECK FUEL SHUTOFF VALVE PRIMARY CIRCUIT INSIDE 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.	Yes	→ KEY OFF. REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
	• Key on, engine off. • While viewing the FSVF PID, crank the engine. • Does the PID display indicate a fault during crank?	No	→ KEY OFF. The fuel pump primary circuit is OK in the harness and PCM. If DTC P0231 is present: GO to KC20 . If DTC P0232 is present: GO to KC10 .
KC10	DTC P0232: DOES ENGINE START?		
	• Does the engine start?	Yes	→ GO to KC11 .
		No	→ GO to KC15 .
KC11	CHECK IF POWER IS ALWAYS BEING SUPPLIED TO FSV PWR CIRCUIT		
	• Disconnect scan tool from DLC. • Disconnect PCM. • Key on, engine off. • All accessories off (such as interior lamps or radios). • Measure voltage between PCM harness connector pin 40 and ground. • Is voltage less than 1.5 volts?	Yes	→ GO to KC13 .
		No	→ GO to KC12 .
KC12	CHECK FOR FUEL SHUTOFF VALVE RELAY CONTACTS ALWAYS CLOSED		
	• Disconnect fuel shutoff valve relay. • Key on, engine off (with accessories off). • Again measure voltage between PCM harness connector pin 40 and ground. • Is voltage less than 1.5 volts?	Yes	→ REPLACE fuel shutoff valve relay.
		No	→ REPAIR FSV PWR/FSVM circuit short to power.

KC6 - KC12

Fuel Shutoff Valve Relay

KC

Test Steps		Results	Action to Take
KC13	CHECK FOR OPEN FSVM CIRCUIT BETWEEN PCM AND FUEL SHUTOFF VALVE RELAY		
	- Disconnect fuel shutoff valve relay. - Measure resistance between PCM harness connector pin 40 and FSV PWR circuit at the fuel shutoff valve relay harness connector. Is resistance less than 5.0 ohms?	Yes → No →	REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuit.
KC15	CHECK INERTIA FUEL SHUTOFF (IFS) SWITCH		
	- 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 KC16 . REPLACE or RESET IFS switch.
KC16	CHECK FOR OPEN FSV PWR CIRCUIT BETWEEN IFS SWITCH AND FUEL SHUTOFF VALVE RELAY		
	- Disconnect fuel shutoff valve relay. - Measure resistance of FSV PWR circuit between the fuel shutoff valve relay and IFS switch harness connectors. Is resistance less than 5.0 ohms?	Yes → No →	RECONNECT fuel shutoff valve relay. GO to KC17 . REPAIR open in FSV PWR circuit between IFS switch and FSVM connection to circuit.
KC17	CHECK FSV PWR CIRCUIT RESISTANCE TO GROUND THROUGH THE FUEL SOLENOID SHUTOFF VALVES		
	- Measure resistance between the FSV PWR circuit to the fuel solenoid shutoff valves at the IFS switch harness connector and chassis ground. Is resistance less than 10.0 ohms?	Yes → No →	No fault is indicated. VERIFY previous test step results. If OK, disregard DTC P0232 at this time. RECONNECT IFS switch. RETURN to Symptom Charts, Step 1: Quick Test and CONTINUE diagnosis as directed. REPAIR open circuit. Open is either in the common FSV PWR circuit before any splice to the individual fuel solenoid shutoff valves, or in each of the individual fuel solenoid shutoff valve circuits path to ground.
KC20	DTC P0231: DOES ENGINE START?		
	Note: If Key On, Engine Off (KOEO) DTC P0230 is also present and has not been checked, GO to KC1 to check primary fuel shutoff valve circuit first. Does the engine start?	Yes → No →	DISCONNECT PCM. GO to KC13 . GO to KC21 .

KC13 - KC20

Fuel Shutoff Valve Relay

KC

Test Steps		Results	Action to Take
KC21	CHECK B+ VOLTAGE TO FUEL SHUTOFF VALVE RELAY		
	- Disconnect fuel shutoff valve relay. - Measure B+ circuit voltage at the fuel shutoff valve relay harness connector. Is voltage greater than 10.5 volts?	Yes → No →	GO to KC22 . VERIFY integrity of fuse for B+ supply to fuel shutoff valve relay. If OK, REPAIR open B+ circuit. If fuse is damaged, check B+ and FSV PWR circuit for short to ground before replacing.
KC22	CHECK FOR OPEN FSV PWR CIRCUIT BETWEEN RELAY AND FSVM SPLICE		
	- Measure resistance between FSV PWR circuit at fuel shutoff valve relay harness connector and ground. Is resistance less than 10.0 ohms?	Yes → No →	REPLACE fuel shutoff valve relay. REPAIR open in FSV PWR circuit between FSVM splice and fuel shutoff valve relay.
KC30	CONTINUOUS MEMORY DTC P0232: CHECK HARNESS		
	Note: If Continuous Memory Diagnostic Trouble Code (DTC) P0230 is also present, GO to KC40 . - Key on, engine off. - Access FSVM PID. - Observe the PID for an indication of a fault while completing the following (the FSVM PID will turn ON when an open or short to power is detected): - Shake, wiggle, bend the FSV PWR circuit between the fuel shutoff valve relay and the fuel solenoid shutoff valves. - Shake, wiggle, bend the fuel shutoff valves ground circuits from each fuel solenoid shutoff valve to ground. - Shake, wiggle, bend the FSVM circuit between the PCM and the splice to the FSV PWR circuit. - Lightly tap inertia fuel shutoff switch and fuel shutoff valve relay to simulate road shock. - Key off. Is fault indicated/found?	Yes → No →	ISOLATE fault and REPAIR as necessary. Unable to duplicate or identify fault at this time. GO to Z1 .

KC21 - KC30

Fuel Shutoff Valve Relay**KC**

Test Steps		Results	→	Action to Take
KC35	CONTINUOUS MEMORY DTCP0231: CHECK FUEL SHUTOFF VALVES SECONDARY CIRCUITS BETWEEN B+ SUPPLY AND FPM CONNECTION			
• Disconnect inertia fuel shutoff switch. • Disconnect PCM. • Install a jumper wire between PCM harness connector pins 80 (FSV) and ground. • Connect a digital multimeter between PCM harness connector pins 40 (FPM) and ground. • Key on. The fuel shutoff valve relay will activate and voltage will be greater than 10.0 volts. • Observe voltage for an indication of a fault while completing the following (the voltage will change suddenly when a fault is detected, indicating an open): — Shake, wiggle, bend the B+ circuit to the fuel shutoff valve relay. — Lightly tap the fuel shutoff valve relay to simulate road shock. — Shake, wiggle, bend the FSV PWR circuit between the fuel shutoff valve relay and the FSVM splice. • Key off. • Inspect the fuel shutoff valve relay connector for corrosion, damaged pins. • Is a fault indicated?		Yes	→	ISOLATE fault and REPAIR as necessary.
		No	→	Unable to duplicate or identify fault at this time. GO to Z1.

KC35

Fuel Shutoff Valve Relay**KC**

Test Steps		Results	Action to Take
KC40	CONTINUOUS MEMORY DTC P0230: CHECK FUEL SHUTOFF VALVE PRIMARY CIRCUITS		
• Key on, engine off. Wait 5 seconds. • Access FSVF PID. The PID will indicate no fault (or NO), indicating that the PCM detects VPWR voltage through the fuel shutoff valve relay coil and FSV circuit to the PCM pin 80. • Observe the FSVF PID for an indication of a fault while completing the following (the FSVF PID will indicate a fault (or YES) when an open is detected (this is because the PCM will not detect VPWR voltage on pin 80 (FSV)): — Shake, wiggle, bend the fuel shutoff valve circuit between the PCM pin 80 and the fuel shutoff valve relay. — Shake, wiggle bend the VPWR circuit between the electronic engine control power relay and the fuel shutoff valve relay. — Lightly tap the fuel shutoff valve relay (to simulate road shock). • Key off. • Inspect the PCM and fuel shutoff valve relay connectors for corrosion, damaged pins. • Is a fault indicated?		Yes	→ ISOLATE fault and REPAIR as necessary.
		No	→ Unable to duplicate or identify fault at this time. GO to Z1.

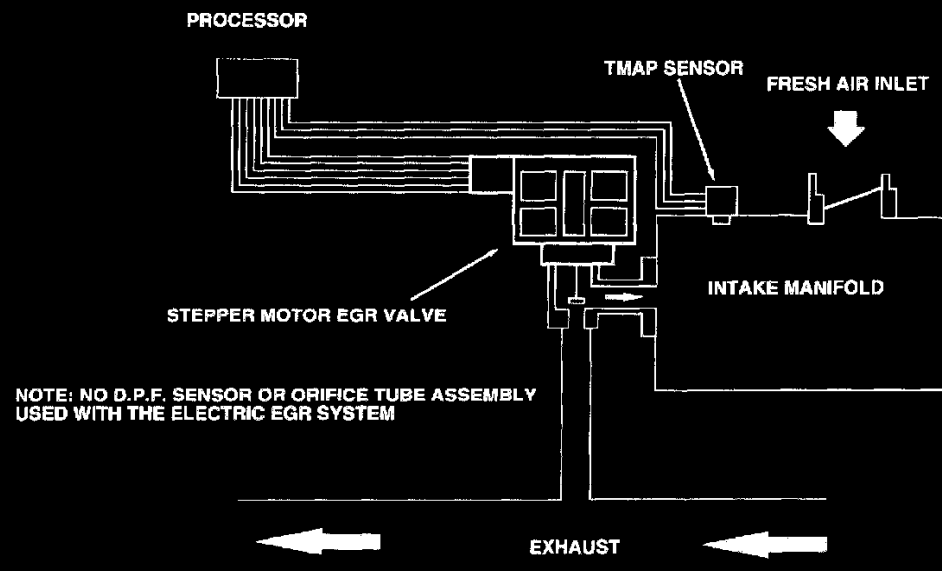
KC40

Test KD: Electric Exhaust Gas Recirculation (EEGR) System

**Exhaust Gas Recirculation (EGR)
System (Electric)****KD****Note**

This Pinpoint Test is intended to diagnose the following:

- EGR Motor/Valve assembly (9D475)
- Harness circuit: EGR
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematic and Connectors

A0027514

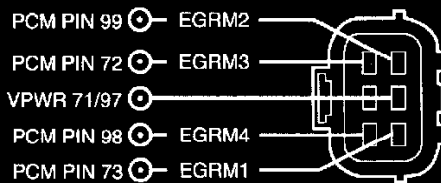
Note, Schematic and Connectors

Exhaust Gas Recirculation (EEGR) System (Electric)

KD

Ranger 2.3L

ELECTRIC EGR MOTOR HARNESS CONNECTOR



**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

A0034995

Test Steps		Results →	Action to Take
KD1	P0403: CHECK CONNECTION OF EEGR TO HARNESS		
	Note: If the DTC (Diagnostic Trouble Code) was generated by an intermittent condition, maximum benefit of the following pin point tests will be obtained by having an assistant wiggle the harness/connectors when making measurements. - Check the harness connector at the EEGR motor. Is the connector properly seated?	Yes → No →	GO to KD2. REPAIR as necessary.
KD2	CHECK FOR B+ AT HARNESS CONNECTOR TO THE EEGR MOTOR		
	- Key on, engine off. - Measure the voltage at the EEGR harness connector between pins 71, 97, and battery negative post. Is the voltage grater than 10.5 volts?	Yes → No →	GO to KD3. REPAIR open supply circuit.
KD3	CHECK EEGR HARNESS CIRCUIT FOR SHORTS TO GROUND		
	- Key off. - Disconnect the PCM and EEGR harness connector. - Measure the resistance of each EEGR circuit between the PCM harness connector and battery negative post. Is the resistance of each circuit grater than 10,000 ohms?	Yes → No →	GO to KD4. REPAIR short to ground in the harness.

Schematic, Test KD1 - KD3

Exhaust Gas Recirculation (EEGR) System (Electric)

KD

Test Steps		Results	Action to Take
KD4	CHECK FOR OPEN CIRCUITS IN THE EEGR HARNESS		
	- Measure the resistance between the PCM and EEGR connector of each EEGR circuit. Is resistance of each circuit less than 5 ohms?	Yes → No →	GO to KD5 . REPAIR the open circuit in the harness.
KD5	CHECK EEGR HARNESS CIRCUIT FOR SHORTS TO EACH OTHER		
	- Key off. - Measure the resistance at the PCM harness connector between pin 72, and pins 73, 98, 99, then pin73 and pins 98, 99. Is the resistance of each measurement greater than 10,000 ohms?	Yes → No →	GO to KD6 . REPAIR short in harness
KD6	CHECK FOR SHORTS TO POWER IN THE EEGR HARNESS		
	- Reconnect the PCM harness connector. - Key on engine off. - Measure the voltage between the EEGR connector pins 72, 73, 98, 99, and battery negative post. Is the voltage less than 0.1 volts?	Yes → No →	GO to KD7 . REPAIR short to power in harness.
KD7	CHECK EEGR MOTOR WINDINGS FOR OPEN AND SHORT CIRCUITS		
	- Key off. - Disconnect the PCM connector and reconnect the EEGR connector. - Measure the resistance at the PCM harness connector between pin 71/97 and pins 73 and 99 then between pin 71/97 and pins 72 and 98. Is resistance between 20 and 24 Ohms?	Yes → No →	GO to KD8 . REPAIR the EEGR assembly.
KD8	CHECK THE EEGR MOTOR WINDINGS FOR SHORTS TO GROUND		
	- Key off. - Measure the resistance at the PCM harness connector between the EEGR pins 72, 73, 98, 99, and the battery negative post. Is the resistance greater than 10,000 Ohms?	Yes → No →	REPLACE the PCM(refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR EEGR motor.

KD4 - KD8

**Exhaust Gas Recirculation (EEGR)
System (Electric)****KD**

Test Steps		Results	→	Action to Take
KD9	DTC P0400/P1408 CHECK FOR STUCK EGR VALVE OPERATION			
Note: Service all of the following DTC's first if present: P0102, P0103, P0107, P0108, P1100, P1101 • Select the Output State Control (OSC) function on the scan tool. • Enter the EEGR PID (EGRMDS) and the MAP PID (MAP). • Operate the engine at normal operating temperature between 1000/1200 r.p.m. to prevent engine stalling. • Add a small amount of EGR (approx. 8 to 12 steps) using the OSC function while monitoring the MAP PID. • The MAP value should increase as EGR is introduced. Note: The engine r.p.m. must be held at a fixed value during this test. Additionally, DTC's may have been generated as a result of this procedure. After running this test clear any DTC that may have been induced. • Is a increase in MAP value seen?		Yes	→	Condition is not present at this time, but be sure the MAP is properly seated and the vacuum source is not blocked.
		No	→	REPLACE EEGR Motor/Valve assembly.

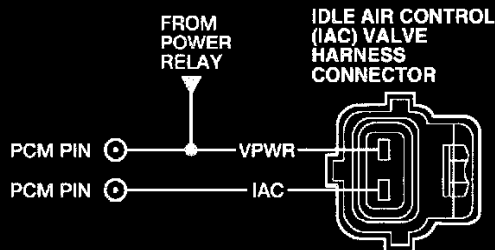
KD9

Test KE: Idle Air Control (IAC) Valve

Idle Air Control (IAC) Valve**KE****Note**

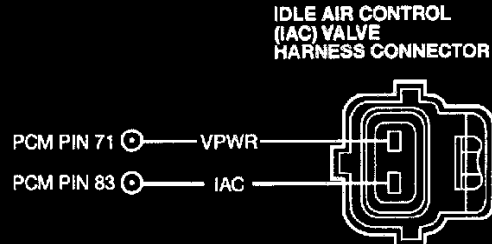
This Pinpoint Test is intended to diagnose the following:

- Idle Air Control (IAC) Valve (9F715)
- Harness Circuits: IAC and VPWR
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematics and Connectors**LS6/LS8**

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0041630

All Others

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

AA4562-B

PCM CONNECTOR PIN NUMBERS

APPLICATION	VPWR	IAC
EXPEDITION NAVIGATOR	B2	A34/A36
LS6/LS8, THUNDERBIRD	C25	C9
EXPLORER MOUNTAINEER	C69	C9

Note, Schematics and Connectors

Idle Air Control (IAC) Valve**KE**

Test Steps		Results	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 all Continuous Memory DTCs. - Note: If unable to perform KOER Self-Test to completion, GO to KE2. Run Key On Engine Running (KOER) Self-Test. - Is DTC P0505, P1504 or P1507 retrieved during KOER Self-Test or from Continuous Memory?	Yes → KEY OFF. GO to KE2. No → 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		
	Note: If EGR DTC P0402 was output during Self Test, diagnose it first before continuing with this Pinpoint Test. - Disconnect IAC valve. - Key on, engine off. - Measure VPWR circuit voltage at the IAC valve harness connector. - Is voltage greater than 10.5 volts?	Yes → KEY OFF. GO to KE3. No → REPAIR open circuit.	
KE3	CHECK IAC VALVE RESISTANCE		
	- IAC valve disconnected. - Measure IAC valve resistance. - Is resistance between 6.0 and 13.0 ohms?	Yes → GO to KE4. No → REPLACE IAC valve.	
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 → For DTC P1504: GO to KE7. All others: GO to KE5. No → REPLACE IAC valve.	
KE5	CHECK AIR INLET FOR PLUGGING		
	- Inspect the entire intake air system for debris, blockage and other damage. - Remove and inspect IAC air tubes (if equipped) for blockage and other damage. - Remove and inspect the air cleaner element for excessive dirt. - Is the intake air system OK?	Yes → RESTORE inlet air system. GO to KE6. No → REPAIR as necessary.	

KE1 - KE5

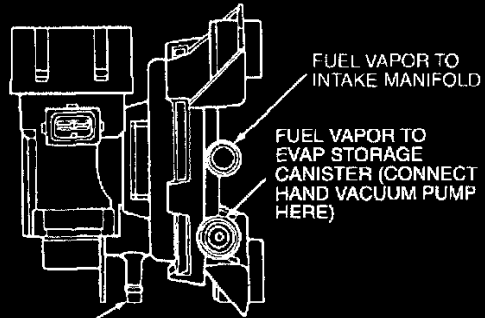
Idle Air Control (IAC) Valve**KE**

Test Steps		Results	Action to Take
KE6	CHECK FOR INLET AIR 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. — Damaged or loose IAC air tubes. — 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. • Are any leaks detected in the above areas?		Yes → REPAIR as necessary. No → KEY OFF. GO to KE7.	
KE7	CHECK IAC CIRCUIT FOR OPEN IN HARNESS		
Note: Refer to the PCM connector pin numbers in the beginning of this Pinpoint Test. • IAC valve disconnected. • Disconnect PCM. • Measure resistance of IAC circuit between PCM harness connector pin and IAC valve harness connector. • Is resistance less than 5.0 ohms?		Yes → GO to KE8. No → REPAIR open circuit.	
KE8	CHECK IAC CIRCUIT FOR SHORT TO PWR IN HARNESS		
• Key on, engine off. • Measure voltage on IAC circuit between PCM harness connector pin and battery negative post. • Is voltage less than 1.0 volt?		Yes → KEY OFF. GO to KE9. No → REPAIR short circuit.	
KE9	CHECK IAC CIRCUIT FOR SHORT TO GROUND IN HARNESS		
• Disconnect scan tool from DLC. • Measure resistance between IAC and PWR GND circuits at the PCM harness connector. • Is each resistance greater than 10,000 ohms?		Yes → For DTC P1504: REPLACE PCM. All Others: GO to KE10. No → REPAIR short circuit.	

Idle Air Control (IAC) Valve**KE**

Test Steps		Results	Action to Take
KE10	CHECK IAC SIGNAL FROM PCM		
- Reconnect PCM and IAC valve. Note: If stalling occurs place a shim under the hard stop screw to maintain idle conditions). - Key on, engine running. - Access IAC and RPM PIDS. - With engine at normal operating temperature, accessories OFF and at closed throttle, the IAC duty cycle must be between approximately 22 percent and 45 percent. - Slowly increase engine speed to 3000 rpm and return to closed throttle (Note: If closed throttle rpm is significantly higher than normal, ignore this step). Is the IAC duty cycle within specification at closed throttle and does the duty cycle respond to the change in rpm?		Yes	→ For Continuous Memory DTCs P1504 and P1507: GO to KE30. All others: KEY OFF. INSPECT throttle body for damage. REPAIR as necessary. If OK, REPLACE IAC valve. RESET Keep Alive Random Access Memory (RAM). (REFER to Diagnostic Methods, Powertrain Control Module (PCM) Reset).
		No	→ For DTC P1507, REPLACE IAC valve, otherwise REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
KE20	DTC P1506: CHECK FOR VACUUM LEAKS		
- 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 or cracked IAC air tubes. - 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. Are any leaks detected in the above areas?		Yes	→ KEY OFF. REPAIR as necessary.
		No	→ KEY OFF. GO to KE21.

Idle Air Control (IAC) Valve**KE**

Test Steps		Results	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.
KE22	CHECK IAC VALVE FOR PROPER FUNCTION - Key on, engine running. - Bring engine to normal operating temperature. - Transmission in PARK or NEUTRAL. - Disconnect IAC valve. Does the rpm drop or engine stall?	Yes No	→ KEY OFF. GO to KE23 . → KEY OFF. INSPECT throttle body for damage. REPAIR as necessary. If OK, REPLACE IAC valve. RESET Keep Alive Random Access Memory (RAM). (REFER to Diagnostic Methods, Powertrain Control Module (PCM) Reset.)

KE21 - KE22

Idle Air Control (IAC) Valve**KE**

Test Steps		Results	Action to Take
KE23	CHECK IAC CIRCUIT FOR SHORT TO GND IN HARNESS		
	Note: Refer to the PCM connector pin numbers in the beginning of this Pinpoint Test. • Disconnect scan tool from DLC. • Disconnect PCM. • Measure resistance between IAC circuit at the PCM harness connector and battery negative post. • Is each resistance greater than 10,000 ohms?	Yes → No →	For fast idle symptom currently present: REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). All others: RESTORE vehicle. GO to KE30. REPAIR short circuit.
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 completing 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. For idle quality, starting or stalling symptoms currently present: REPLACE IAC valve. All others: Unable to duplicate or identify fault at this time. GO to Z1.

KE23 - KE30

Test KF: Fan Control (FC) Relay

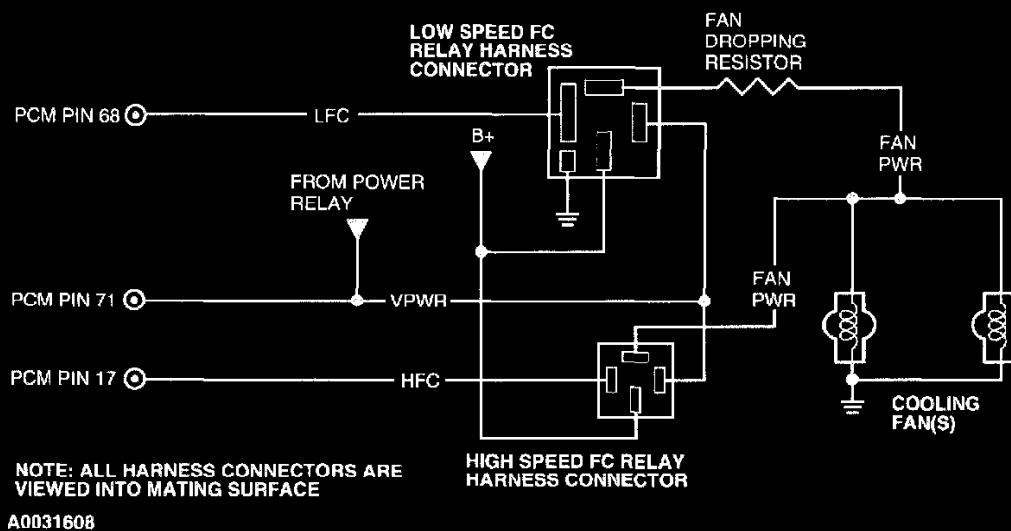
Fan Control (FC) Relay**KF****Note**

This Pinpoint Test is intended to diagnose the following:

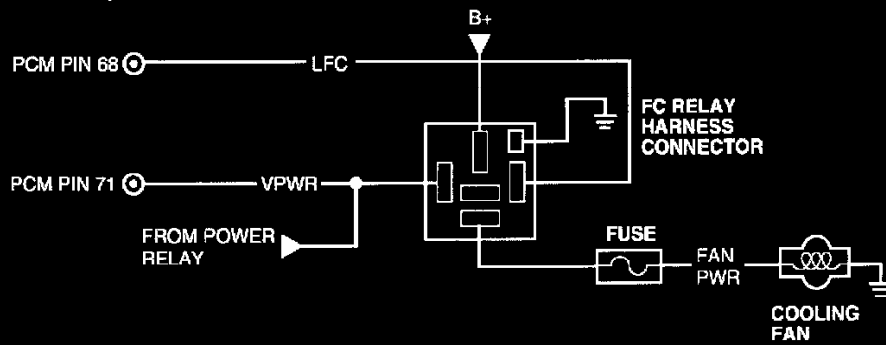
- Harness circuits: VPWR, B+, HFC, LFC, MFC, IGN START/RUN, FAN(s) PWR
- High speed fan control (FC), low speed FC and medium speed FC relays
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematics and Connectors

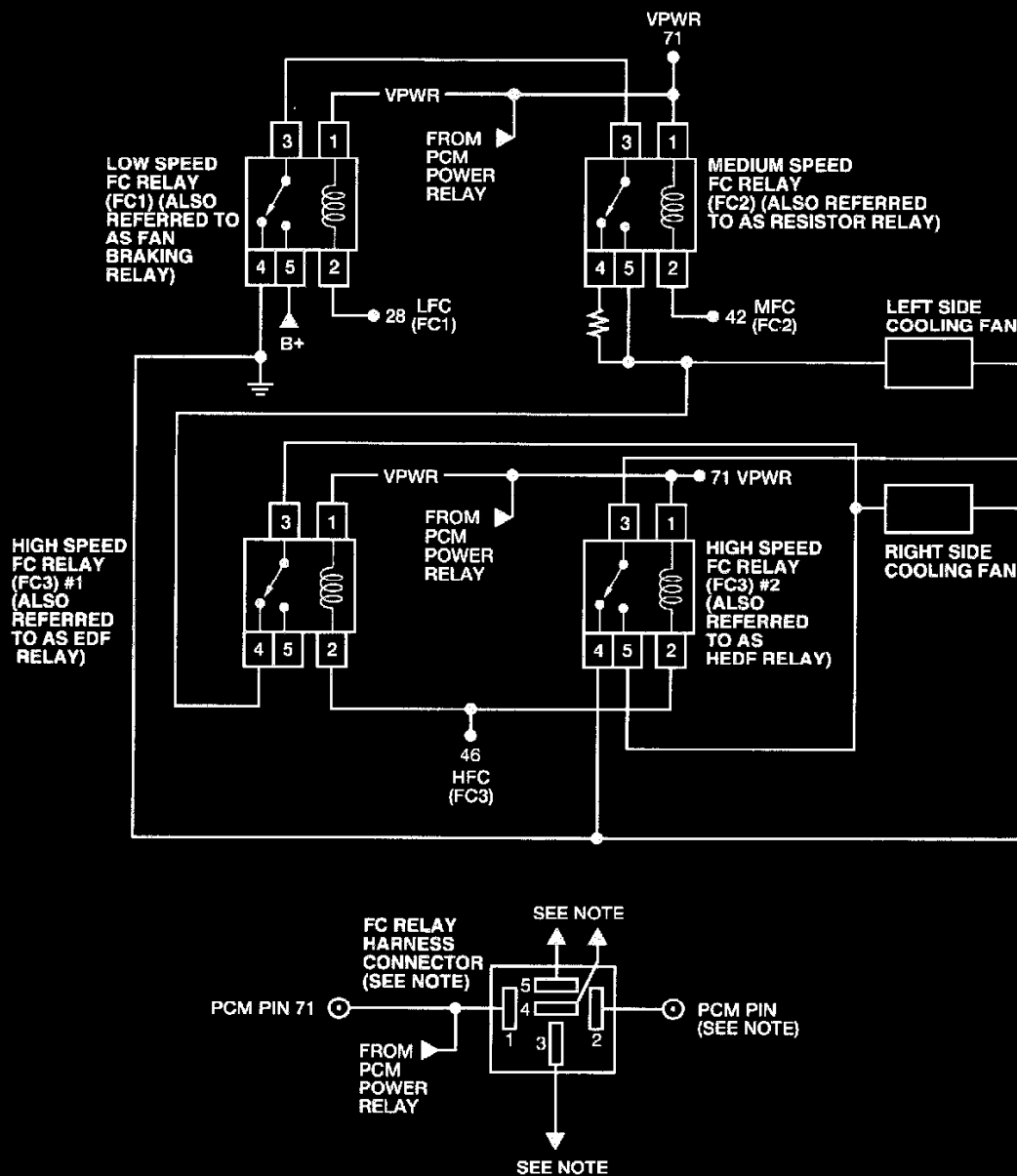
Focus (with A/C), Cougar



Note, Schematics and Connectors

Fan Control (FC) Relay**KF****Focus (Without A/C)****Test Schematic**

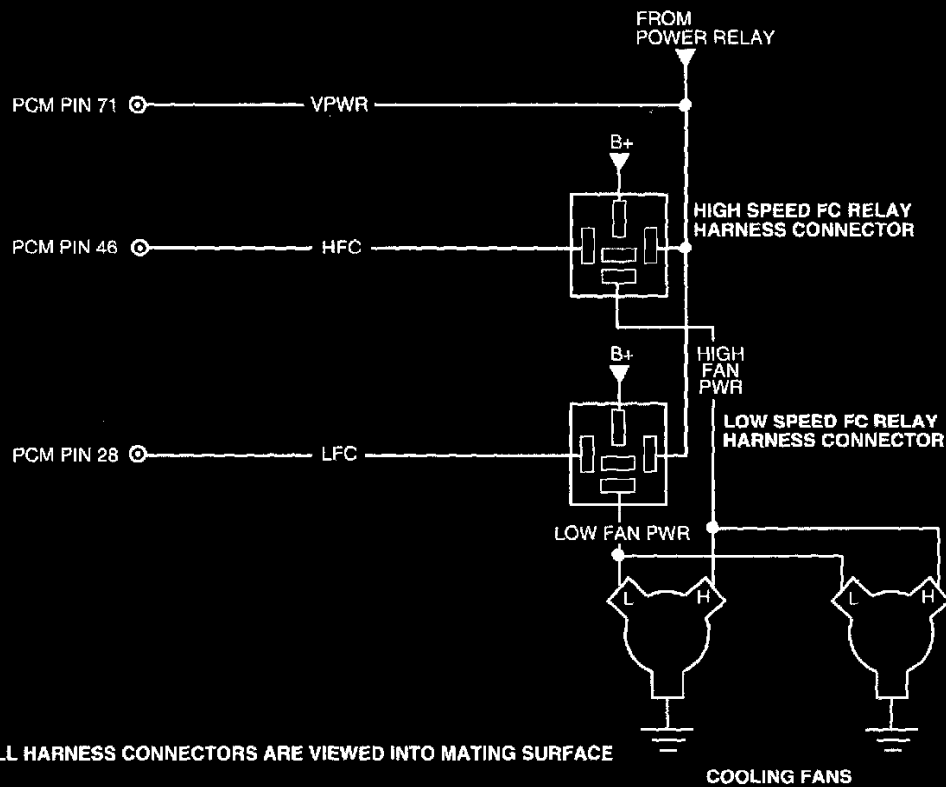
Fan Control (FC) Relay

KF**Taurus/Sable**

A0042252

NOTE: REFER TO DRAWING ABOVE

Test Schematic

Fan Control (FC) Relay**KF****Continental**

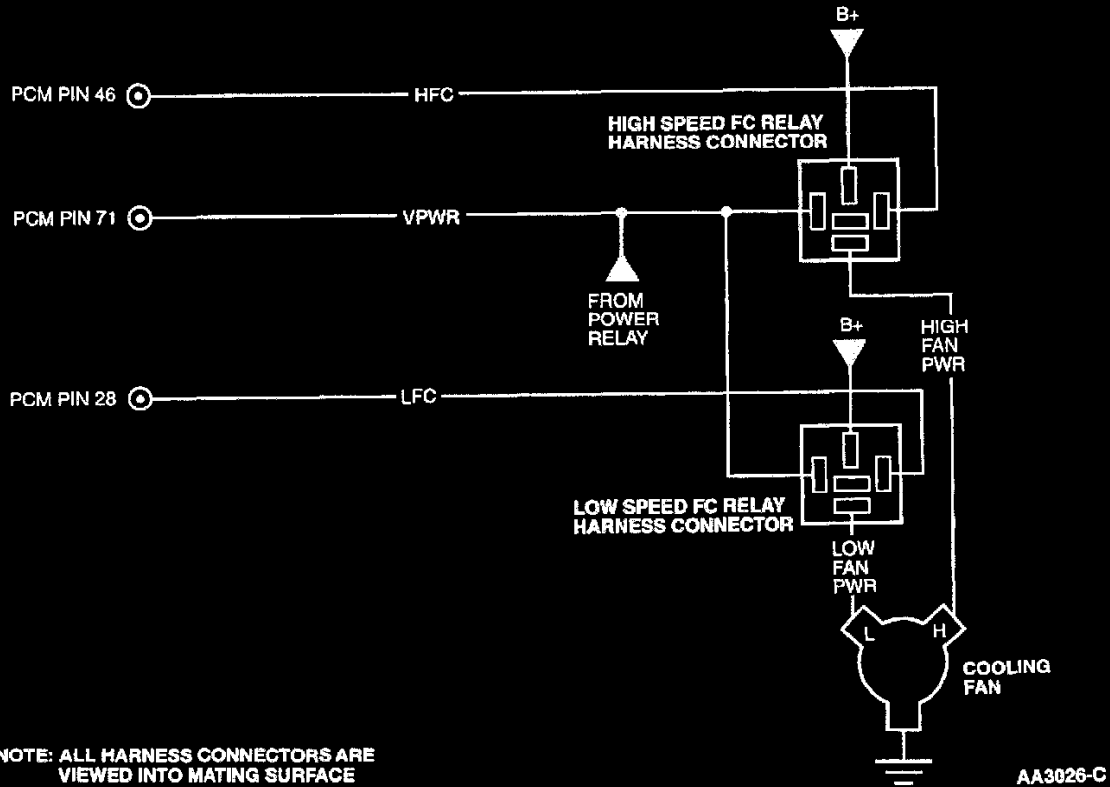
A0028392

Test Schematic

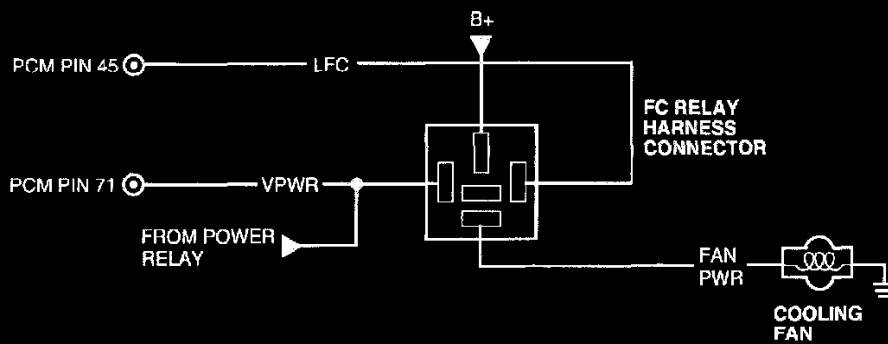
Fan Control (FC) Relay

KF

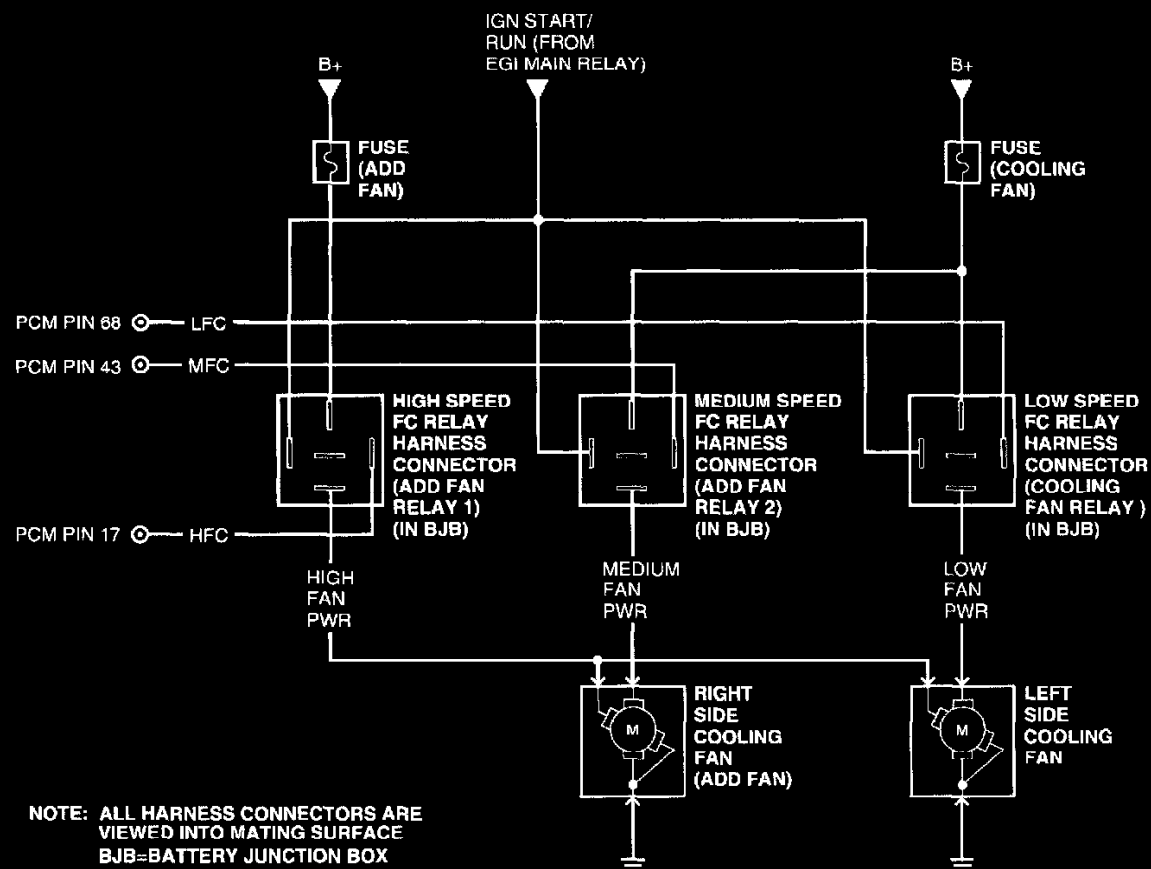
Crown Victoria/Grand Marquis, Town Car



Ranger



Test Schematic

Fan Control (FC) Relay**KF****2.0L Escape**

A0029208

Note: Although the PCM output circuits are named low, medium and high speed fan control (FC), cooling fan speed is controlled by a combination of these outputs. Refer to Description and Operation (PCM Outputs) for more information.

2.0L Escape Fan Diagnosis Chart

Cooling Fan Motor(s) With Concern	Output Test Mode That Has Concern	FC Relay and Cooling Fan To Be Checked
Both	Low and High	Low, Medium and High Speed FC relays; Both Fans
Both	Low	Low and Medium Speed FC relays; Both Fans
Both	High	High Speed FC relay; Both Fans

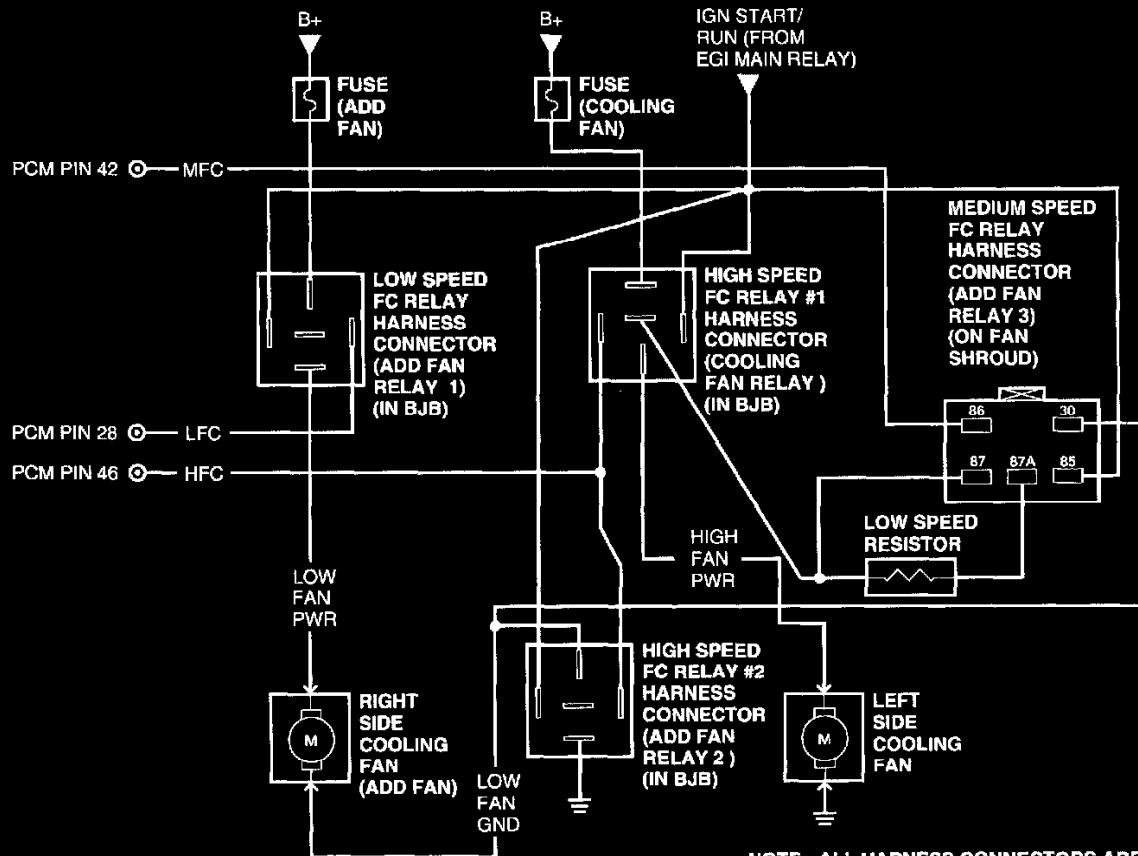
(Continued)

Schematic, Diagnosis Chart

Fan Control (FC) Relay**KF****2.0L Escape Fan Diagnosis Chart**

Cooling Fan Motor(s) With Concern	Output Test Mode That Has Concern	FC Relay and Cooling Fan To Be Checked
Passenger Side Fan	Low and High	Medium and High Speed FC relays; Passenger Side Fan
Passenger Side Fan	Low	Medium Speed FC relay; Passenger Side Fan
Passenger Side Fan	High	High Speed FC relay; Passenger Side Fan
Driver's Side Cooling Fan	Low and High	Low and High Speed FC relays; Driver's Side Cooling Fan
Driver's Side Cooling Fan	Low	Low Speed FC relay; Driver's Side Cooling Fan
Driver's Side Cooling Fan	High	High Speed FC relay; Driver's Side Cooling Fan

Diagnosis Chart

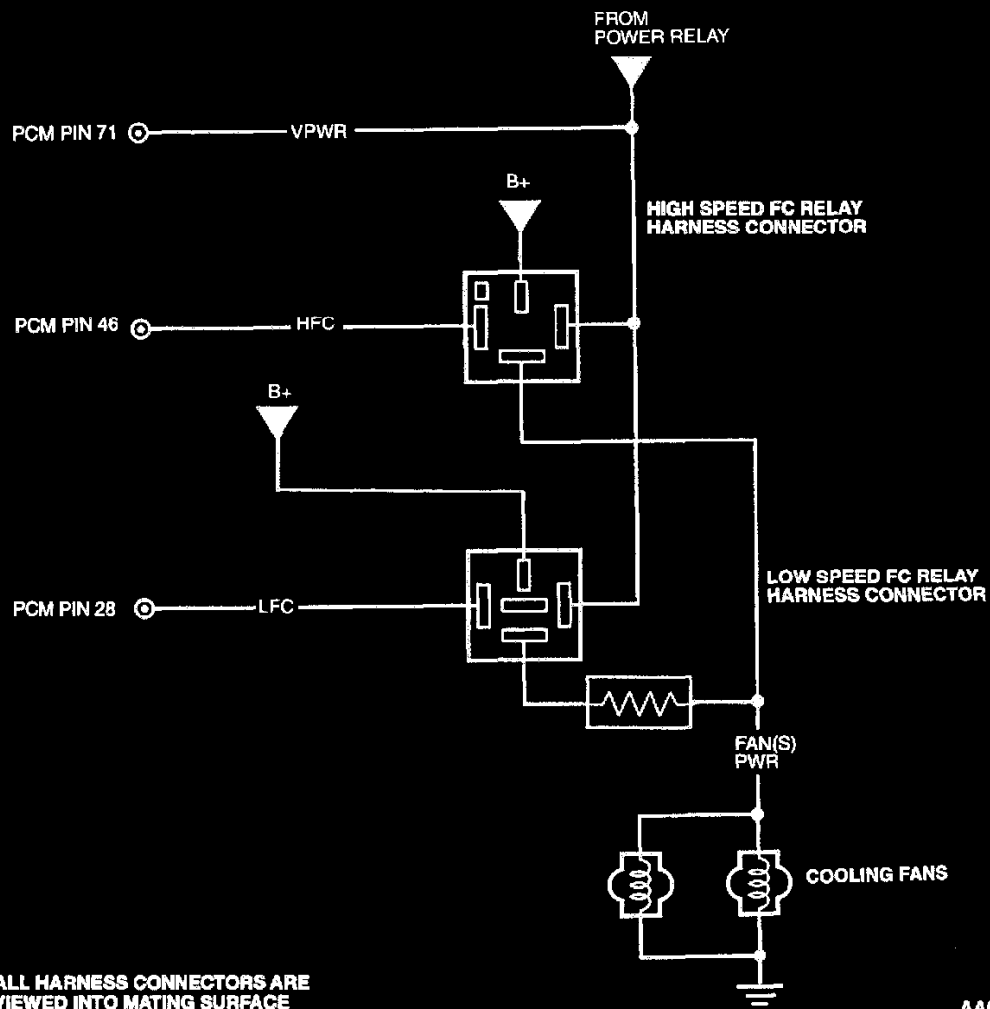
Fan Control (FC) Relay**KF****3.0L Escape**

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
BJB=BATTERY JUNCTION BOX

A0029209

Note: Although the PCM output circuits are named low, medium and high speed fan control (FC), cooling fan speed is controlled by a combination of these outputs. Refer to Description and Operation (PCM Outputs) for more information.

Test Schematic

Fan Control (FC) Relay**KF****Windstar**

Test Schematic

Fan Control (FC) Relay**KF**

Test Steps		Results	→	Action to Take								
KF1	DTC P1474/P1477/P1479 or FC PRIMARY CIRCUIT FAULT: CHECK VPWR (or IGN START/RUN for ESCAPE) VOLTAGE TO APPLICABLE FAN CONTROL RELAY											
- NOTE: During diagnosis, use the chart below to determine the correct circuit and relay being tested. <table><tr><th>DTC</th><th>Circuit/ Relay</th></tr><tr><td>P1474</td><td>LFC</td></tr><tr><td>P1477</td><td>MFC</td></tr><tr><td>P1479</td><td>HFC</td></tr></table> - Disconnect appropriate fan control relay. - Key on, engine off. - Measure VPWR (IGN START/RUN for Escape) circuit voltage at the applicable fan control relay harness connector. Is voltage greater than 10.5 volts?		DTC	Circuit/ Relay	P1474	LFC	P1477	MFC	P1479	HFC	Yes	→	GO to KF2 .
DTC	Circuit/ Relay											
P1474	LFC											
P1477	MFC											
P1479	HFC											
		No	→	REPAIR open VPWR (or IGN START/RUN) circuit to the applicable fan control relay.								
KF2	CHECK FOR LFC, MFC or HFC CIRCUIT CYCLING											
- Key on, engine off. - Connect a non-powered test lamp between the VPWR (or IGN START/RUN) circuit and the LFC, MFC or HFC circuit at the applicable fan control relay harness connector. - Access Output Test Mode on scan tool. - While observing test lamp, command the appropriate cooling fan speed on and off (for Taurus/Sable and Escape, commanding the low speed fan on will also command the medium speed fan output on). Does the test lamp turn on and off when the cooling fan output is commanded on and off?		Yes	→	REPLACE appropriate fan control relay.								
		No	→	REPEAT test step to VERIFY results. If test lamp still does not turn on and off as expected, turn KEY OFF. REMOVE test lamp. GO to KF3 .								
KF3	CHECK LFC, MFC or HFC CIRCUIT FOR SHORT TO POWER IN HARNESS											
- Disconnect PCM. - Key on, engine off. - Measure voltage between the LFC, MFC or HFC circuit at the applicable fan relay harness connector and ground. Is voltage less than 1.0 volt?		Yes	→	KEY OFF. GO to KF4 .								
		No	→	REPAIR short circuit.								
KF4	CHECK LFC, MFC or HFC CIRCUIT FOR SHORT TO GROUND IN HARNESS											
- Disconnect scan tool from DLC. - Measure resistance between the LFC, MFC or HFC circuit at the applicable fan relay harness connector and ground. Is resistance greater than 10,000 ohms?		Yes	→	GO to KF5 .								
		No	→	REPAIR short circuit.								

KF1 - KF4

Fan Control (FC) Relay**KF**

Test Steps		Results	Action to Take
KF5	CHECK FOR OPEN LFC, MFC or HFC CIRCUIT		
	Note: Refer to the PCM connector pin numbers at the beginning of this pinpoint test. - Measure resistance of the LFC, MFC or HFC circuit between the appropriate PCM harness connector pin (LFC, MFC or HFC) and the appropriate fan control relay harness connector. Is resistance less than 5.0 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuit.
KF7	DTC P1479 (Taurus/Sable and 3.0L Escape) CHECK VPWR (or IGNITION START/RUN) CIRCUIT VOLTAGE TO HIGH SPEED FC RELAY #1		
	- Disconnect high speed FC relay #1 (for Escape, MAIN FAN in BJB). - Key on, engine off. - Measure VPWR (IGN START/RUN for Escape) circuit voltage at the high speed FC relay #1 harness connector. Is voltage greater than 10.5 volts?	Yes → No →	GO to KF8. REPAIR open IGN START/RUN circuit.
KF8	CHECK FOR HFC CIRCUIT CYCLING AT HIGH SPEED FC RELAY #1		
	- Connect a non-powered test lamp between the VPWR (or IGN START/RUN) circuit and the HFC circuit at the high speed FC relay #1 harness connector. - Access Output Test Mode on scan tool. - While observing test lamp, command the high speed cooling fan on and off. Does the test lamp turn on and off when the high speed cooling fan output is commanded on and off?	Yes → No →	REPLACE high speed FC relay #1. Leave test lamp connected. GO to KF9.
KF9	CHECK FOR HFC CIRCUIT CYCLING WITH HIGH SPEED FC RELAY #2 DISCONNECTED		
	- The non-powered test lamp still connected between the VPWR (or IGN START/RUN) circuit and the HFC circuit at the high speed FC relay #1 harness connector. - Cooling fans commanded off. - Disconnect high speed FC relay #2 (for Escape, ADD FAN 2 in BJB). - While observing test lamp, again command the high speed cooling fan on and off. Does the test lamp now turn on and off when the high speed cooling fan output is commanded on and off?	Yes → No →	REPLACE high speed FC relay #2. GO to KF3 to diagnose the HFC circuit. Make checks at the high speed FC relay #1 harness connector.

KF5 - KF9

Fan Control (FC) Relay**KF**

Test Steps		Results →	Action to Take
KF10	CONTINUOUS MEMORY DTC P1474: CHECK LOW SPEED FAN CONTROL (LFC) CIRCUIT FOR OPEN OR SHORT TO POWER		
	• A/C and defrost off. • Disconnect cooling fan connector (both for applications with two fans). • Connect a non-powered test lamp between the (LOW) FAN PWR circuit and ground circuit at the cooling fan harness connector. For applications with two fans, connect light to the following fan harness connector: — Driver's side for Taurus/Sable and 2.0L Escape. — Passenger side for 3.0L Escape. — Other applications with two fans, either one can be used. • Key on, engine off. • Access Output Test Mode on scan tool. • Command Low Speed Fan on. • Observe test lamp for an indication of a fault while completing the following (the lamp will turn off when a fault is detected, indicating an open or short to power): — Shake, wiggle and bend the LFC circuit between the PCM and (low speed) FC relay. — Shake, wiggle and bend the VPWR (or IGN START/RUN) circuit to the (low speed) FC relay. — Lightly tap on the (low speed) FC relay to simulate road shock. • Is a fault indicated?	Yes → No →	ISOLATE fault and REPAIR as necessary. GO to KF11.
KF11	CHECK LFC CIRCUIT FOR SHORT TO GROUND		
	• Key on, engine off. • Command Low Speed Fan off. • Observe test lamp for an indication of a fault while completing the following (the lamp will turn on when a fault is detected, indicating LFC circuit short to ground): — Shake, wiggle and bend the LFC circuit between the PCM and (low speed) FC relay. — Lightly tap on the (low speed) FC relay to simulate road shock. • Is a fault indicated?	Yes → No →	ISOLATE fault and REPAIR as necessary. KEY OFF. GO to Z1.

KF10 - KF11

Fan Control (FC) Relay**KF**

Test Steps		Results →	Action to Take
KF15	CONTINUOUS MEMORY DTC P1477: CHECK MEDIUM SPEED FAN CONTROL (MFC) CIRCUIT FOR OPEN OR SHORT TO POWER - A/C and defrost off. - Disconnect both cooling fans. For 2.0L Escape: - Connect a non-powered test lamp between the MEDIUM FAN PWR circuit and ground circuit at the passenger side cooling fan harness connector. For Taurus/Sable and 3.0L Escape: - Disconnect medium speed FC relay (For Escape, ADD FAN 3, on fan shroud). - Connect a non-powered test lamp between the MFC circuit and VPWR or IGN START/RUN circuit at the medium speed FC relay harness connector. - Key on, engine off. - Access Output Test Mode on scan tool. - Command Low Speed Fan on (this also commands on the medium speed fan). - Observe test lamp for an indication of a fault while completing the following (the lamp will turn off when a fault is detected, indicating an open or short to power): - Shake, wiggle and bend the MFC circuit between the PCM and medium speed FC relay. - Shake, wiggle and bend the IGN START/RUN circuit to the medium speed FC relay. - For 2.0L, lightly tap on the medium speed FC relay to simulate road shock. Is a fault indicated?	Yes → No →	ISOLATE fault and REPAIR as necessary. GO to KF16.
KF16	CHECK MFC CIRCUIT FOR SHORT TO GROUND - Key on, engine off. - Command Low Speed Fan off. - Observe test lamp for an indication of a fault while completing the following (the lamp will turn on when a fault is detected, indicating MFC circuit short to ground): - Shake, wiggle and bend the MFC circuit between the PCM and medium speed FC relay. - For 2.0L, lightly tap on the medium speed FC relay to simulate road shock. - For 3.0L, inspect medium speed FC relay for intermittent concerns. Is a fault indicated?	Yes → No →	ISOLATE fault and REPAIR as necessary. KEY OFF. GO to Z1.

KF15 - KF16

Fan Control (FC) Relay**KF**

Test Steps		Results	→	Action to Take
KF20	CONTINUOUS MEMORY DTC P1479: CHECK HIGH SPEED FAN CONTROL (HFC) CIRCUIT FOR OPEN OR SHORT TO POWER			
• A/C and defrost off. • Disconnect cooling fan connector(s) (both for applications with two fans). • Connect a non-powered test lamp between the (HIGH) FAN PWR circuit and ground circuit at the cooling fan harness connector (for applications with two fans; passenger side for 2.0L Escape, driver's side for 3.0L Escape, either one for others). • 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 completing the following (the lamp will turn off when a fault is detected, indicating an open or short to power): — Shake, wiggle and bend the HFC circuit between the PCM and high speed FC relay. — Shake, wiggle and bend the VPWR (IGN START/RUN for Escape) circuit to the high speed FC relay (for 3.0L Escape, both relays). — Lightly tap on the high speed FC relay to simulate road shock. • Is a fault indicated?		Yes	→	ISOLATE fault and REPAIR as necessary.
		No	→	GO to KF21.
KF21	CHECK HFC CIRCUIT FOR SHORT TO GROUND			
• Command High Speed Fan off. • Observe test lamp for an indication of a fault while completing the following (the lamp will turn on when a fault is detected, indicating an HFC circuit short to ground): — Shake, wiggle and bend the HFC circuit between the PCM and high speed FC relay. — Lightly tap on the HFC relay to simulate road shock. • Is a fault indicated?		Yes	→	ISOLATE fault and REPAIR as necessary.
		No	→	KEY OFF. GO to Z1.

KF20 - KF21

Fan Control (FC) Relay**KF**

Test Steps		Results	→	Action to Take
KF23	CONTINUOUS MEMORY DTC P1479 (Taurus/Sable): CHECK HIGH SPEED FAN CONTROL (HFC) CIRCUIT FOR OPEN OR SHORT TO POWER			
	• A/C and defrost off. • Disconnect both cooling fans. • Disconnect one high speed FC relay (either one). • Connect a non-powered test lamp between the HFC circuit and VPWR circuit at the high speed FC relay harness connector. • Key on, engine off. • Access Output Test Mode on scan tool. • Command Low Speed Fan on (the HFC output is grounded for low speed fan). • Observe test lamp for an indication of a fault while completing the following (the lamp will turn off when a fault is detected, indicating an open or short to power): — Shake, wiggle and bend the HFC circuit between the PCM and both high speed FC relays. — Shake, wiggle and bend the VPWR circuit to the high speed FC relay. — Lightly tap on the high speed FC relay that is still connected to simulate road shock. • Is a fault indicated?	Yes	→	ISOLATE fault and REPAIR as necessary.
		No	→	GO to KF24.
KF24	CHECK FOR HFC CIRCUIT SHORT TO GROUND			
	• Key on, engine off. • Command Low Speed Fan off. • Observe test lamp for an indication of a fault while completing the following (the lamp will turn on when a fault is detected, indicating HFC circuit short to ground): — Shake, wiggle and bend the HFC circuit between the PCM and both high speed FC relays. • Inspect high speed FC relay that is disconnected for intermittent concerns. • Is a fault indicated?	Yes	→	ISOLATE fault and REPAIR as necessary.
		No	→	KEY OFF. GO to Z1.

KF23 - KF24

Fan Control (FC) Relay**KF**

Test Steps		Results →	Action to Take
KF25	ONE OR ALL FAN SPEEDS INOPERATIVE: CHECK FAN CONTROL FAULT PIDs TO VERIFY FAN CONTROL PRIMARY CIRCUITS		
	- Verify A/C is off, and engine temperature is below the temperature where the cooling fan would come on. - Key on, engine off. - Access the LFCF, MFCF and HFCF PIDs (as appropriate, according to which circuits the vehicle has). Does the LFCF, MFCF or HFCF PID indicate a fault (or YES)?	Yes → No →	For the PID(s) that indicates a fault, a primary circuit fault is indicated for that circuit. . For Taurus/Sable and 3.0L Escape with HFCF PID indicating a fault: GO to KF7. All others: GO to KF1. For Escape: GO to KF85. For Taurus/Sable: PCM primary circuits OK. Refer to Cooling System to check secondary wiring to cooling fan. All others: GO to KF30.
KF30	ELECTRIC COOLING FAN CONCERN (WITH NO DTCs): CHECK FAN FUNCTION		
	- Key on, engine off. - Access Output Test Mode on scan tool. - Command the cooling fan on and check for fan operation. For two speed fan applications, check both fan speeds (wait 20 seconds after commanding high speed fan on, verify fan speed changes). Does the fan(s) operate (all speeds)?	Yes → No →	KEY OFF. Cooling fan circuits OK. RETURN to Symptom Charts. COMMAND cooling fan off. REMAIN in Output Test Mode. For Focus (with A/C), Cougar and Windstar: GO to KF50. For Focus (without A/C) and Ranger: Fan will not operate. GO to KF41. All others: GO to KF31.
KF31	DID THE FAN(S) OPERATE AT ANY SPEED?		
	Note: For applications with two cooling fan motors, if one cooling fan motor does not operate when the other motor operates, GO to KF70. During the operational check of both fan speeds, did the fan(s) operate at any speed?	Yes → No →	Only one fan speed is operational. GO to KF40. Cooling fan will not operate at any speed. GO to KF32.

KF25 - KF31

Fan Control (FC) Relay**KF**

Test Steps		Results	Action to Take
KF32	COOLING FAN WILL NOT OPERATE AT ANY SPEED: 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(s) (both for applications with two fans). • Command high speed fan on. • Measure voltage between the HIGH FAN PWR circuit at the cooling fan harness connector and chassis ground. • Is voltage greater than 10.0 volts?	Yes → No →	KEY OFF. Power is being supplied to fan. GO to KF37 (to check cooling fan ground circuit). KEY OFF. Power is not being supplied to fan. GO to KF33 .
KF33	CHECK B+ TO HIGH SPEED FC RELAY AND LOW SPEED FC RELAY		
	• Disconnect high speed and low speed FC relays. • Measure B+ circuit voltage at the high speed FC relay harness connector. • Measure B+ circuit voltage at the low speed FC relay harness connector. • Is voltage greater than 10.0 volts?	Yes → No →	GO to KF34 . B+ circuit fault. CHECK condition of related fuses. If OK, REPAIR open circuit. If fuse is damaged, CHECK B+ and FAN PWR circuits for short to ground before replacing.
KF34	CHECK FOR OPEN HIGH FAN PWR AND LOW FAN PWR CIRCUITS		
	• Measure resistance of the HIGH FAN PWR circuit between the High Speed FC relay harness connector and the cooling fan harness connector(s). Resistance should be less than 5.0 ohms. • Measure resistance of the LOW FAN PWR circuit between the low speed FC relay harness connector and the cooling fan harness connector(s). Resistance should be less than 5.0 ohms. • Do the HIGH FAN PWR and LOW FAN PWR circuits check OK?	Yes → No →	GO to KF35 . REPAIR open circuit.
KF35	COMMAND LOW SPEED FAN ON AND CHECK FOR VOLTAGE TO COOLING FAN		
	• Reconnect low speed FC relay and high speed FC relay. • Key on, engine off. • Again, enter Output Test Mode on scan tool. • Command Low Speed Fan on. • Measure LOW FAN PWR circuit voltage at the cooling fan harness connector (either one for applications with two fans). • Is voltage greater than 10.0 volts?	Yes → No →	KEY OFF. REPLACE the High Speed FC relay, then GO to KF37 . KEY OFF. GO to KF75 , and follow directions for low speed fan inoperative. After repair, GO to KF75 and follow directions for high speed fan inoperative.

Fan Control (FC) Relay**KF**

Test Steps		Results	→	Action to Take
KF37	CHECK 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(s). REPAIR ground circuit.
KF40	DETERMINE WHICH FAN SPEED IS OPERATIONAL			
	Is the low speed fan operational?	Yes No	→ →	High speed fan inoperative. GO to KF46 . Low speed fan inoperative. GO to KF41 .
KF41	(LOW SPEED) FAN INOPERATIVE: COMMAND LOW SPEED FAN ON AND CHECK FOR VOLTAGE TO COOLING FAN			
	Note: The following steps apply to applications with either a one or two speed fan. Refer to the fan speed in parenthesis as appropriate. - Key on, engine off. - Still in Output Test Mode with fan commanded off. - Disconnect cooling fan(s) (both for applications with two fans). - Command low speed fan on. - Measure (LOW) FAN PWR circuit voltage at the cooling fan harness connector (either one for applications with two fans). Is voltage greater than 10.0 volts?	Yes No	→ →	VERIFY ground circuit to fan. If OK, REPLACE fan motor. KEY OFF. GO to KF42 .
KF42	CHECK B+ VOLTAGE TO (LOW SPEED) FAN CONTROL (FC) RELAY			
	- Disconnect (Low Speed) FC relay. - Measure B+ circuit voltage at the (low speed) FC relay harness connector. Is voltage greater than 10.5 volts?	Yes No	→ →	GO to KF43 . VERIFY condition of related fuse. If OK, REPAIR open B+ circuit. If fuse was damaged CHECK B+ and (LOW) FAN PWR circuit for short to ground before replacing.
KF43	CHECK FOR OPEN (LOW) FAN PWR CIRCUIT			
	- Measure resistance of the (LOW) FAN PWR circuit between the (low speed) FC relay harness connector and the cooling fan harness connector(s). Is resistance less than 5.0 ohms?	Yes No	→ →	GO to KF75 . REPAIR open circuit.

Fan Control (FC) Relay**KF**

Test Steps		Results	Action to Take
KF46	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(s) (both for applications with two fans). • Command high speed fan on. • Measure HIGH FAN PWR circuit voltage at the cooling fan harness connector. • Is voltage greater than 10.0 volts?	Yes → No →	VERIFY ground circuit to fan. If OK, REPLACE fan motor. KEY OFF. GO to KF47 .
KF47	CHECK B+ VOLTAGE TO HIGH SPEED FAN CONTROL (FC) RELAY		
	• Disconnect high speed FC relay. • Measure B+ circuit voltage at the high speed FC relay harness connector. • Is voltage greater than 10.5 volts?	Yes → No →	GO to KF48 . VERIFY condition of related fuse. If OK, REPAIR open B+ circuit. If fuse was damaged, CHECK B+ and HIGH FAN PWR circuit for short to ground before replacing.
KF48	CHECK FOR OPEN HIGH FAN PWR CIRCUIT		
	• Measure resistance of the HIGH FAN PWR circuit between the high speed FC relay harness connector and the cooling fan harness connector. • Is resistance less than 5.0 ohms?	Yes → No →	GO to KF75 . REPAIR open circuit.
KF50	LOW AND/OR HIGH SPEED COOLING FAN DOES NOT OPERATE: CHECK FOR B+ TO HIGH SPEED FC AND LOW SPEED FC RELAYS		
	Note: For applications with two cooling fan motors, if one motor does not operate when the other motor operates, GO to KF70 . • Disconnect high speed FC and low speed FC relays. • Measure B+ circuit voltage at both high speed FC and low speed FC relay harness connectors. • Are both voltages greater than 10.5 volts?	Yes → No →	GO to KF51 . VERIFY condition of related fuses. If OK, REPAIR open B+ circuit. If fuse was damaged, CHECK B+ and fan(s) PWR circuits for short to ground before replacing.
KF51	CHECK FOR OPEN FAN PWR, FAN GROUND AND INTERNAL FAN CIRCUITS		
	• Measure resistance between battery negative post and the FAN PWR circuit at both the high speed FC and low speed FC relay harness connectors. • Are both resistances less than 15.0 ohms?	Yes → No →	GO to KF52 . GO to KF56 .

KF46 - KF51

Fan Control (FC) Relay**KF**

Test Steps		Results →	Action to Take
KF52	CHECK FAN PWR CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	• Disconnect both cooling fans. • Measure resistance between the FAN PWR circuit in harness and ground. • Is resistance greater than 10,000 ohms?	Yes → No →	GO to KF53. REPAIR FAN PWR circuit short to ground.
KF53	CHECK HIGH SPEED FC AND LOW SPEED FC RELAY OPERATION		
	• Reconnect high speed FC and low speed FC relays. • Key on, engine off. • Access Output Test Mode on scan tool. • Check high speed FC relay operation: — Command high speed fan on, wait 15 seconds. — Measure voltage to the FAN PWR circuit at the cooling fan harness connector (either one). — Voltage must be greater than 10.5 volts. • Check low speed FC relay operation: — Command low speed fan on. — Measure voltage to the FAN PWR circuit at the cooling fan connector (either one). — Voltage must be greater than 10.0 volts. • Do the high speed FC and low speed FC relays operate correctly?	Yes → No →	REPLACE cooling fan(s). KEY OFF. NOTE which fan speed was inoperative. GO to KF75.
KF56	CHECK FOR OPEN FAN PWR CIRCUIT BETWEEN COOLING FAN AND THE HIGH SPEED FC AND LOW SPEED FC RELAYS		
	• Disconnect cooling fan (either one). • Measure resistance of FAN PWR circuit between cooling fan harness connector and both the high speed FC and low speed FC relay harness connectors. • Are both resistances less than 15.0 ohms?	Yes → No →	GO to KF57. REPAIR open in FAN PWR circuit (if open is only between low speed FC relay and fan, first verify dropping resistor connection).
KF57	CHECK COOLING FAN GROUND CIRCUIT		
	• Measure resistance of ground circuit between the cooling fan harness connector and chassis ground. • Is resistance less than 5.0 ohms?	Yes → No →	REPLACE inoperative cooling fan(s). REPAIR ground circuit.

KF52 - KF57

Fan Control (FC) Relay**KF**

Test Steps		Results	Action to Take
KF60	LOW, MEDIUM AND/OR HIGH SPEED COOLING FAN ALWAYS RUNS (NO DTCS): VERIFY FAN IS NOT ON BECAUSE OF A/C HIGH PRESSURE SWITCH INPUT TO PCM		
	- Start engine. - Access ACP PID. - Is the ACP PID "CLOSED"?	Yes → No →	The PCM will turn the cooling fan on when the A/C high pressure switch input is "closed". Leave engine running. GO to KF61 . Input OK For Taurus/Sable: Refer to Cooling System to check secondary wiring to cooling fan. All Others: GO to KF65 .
KF61	CHECK A/C HIGH PRESSURE SWITCH (the medium pressure, normally open contacts)		
	- Disconnect A/C high pressure switch (refer to the beginning of pinpoint test KM if needed). - Again, view the ACP PID on scan tool. - Is the ACP PID still "CLOSED"?	Yes → No →	KEY OFF. GO to KF62 (to check A/C high pressure switch input to PCM). KEY OFF. RECONNECT A/C high pressure switch. REFER to Heating and Air Conditioning to check for over-pressurized A/C system, etc. If OK, REPLACE A/C high pressure switch.
KF62	CHECK ACPSW CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool from DLC. - Disconnect PCM. - Measure resistance between PCM harness connector Pin 86 and ground. - Is resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.

KF

Test Steps		Results	Action to Take
KF63	LOW AND/OR HIGH SPEED COOLING FAN ALWAYS RUNS (NO DTCS): VERIFY FAN IS NOT ON BECAUSE OF A/C PRESSURE SENSOR INPUT TO PCM		
	- A/C off. - Start engine. - Access ACP V PID. Is the ACP V PID greater than 3.0 volts?	Yes → No →	KEY OFF. REFER to Heating and Air Conditioning to check for high A/C system pressure and other checks as directed. Input is not causing the fan to run. GO to KF65.
KF65	CHECK FOR (LOW SPEED) FC RELAY ALWAYS CLOSED		
	Note: Verify A/C and defrost are off. - Disconnect (low speed) FC relay. - Key on, engine off. Does fan continue to run?	Yes → No →	For Focus (without A/C) and Ranger: REPAIR FAN PWR circuit for short to power. All others: KEY OFF. GO to KF66. KEY OFF. GO to KF80.
KF66	CHECK HIGH SPEED FC RELAY		
	- Low speed FC relay disconnected. - Disconnect high speed FC relay (for 3.0 Escape, high speed FC relay #1). - Key on, engine off. Does fan continue to run?	Yes → No →	For Focus, Cougar, Ranger and Windstar: REPAIR FAN PWR circuit for short to power. For 2.0L Escape: KEY OFF. GO to KF68. For 3.0L Escape: If passenger side fan always runs, REPAIR LOW FAN PWR circuit short to power. If driver's side fan always runs, REPAIR HIGH FAN PWR short to power. All others: KEY OFF. GO to KF67. KEY OFF. GO to KF80.
KF67	CHECK LOW FAN PWR CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Disconnect cooling fan(s). - Key on, engine off. - Measure voltage to the LOW FAN PWR circuit at the cooling fan harness connector. Is voltage less than 1.0 volt?	Yes → No →	REPAIR HIGH FAN PWR circuit for short to power. REPAIR LOW FAN PWR circuit for short to power.

Fan Control (FC) Relay

KF

Test Steps		Results	Action to Take
KF76	CHECK OPERATION OF LOW, MEDIUM and/or HIGH SPEED FAN PRIMARY CIRCUITS		
	- Reconnect cooling fan(s) and low, medium or high speed fan control relay(s). - Key on, engine off. - Enter Output Test Mode on scan tool. For low speed fan inoperative (fan inoperative for one speed fan applications): - Access LFC and LFCF PIDs. - With LFC PID off (low speed fan commanded off by PCM), the LFCF PID must indicate no fault (or NO). - Command the Low Speed Fan on (the LFC PID will now be on). - The LFCF PID must still indicate no fault. For medium speed fan inoperative (Escape): - Access MFC and MFCF PIDs (if MFC and MFCF PIDs are not available, GO to KF78). - With MFC PID off (medium speed fan commanded off by PCM), the MFCF PID must indicate no fault (or NO). - Command the Low Speed Fan on (the MFC PID will now be on). - The MFCF PID must still indicate no fault. 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 indicate no fault (or NO). - Command the high speed fan on (the HFC PID will now be on). - The HFCF PID must still indicate no fault. Does the LFCF, MFCF or HFCF PID indicate a fault (or Yes) with the fan commanded on or off?	Yes → No →	KEY OFF. An LFC, MFC or HFC primary fault is detected. If the LFCF PID indicated a fault: GO to KF1 and follow DTC P1474 diagnosis. If the MFCF PID indicated a fault: GO to KF1 and follow DTC P1477 diagnosis. If the HFCF PID indicated a fault: GO to KF1 and follow DTC P1479 diagnosis. Primary circuits OK. For low speed fan inoperative, REPLACE low speed FC relay. For medium speed fan inoperative, REPLACE medium speed FC relay. For high speed fan inoperative, REPLACE high speed FC relay. VERIFY applicable FAN PWR circuit is not short to ground.
KF77	CHECK OPERATION OF LOW SPEED FAN PRIMARY CIRCUITS		
	- Reconnect cooling fan (if it was disconnected). - Key on, engine off. - Connect a non-powered test lamp between the VPWR circuit and the LFC circuit at the low speed FC relay harness connector. - Access Output Test Mode on scan tool. - While observing test lamp, command the low speed fan on and off. Does the test lamp turn on and off when the cooling fan output is commanded on and off?	Yes → No →	Primary circuits OK. REPLACE the low speed FC relay. VERIFY applicable FAN PWR circuit is not short to ground. KEY OFF. An LFC primary fault is detected. GO to KF1 and follow DTC P1474 diagnosis.

KF76 - KF77

Fan Control (FC) Relay**KF**

Test Steps		Results	Action to Take
KF78	CHECK OPERATION OF MEDIUM SPEED FAN PRIMARY CIRCUITS		
	- Reconnect cooling fan (if it was disconnected). - Key on, engine off. - Connect a non-powered test lamp between the VPWR circuit and the MFC circuit at the medium speed FC relay harness connector. - Access Output Test Mode on scan tool. - While observing test lamp, command the low speed fan on and off. Does the test lamp turn on and off when the cooling fan output is commanded on and off?	Yes → No →	Primary circuits OK. REPLACE the medium speed FC relay. VERIFY applicable FAN PWR circuit is not short to ground. KEY OFF. An MFC primary fault is detected. GO to KF1 and follow DTC P1477 diagnosis.
KF79	CHECK OPERATION OF HIGH SPEED FAN PRIMARY CIRCUITS		
	- Reconnect cooling fan (if it was disconnected). - Key on, engine off. - Connect a non-powered test lamp between the VPWR circuit and the HFC circuit at the high speed FC relay harness connector. - Access Output Test Mode on scan tool. - While observing test lamp, command the high speed fan on (wait 15 seconds) and off. Does the test lamp turn on and off when the cooling fan output is commanded on and off?	Yes → No →	Primary circuits OK. REPLACE the high speed FC relay. VERIFY applicable FAN PWR circuit is not short to ground. KEY OFF. A HFC primary fault is detected. GO to KF1 and follow DTC P1479 diagnosis.

Fan Control (FC) Relay**KF**

Test Steps		Results	Action to Take
KF80	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 FC relay(s). • Key on, engine off. • 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 indicate no fault (or 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 indicate no fault (or NO). • Does the HFCF or LFCF PID indicate a fault (or Yes) with the fan commanded off?		Yes	→ KEY OFF. An HFC or LFC primary circuit fault is detected. If the HFCF PID indicated a fault: GO to KF1 and follow DTC P1479 diagnosis. If the LFCF PID indicated a fault: GO to KF1 and follow DTC P1474 diagnosis.
		No	→ Primary circuits OK. If fan stopped running with the low speed FC relay disconnected, REPLACE the low speed FC relay. If fan stopped running with the high speed FC relay disconnected, REPLACE the high speed FC relay.

KF80

Fan Control (FC) Relay**KF**

Test Steps		Results	Action to Take
KF85	ELECTRIC COOLING FAN CONCERN, WITH NO DTCs (ESCAPE): CHECK FAN FUNCTION		
• Key on, engine off. • Access Output Test Mode on scan tool. • Command the low speed cooling fan on and note fan operation: — Both the low speed and medium speed fans will be commanded on by the PCM. Both cooling fans should be running at low speed (medium speed for 3.0L). • Command the high speed cooling fan on and note fan operation: — Both fans should be running at high speed. • Do the fans operate as expected?		Yes No	→ KEY OFF. Cooling fan circuits OK. RETURN to Symptom Charts. → KEY OFF. For 2.0L: Note which fan and/or fan speed did not operate (refer to PPT KF Pre-Diagnostic Information for schematic and the 2.0L Escape Fan Diagnosis Chart to help identify which fan or fan speed(s) needs to be diagnosed). GO to KF86. For 3.0L: — For; fans do not operate with low speed fan commanded on, but both fans operate with high speed fan commanded on, GO to KF95. — For; fans do not operate with low speed fan commanded on, and only one fan operates with high speed fan commanded on, GO to KF105. — For; fans operate with low speed fan commanded on, but only one fan operates with high speed fan commanded on, GO to KF115. — For; only one fan operates with low speed fan commanded on, but both fans operate with high speed fan commanded on, GO to KF124.
KF86	CHECK B+ VOLTAGE TO LOW, MEDIUM and/or HIGH SPEED FAN CONTROL (FC) RELAYS		
• Disconnect the low, medium and/or high speed FC relay(s) (as applicable). • Measure B+ circuit voltage at the Low, Medium and/or High Speed FC relay(s) vehicle harness connectors. • Is voltage(s) greater than 10.0 volts?		Yes No	→ GO to KF87. → B+ circuit fault. CHECK condition of related fuses. If OK, REPAIR open circuit. If fuse is damaged, CHECK B+ and FAN PWR circuits for short to ground before replacing.

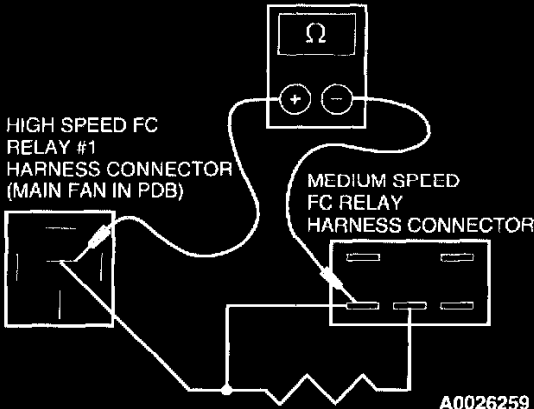
KF85 - KF86

Fan Control (FC) Relay**KF**

Test Steps		Results	Action to Take
KF87	CHECK CONTINUITY OF APPLICABLE FAN PWR CIRCUITS		
	- Disconnect applicable cooling fan(s). - Measure resistance of the LOW FAN PWR, MEDIUM FAN PWR and/or HIGH FAN PWR circuit between the applicable cooling fan harness connector(s) and the applicable FC relay harness connector(s). Is resistance(s) less than 5.0 ohms?	Yes → No →	GO to KF88. REPAIR open circuit(s).
KF88	CHECK FOR POWER TO FAN(S)		
	- Reconnect the low, medium and/or high speed FC relay(s) (whichever were disconnected). - Disconnect both cooling fans, if not already disconnected. - Key on, engine off. - Access Output Test Mode on scan tool. If low speed and/or medium speed fan is inoperative: - Command the low speed fan on. - Measure LOW FAN PWR and/or MEDIUM FAN PWR circuit voltage at the applicable cooling fan harness connector(s). If high speed fan is inoperative: - Command the high speed fan on. - Measure HIGH FAN PWR circuit voltage at the applicable cooling fan harness connector(s). Is voltage(s) greater than 10.0 volts?	Yes → No →	GO to KF89. GO to KF75 to check cooling fan primary circuit(s).
KF89	CHECK COOLING FAN(S) GROUND		
	- Disconnect scan tool from DLC. - Measure resistance of ground circuit between the applicable cooling fan harness connector(s) and chassis ground. Is resistance less than 5.0 ohms?	Yes → No →	REPLACE fan(s) that did not operate correctly in KF85. REPAIR ground circuit.
KF95	CHECK RESISTANCE OF LOW FAN GND CIRCUIT BETWEEN PASSENGER SIDE COOLING FAN AND MEDIUM SPEED FC RELAY		
	- Disconnect medium speed FC relay (ADD FAN 3, on fan shroud). - Disconnect passenger side cooling fan. - Measure resistance of the LOW FAN GND circuit between the passenger side cooling fan and medium speed fan FC relay harness connectors. Is resistance less than 5.0 ohms?	Yes → No →	GO to KF96. REPAIR open LOW FAN GND circuit (open is between medium speed FC relay and splice to high speed FC relay).

KF87 - KF95

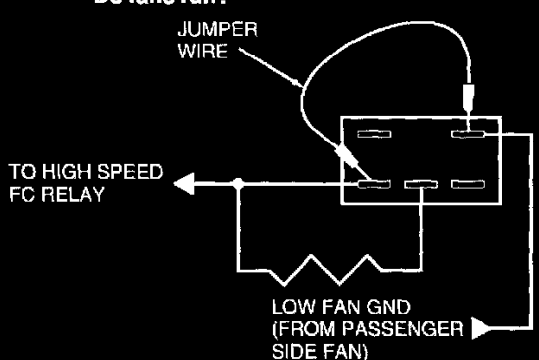
Fan Control (FC) Relay**KF**

Test Steps		Results	Action to Take
KF96	MEASURE RESISTANCE OF CIRCUIT BETWEEN MEDIUM SPEED FC RELAY AND HIGH SPEED FC RELAY #1		
- Reconnect cooling fan. - Disconnect high speed FC relay #1 (MAIN FAN in BJB). - Measure resistance of the circuit between the medium speed FC relay and high speed FC relay #1 harness connectors as shown below (the circuit that does not go through the resistor is being tested). Is resistance less than 5.0 ohms?  A0026259		Yes No	→ GO to KF97. → REPAIR open circuit between medium speed FC relay and high speed FC relay #1.

KF96

Fan Control (FC) Relay

KF

Test Steps		Results	Action to Take
KF97	BYPASS MEDIUM SPEED FC RELAY AND CHECK FAN OPERATION - Reconnect high speed FC relay #1. - Connect jumper wire in medium speed FC relay harness connector as shown below (jumper is between LOW FAN GND from passenger side cooling fan pin and circuit between medium speed and high speed FC relays that does not go through low speed resistor pin). - Key on, engine off. - Access Output Test Mode on scan tool. - Command low speed fan on. Do fans run?  MEDIUM SPEED FC RELAY HARNESS CONNECTOR A0026260	Yes → No →	KEY OFF. REPLACE medium speed FC relay. KEY OFF. GO to KF98.
KF98	CHECK NORMALLY CLOSED (N/C) CONTACTS OF HIGH SPEED FC RELAY #1 - Again, disconnect the high speed FC relay #1. - Measure resistance of the normally closed contacts of the high speed FC relay #1 (relay pins 30 and 87A are for the normally closed contacts). Is resistance less than 5.0 ohms?	Yes → No →	No fault is detected. Reconfirm previous test steps. If OK, RETURN to Symptom Charts. Replace high speed FC relay #1.
KF105	DID THE DRIVERS SIDE FAN OPERATE IN KF85? In step KF85, was the driver's side cooling fan the one that DID operate?	Yes → No →	Passenger side fan did not operate. GO to KF110. Driver's side fan did not operate. GO to KF106.

KF97 - KF105

Fan Control (FC) Relay**KF**

Test Steps		Results	→	Action to Take
KF106	COMMAND HIGH SPEED FAN ON AND CHECK FOR B+ TO DRIVER'S SIDE FAN			
	• Disconnect driver's side fan. • Key on, engine off. • Access Output Test Mode on scan tool. • Command high speed fan on. • Measure voltage between the HIGH FAN PWR circuit at the driver's side fan harness connector and chassis ground. • Is voltage greater than 10.5 volts?	Yes No	→ →	KEY OFF. GO to KF107 . KEY OFF. GO to KF108 .
KF107	CHECK DRIVER'S SIDE FAN GROUND CIRCUIT			
	• Measure resistance of the driver's side fan ground circuit between the fan harness connector and chassis ground. • Is resistance less than 5.0 ohms?	Yes No	→ →	REPLACE driver's side fan. REPAIR open ground circuit.
KF108	CHECK HIGH FAN PWR CIRCUIT CONTINUITY			
	• Disconnect high speed FC relay #1 (MAIN FAN in BJB) • Measure resistance of the HIGH FAN PWR circuit between the high speed FC relay #1 and fan harness connectors. • Is resistance less than 5.0 ohms?	Yes No	→ →	REPLACE high speed FC relay #1. REPAIR open circuit.
KF110	CHECK B+ TO LOW SPEED FC RELAY			
	• Disconnect low speed FC relay (ADD FAN in BJB). • Measure B+ circuit voltage at the low speed FC relay harness connector. • Is voltage greater than 10.5 volts?	Yes No	→ →	GO to KF111 . B+ circuit fault. CHECK condition of related fuses. If OK, REPAIR open circuit. If fuse is damaged, CHECK B+ and FAN PWR circuits for short to ground before replacing.
KF111	COMMAND LOW SPEED FAN ON AND CHECK FOR B+ TO PASSENGER'S SIDE FAN			
	• Reconnect low speed FC relay. • Disconnect passenger's side fan. • Key on, engine off. • Access Output Test Mode on scan tool. • Command low speed fan on. • Measure voltage between the LOW FAN PWR circuit at the passenger's side fan harness connector and chassis ground. • Is voltage greater than 10.5 volts?	Yes No	→ →	KEY OFF. GO to KF112 . KEY OFF. GO to KF113 .

KF106 - KF111

Fan Control (FC) Relay**KF**

Test Steps		Results	→	Action to Take
KF112	CHECK CONTINUITY OF LOW FAN GND CIRCUIT BETWEEN FAN AND HIGH SPEED FC RELAY #2			
	- Disconnect high speed FC relay #2 (ADD FAN 2 in BJB). - Measure resistance of the LOW FAN GND circuit between the high speed FC relay #2 and the passenger side fan harness connectors. Is resistance less than 5.0 ohms?	Yes	→	REPLACE passenger side cooling fan.
		No	→	REPAIR open LOW FAN GND circuit between fan and splice to high speed FC relay #2.
KF113	CHECK LOW FAN PWR CIRCUIT CONTINUITY			
	- Again, disconnect low speed FC relay. - Measure resistance of the LOW FAN PWR circuit between the low speed FC relay and the passenger's side fan harness connectors. Is resistance less than 5.0 ohms?	Yes	→	REPLACE low speed FC relay.
		No	→	REPAIR open circuit.
KF115	WHICH COOLING FAN DID OPERATE IN KF85?			
	In step KF85, was the driver's side cooling fan the one that DID operate?	Yes	→	Passenger side fan did not operate at high speed. GO to KF118 .
		No	→	Driver's side fan did not operate at high speed. GO to KF116 .
KF116	CHECK B+ AND IGNITION START/RUN TO HIGH SPEED FC RELAY #1			
	- Disconnect high speed FC relay #1 (MAIN FAN in BJB). - Measure B+ circuit voltage at the high speed FC relay #1 harness connector. - Key on, engine off. - Measure ignition start/run circuit voltage at the high speed FC relay #1 harness connector. Are both voltages greater than 10.5 volts?	Yes	→	KEY OFF. REPLACE high speed FC relay #1.
		No	→	KEY OFF. CHECK condition of related fuses. If OK, REPAIR open circuit. If fuse is damaged, CHECK B+ and HIGH FAN PWR circuits for short to ground before replacing.
KF118	CHECK IGNITION START/RUN AND GND CIRCUITS TO HIGH SPEED FC RELAY #2			
	- Disconnect high speed FC relay #2 (ADD FAN 2 in BJB). - Key on, engine off. - Measure voltage between the ignition start/run circuit and GND circuit at the high speed FC relay #2 harness connector. Is voltage greater than 10.5 volts?	Yes	→	KEY OFF. GO to KF121 .
		No	→	GO to KF119 .

Fan Control (FC) Relay**KF**

Test Steps		Results	Action to Take
KF119	CHECK IGNITION START/RUN VOLTAGE TO HIGH SPEED FC RELAY #2, USING CHASSIS GROUND AS REFERENCE		
	- Measure voltage between the ignition start/run circuit at the high speed FC relay #2 harness connector and chassis ground. Is voltage greater than 10.5 volts?	Yes → No →	KEY OFF. REPAIR open ground circuit to high speed FC relay #2. KEY OFF. REPAIR open ignition start/run circuit to high speed FC relay #2.
KF121	CHECK LOW FAN GND CIRCUIT BETWEEN FAN AND HIGH SPEED FC RELAY #2		
	- Disconnect passenger side cooling fan. - Measure resistance of the LOW FAN GND circuit between the high speed FC relay #2 and the passenger side fan harness connectors. Is resistance less than 5.0 ohms?	Yes → No →	GO to KF122 . REPAIR open LOW FAN GND circuit between high speed FC relay #2 and splice to passenger side fan.
KF122	CHECK HFC CIRCUIT CONTINUITY BETWEEN HIGH SPEED FC RELAYS #1 AND #2		
	- Disconnect high speed FC relay #1 (MAIN FAN in BJB). - Measure resistance of HFC circuit between the high speed FC relay #1 and high speed FC relay #2 harness connectors. Is resistance less than 5.0 ohms?	Yes → No →	REPLACE high speed FC relay #2. REPAIR open circuit.
KF124	DISCONNECT HIGH SPEED FC RELAY #2 AND CHECK IF BOTH FANS WILL RUN WITH LOW FAN COMMANDED ON		
	- Disconnect high speed FC relay #2 (ADD FAN 2 in BJB). - Key on, engine off. - Again, access Output Test Mode on scan tool. - Command low speed fan on. Do both fans now operate?	Yes → No →	REPLACE high speed FC relay #2 (contacts are stuck closed). No fault is detected. Reconfirm previous test steps. If OK, RETURN to Symptom Charts.

KF119 - KF124

Test KG: Viscronic Drive Fan (VDF) Clutch

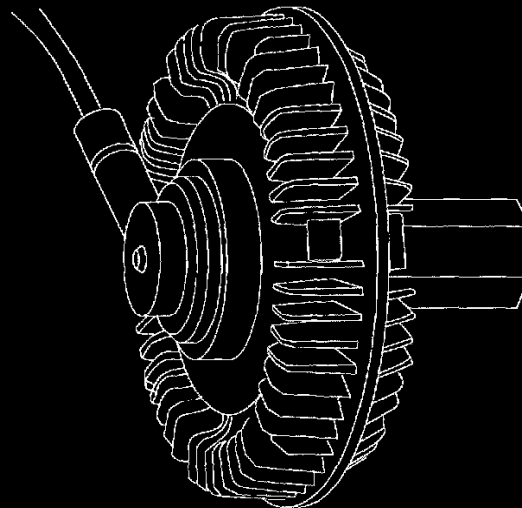
Visctronic Drive Fan (VDF) Clutch**KG****Note**

This Pinpoint Test is intended to diagnose the following:

- Visctronic Drive Fan Clutch(8A616)
- Visctronic Drive Fan Speed Sensor
- Harness circuits: VPWR, Vehicle Buffered Power (VBPWR), Fan Speed Sensor (FSS), Fan Control - Variable (FC-V), and PWRGND
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematics and Connectors

Visctronic Drive Fan (VDF) Clutch



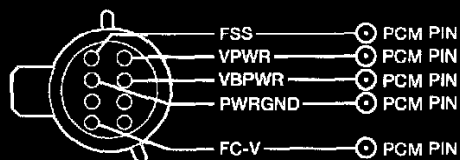
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Note, Schematics and Connectors

Visctronic Drive Fan (VDF) Clutch

KG

VISCTRONIC DRIVE FAN (VDF) CLUTCH



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0039729

PCM CONNECTOR PIN NUMBERS

APPLICATION	FSS	VPWR	VBPWR	PWRGND	FC-V
4.2L F-150	6	71/97	18	51,76,24, and 103	28
4.6L F-150	58	71/97	77	3,51,76, and 103	82
5.4L F-150	58	71/97	77	3,51,76, and 103	82

Test Steps		Results	→	Action to Take
KG1	DTC P0480			
	• Is DTC P0480 a Continuous DTC only?	Yes	→	GO to KG2 .
		No	→	GO to KG4 .
KG2	CONTINUOUS DTC P0480:			
	• Access FANVARF PID (depending on scan tool, the PID may be named VFCE).	Yes	→	ISOLATE fault and REPAIR as Necessary.
	• Key On, Engine Off.	No	→	GO to Z1 for intermittent fault diagnosis.
	• Wiggle the VDF harness and connector while monitoring the PID.			
	• Does the PID read YES for a fault at any time while you are wiggling the harness or connector?			
KG4	CHECK VDF SOLENOID RESISTANCE			
	• Key off.	Yes	→	GO to KG5 .
	• Disconnect VDF solenoid.	No	→	CHECK VDF harness pigtail from the connector to the VDF, for open or short circuits. REPAIR if necessary. If OK, REPLACE VDF assembly.
	• Measure VDF solenoid resistance.			
	• Is resistance between 6.0 and 10.0 ohms?			
KG5	CHECK VPWR VOLTAGE TO VDF SOLENOID			
	• Key on, engine off.	Yes	→	KEY OFF. GO to KG6 .
	• Measure VPWR circuit voltage at VDF vehicle connector.	No	→	REPAIR open or short circuit.
	• Is voltage greater than 10.5 volts?			

Schematic, Test KG1 - KG5

Visctronic Drive Fan (VDF) Clutch**KG**

Test Steps		Results	→	Action to Take
KG6	CHECK VDF CIRCUIT FOR SHORTS TO VBPWR, PWRGND, OR FANSS IN THE VDF HARNESS PIGTAIL FROM THE CONNECTOR TO THE VDF ASSEMBLY.			
	• Key off. • Disconnect VDF solenoid. • Measure VDF solenoid circuit for shorts to other circuits in the VDF harness pigtail. • Is the resistance greater than 10,000 ohms on all pins except the VPWR pin?	Yes No	→ →	GO to KG7 . GO to Z1 for intermittent fault diagnosis.
KG7	CHECK VDF CIRCUIT FOR SHORT TO POWER IN HARNESS			
	• Key on. • Measure voltage between VDF circuit at the PCM harness connector and ground. • Is voltage less than 1.0 volt?	Yes No	→ →	KEY OFF. GO to KG8 . REPAIR short circuit.
KG8	CHECK VDF CIRCUIT FOR OPEN IN HARNESS			
	• Measure resistance of VDF circuit between PCM harness connector and VDF harness connector. • Is resistance less than 5 ohms?	Yes No	→ →	GO to KG9 . REPAIR open circuit.
KG9	CHECK VDF CIRCUIT FOR SHORT TO GROUND IN HARNESS			
	• Measure resistance between VDF circuit at the VDF harness connector and ground. • Is resistance greater than 10,000 ohms?	Yes No	→ →	REFER to Cooling System for diagnosis and testing. If OK, REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
KG10	DTC P0528 AND FAN CONCERNS			
	• Key on, engine off. • Access FANSSM PID. • Slowly rotate the cooling fan. • Does the FANSSM PID read HIGH and LOW as you are rotating the cooling fan?	Yes No	→ →	KEY OFF. FANSS performed as expected. GO to KG12 . KEY OFF. GO to KG13 .
KG12	CHECK VDF FOR MECHANICAL BINDING			
	• Key off • Rotate the cooling fan manually. • Does the fan clutch indicate any abnormal binding?	Yes No	→ →	REFER to Cooling System for diagnosis and testing. GO to Z1 for intermittent fault diagnosis.

KG6 - KG12

Visctronic Drive Fan (VDF) Clutch**KG**

Test Steps		Results →		Action to Take
KG13	CHECK VBPWR TO FSS			
	- Disconnect VDF connector. - Key on. - Measure VBPWR circuit voltage at the vehicle VDF harness connector. Is voltage greater than 10.5 volts?	Yes No	→ →	KEY OFF. GO to KG16 . KEY OFF. GO to KG14 .
KG14	CHECK VBPWR CIRCUIT FOR OPEN IN HARNESS			
	- Disconnect PCM. - Measure resistance of VBPWR circuit between PCM harness connector and VDF harness connector. Is resistance less than 5 ohms?	Yes No	→ →	GO to KG15 . REPAIR open circuit.
KG15	CHECK VBPWR CIRCUIT FOR SHORT TO GROUND IN HARNESS			
	- Disconnect VDF connector. - Measure resistance between VBPWR circuit at the PCM harness connector and ground. Is resistance greater than 10,000 ohms?	Yes No	→ →	GO to KG16 . REPAIR short circuit.
KG16	CHECK PWR GND TO FAN SPEED SENSOR(FSS)			
	- Measure resistance of PWR GND circuit between VDF harness connector and the negative battery post. Is resistance less than 5.0 ohms?	Yes No	→ →	GO to KG17 . REPAIR open circuit.
KG17	CHECK FSS CIRCUIT FOR SHORT TO PWR			
	- Key on. - Measure voltage between the FSS signal circuit at the VDF harness connector and ground. Is voltage less than 1.0 volt?	Yes No	→ →	KEY OFF. GO to KG18 . KEY OFF. REPAIR short circuit.
KG18	CHECK FSS CIRCUIT FOR OPEN			
	- Disconnect PCM. - Measure resistance of the FSS signal circuit between the VDF harness connector and the PCM harness connector. Is the resistance less than 5.0 ohms?	Yes No	→ →	GO to KG19 . REPAIR open circuit.
KG19	CHECK FSS CIRCUIT FOR SHORT TO GROUND			
	- Measure resistance between FSS signal circuit and PWR GND circuits at the VDF vehicle harness connector. Is the resistance greater than 10,000 ohms?	Yes No	→ →	REFER to Cooling System for diagnosis and testing. If OK, REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.

Hydraulic Cooling Fan

KH

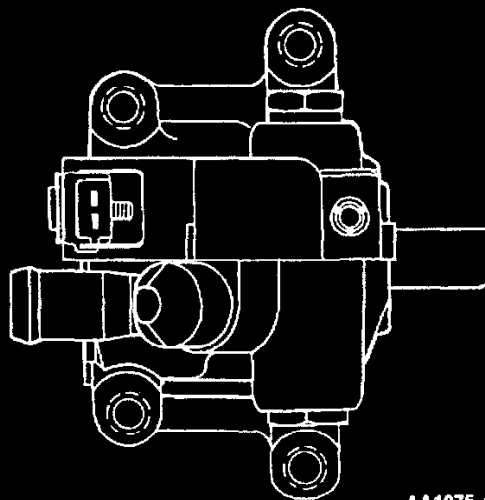
Note

This Pinpoint Test is intended to diagnose the following:

- Hydraulic cooling fan(HCF) solenoid/pump (14A464)
- Harness circuits: VPWR, HCF
- Powertrain control module (PCM) (12A650)

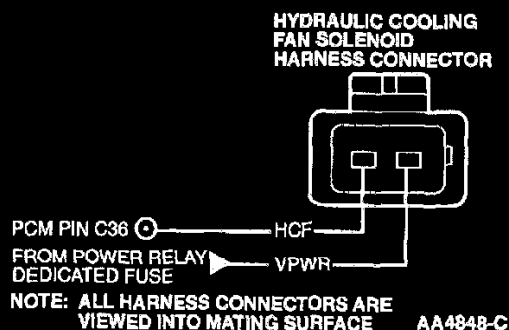
Pinpoint Test Schematics and Connectors

Hydraulic Cooling Fan Pump with Integral Solenoid

**AA1075-A**

Hydraulic Cooling Fan

KH



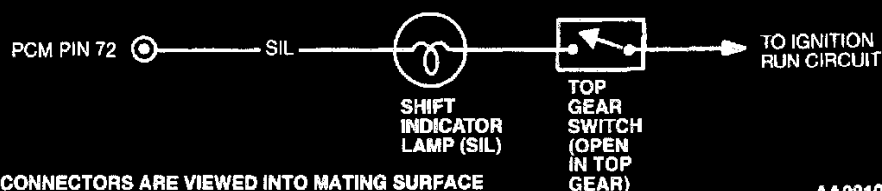
Test Steps		Results	Action to Take
KH1	DTC P1474 OR COOLING FAN CONCERNS: CHECK HCF SOLENOID RESISTANCE		
	• Key off. • Disconnect HCF solenoid. • Measure HCF solenoid resistance. • Is resistance between 8.5 and 11.5 ohms?	Yes → No →	GO to KH2. REPLACE HCF solenoid assembly.
KH2	CHECK VPWR VOLTAGE TO HCF SOLENOID		
	• Key on. • Measure VPWR circuit voltage at HCF solenoid. • Is voltage greater than 10.5 volts?	Yes → No →	KEY OFF. GO to KH3. REPAIR open circuit.
KH3	CHECK HCF CIRCUIT FOR OPEN IN HARNESS		
	• Measure resistance of HCF circuit between PCM harness connector and HCF solenoid harness connector. • Is resistance less than 5 ohms?	Yes → No →	GO to KH4. REPAIR open circuit.
KH4	CHECK HCF CIRCUIT FOR SHORT TO POWER IN HARNESS		
	• Key on. • Measure voltage between HCF circuit at the PCM harness connector and ground. • Is voltage less than 1.0 volt?	Yes → No →	KEY OFF. GO to KH5. REPAIR short circuit.
KH5	CHECK HCF CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	• Disconnect scan tool from DLC. • Measure resistance between HCF circuit at the PCM harness connector and ground. • Is resistance greater than 10,000 ohms?	Yes → No →	REFER to Cooling System for diagnosis and testing. If OK, REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.

Schematic, Test KH1 - KH5

Shift Indicator Lamp (SIL)**KL****Note**

This Pinpoint Test is intended to diagnose the following:

- Harness circuit: SIL
- SIL dimmer relay
- SIL bulb and SIL circuit fuse
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematic**Escort ZX2****NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE****AA0810-B**

Test Steps		Results →	Action to Take
KL1	CHECK SHIFT INDICATOR LAMP (SIL) OPERATION		
	Note: When the SIL is operating properly, it comes on when optimum shift speed is reached. The SIL will turn off after a shift has been completed or while in top gear. • Drive vehicle through all forward gears. • Look for the SIL to come on before the next upshift. • Look for the SIL to be off after a shift has been completed or while in top gear. • Is SIL on all the time?	Yes → No →	KEY OFF. GO to KL4. KEY OFF. GO to KL2.
KL2	CHECK SIL CIRCUIT FUSE		
	• Remove SIL circuit fuse and inspect. • Is fuse OK?	Yes → No →	INSTALL SIL circuit fuse. GO to KL3. REPAIR short circuit. REPLACE SIL circuit fuse.

Note, Schematic and Test KL1 - KL2

Shift Indicator Lamp (SIL)**KL**

Test Steps		Results	→	Action to Take
KL3	CHECK SIL BULB	Yes No	→ →	GO to KL5 . REPLACE SIL bulb.
	- Remove SIL bulb and inspect. Is SIL bulb OK?			
KL4	CHECK SIL CIRCUIT FOR SHORT TO GROUND IN HARNESS	Yes No	→ →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
	- Shift transmission to highest gear. - Disconnect PCM. - Measure resistance between SIL circuit at PCM harness connector and battery negative post. Is resistance greater than 10,000 ohms?			
KL5	CHECK IGN START/RUN VOLTAGE TO SIL SOCKET	Yes No	→ →	KEY OFF. GO to KL7 . KEY OFF. RECONNECT SIL bulb. GO to KL7 .
	- SIL bulb removed. - Transmission in any gear except. - Key on, engine off. - Measure voltage of the SIL circuit between the SIL socket and chassis ground. Is the voltage greater than 10.5 volts?			
KL7	CHECK SIL CIRCUIT FOR OPEN IN HARNESS	Yes No	→ →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuit.
	- SIL bulb removed. - Disconnect PCM. - Measure resistance between SIL circuit at PCM harness connector and SIL bulb socket. Is resistance less than 5.0 ohms?			

KL3 - KL7

Test KM: A/C Clutch Relay, A/C Circuits

A/C Clutch Relay, A/C Circuits

KM

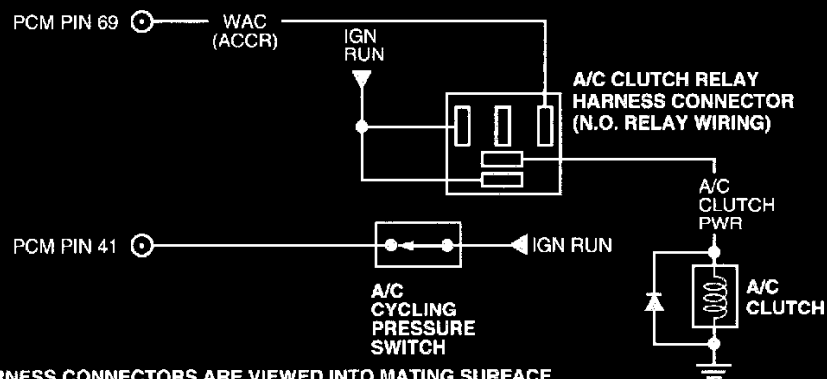
Note

This Pinpoint Test is intended to diagnose the following:

- Harness circuits: VPWR, A/CCS, WAC, A/C Clutch PWR
- A/C clutch relay
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematics and Connectors

Continental

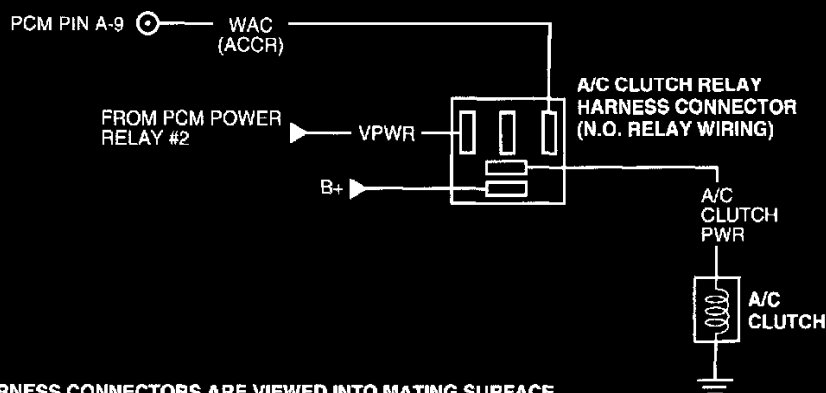


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A/C Clutch Relay, A/C Circuits

KM

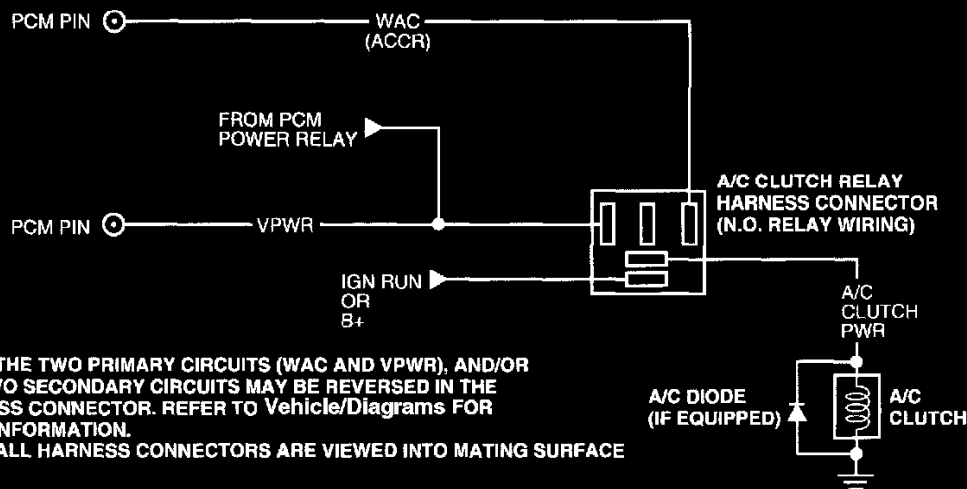
LS6/LS8, Thunderbird



A0040139

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

Focus, Cougar, Taurus/Sable, Town Car, Escape, Ranger, Explorer Sport/Sport Trac, Windstar



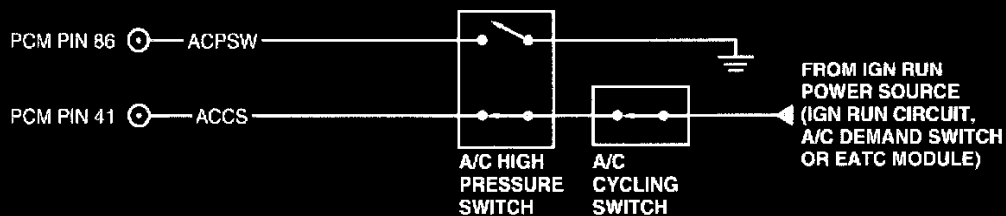
NOTE: THE TWO PRIMARY CIRCUITS (WAC AND VPWR), AND/OR THE TWO SECONDARY CIRCUITS MAY BE REVERSED IN THE HARNESS CONNECTOR. REFER TO Vehicle/Diagrams FOR MORE INFORMATION.
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0040141

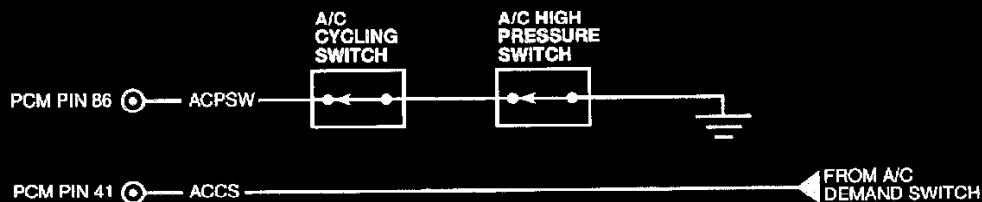
PCM CONNECTOR PIN NUMBERS

PCM TYPE	WAC (ACCR)	VPWR
104 PCM	69	71
150 PCM	A9	A32/A33

Test Schematic

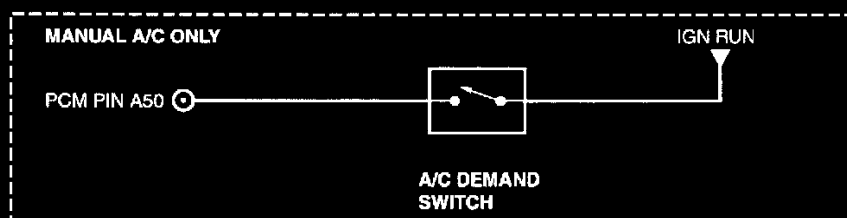
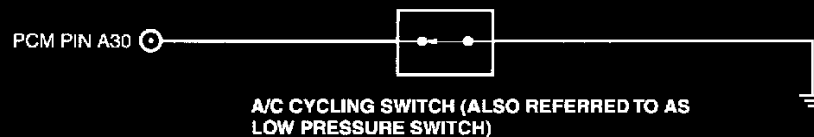
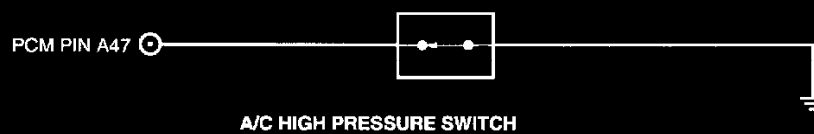
A/C Clutch Relay, A/C Circuits**KM****Focus, Cougar, Taurus/Sable, Crown Victoria/Grand Marquis, Town Car, Escape, (ACPSW and ACCS circuits)**

A0005253

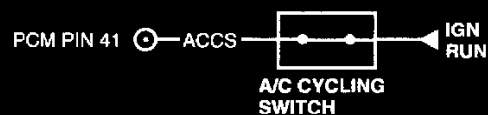
Ranger, Explorer Sport/Sport Trac, (ACPSW and ACCS circuits)

AA4855-A

Test Schematic

A/C Clutch Relay, A/C Circuits**KM****Explorer/Mountaineer (except Sport/Sport Trac)(ACPSW circuits)**

A0040142

Windstar (ACCS Circuit)

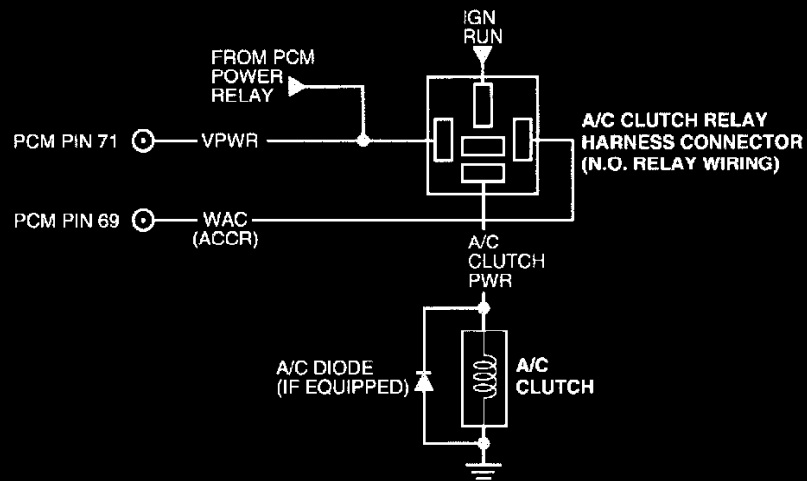
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Test Schematic

A/C Clutch Relay, A/C Circuits

KM

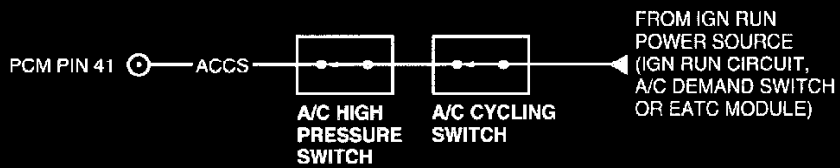
Crown Victoria/Grand Marquis, F-Series, Expedition/Navigator/Blackwood, Excursion, 4.2L E-Series



A0040143

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

F-Series (F-150 without electric fan control), Expedition/Navigator/Blackwood, Excursion, 4.2L E-Series (ACCS Circuit)



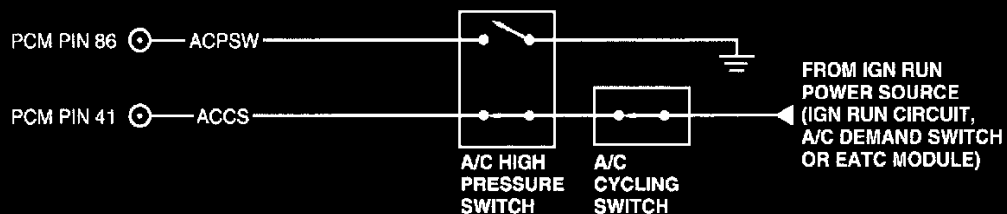
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Test Schematic

A/C Clutch Relay, A/C Circuits

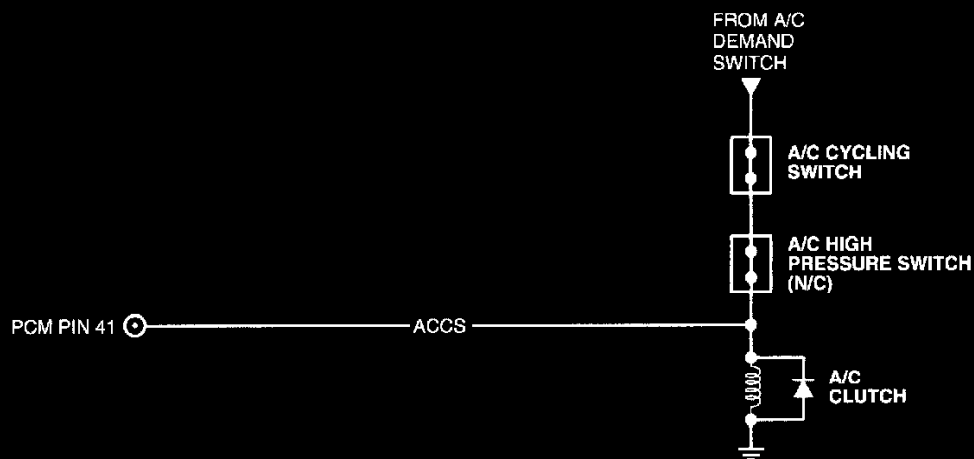
KM

F-150 (with electric fan control)(ACPSW and ACCS circuits)



A0005253

E-Series (Except 4.2L)



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0005256

Test Schematic

A/C Clutch Relay, A/C Circuits

KM

Test Steps		Results	Action to Take
KM1	KOEO/KOER DTC P1460: VERIFY ACCS PID IS OFF		
	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. - Start engine. - A/C and defroster off. - Access ACCS PID. Is the ACCS PID off?	Yes → No →	KEY OFF. GO to KM2. ACCS input to PCM is requesting A/C. REFER to Heating and Air Conditioning, to diagnose symptom (A/C always on).
KM2	CHECK VPWR VOLTAGE TO A/C CLUTCH RELAY		
	- Disconnect A/C clutch relay. - Key on, engine off. - Measure VPWR circuit voltage at the A/C clutch relay harness connector. Is voltage greater than 10.5 volts?	Yes → No →	KEY OFF. GO to KM3. For LS6/LS8 and Thunderbird: GO to B5. All others: REPAIR open circuit. START engine. Turn A/C on, WAIT 15 seconds. A/C off. RERUN Quick Test.
KM3	CHECK A/C CLUTCH RELAY		
	- Refer to pin numbers molded on A/C clutch 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 A/C clutch 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 A/C clutch relay. START engine. TURN A/C on, WAIT 15 seconds. A/C off. RERUN Quick Test.
KM4	CHECK WAC CIRCUIT FOR SHORT TO POWER IN HARNESS		
	- Disconnect PCM. - Key on, engine off. - Measure voltage between WAC circuit at A/C clutch relay vehicle harness connector and ground. Is voltage less than 1.0 volt?	Yes → No →	KEY OFF. GO to KM5. REPAIR short circuit. START engine. Turn A/C on, WAIT 15 seconds. A/C off. RERUN Quick Test.
KM5	CHECK WAC CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool from DLC. - Measure resistance between WAC circuit at A/C clutch relay vehicle harness connector and ground. Is resistance greater than 10,000 ohms?	Yes → No →	GO to KM6. REPAIR short circuit. START engine. Turn A/C on, WAIT 15 seconds. A/C off. RERUN Quick Test.

KM1 - KM5

A/C Clutch Relay, A/C Circuits**KM**

Test Steps		Results	Action to Take
KM6	CHECK WAC CIRCUIT FOR OPEN IN HARNESS		
	Note: Refer to the PCM pin numbers at the beginning of this pinpoint test. - Measure resistance of WAC circuit between PCM harness connector and the A/C clutch relay harness connector. Is resistance less than 5.0 ohms?	Yes → No →	REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). START engine. Turn A/C on, WAIT 15 seconds. A/C off. RERUN Quick Test. REPAIR open circuit. START engine. Turn A/C on, WAIT 15 seconds. A/C off. RERUN Quick Test.
KM10	ACCS PID OFF WITH A/C ON: VERIFY A/C CLUTCH IS GETTING POWER		
	- Start engine. - While listening for A/C clutch to engage, turn A/C on (if clutch cannot be heard, disconnect A/C clutch and connect a non-powered test lamp to A/C clutch PWR and ground circuit to check for power). Does the A/C clutch engage (or the light turn on)?	Yes → No →	Power is getting to A/C clutch, but ACCS PID is OFF. GO to KM11. The ACCS PID is OFF because power is not getting to the A/C clutch. This is not a cause of the low idle symptom. RETURN to Symptom Charts to continue low idle diagnosis, or REFER to Heating and Air Conditioning, to diagnose A/C system concerns.
KM11	CHECK ACCS CIRCUIT FOR OPEN IN HARNESS		
	- Disconnect PCM. - Disconnect A/C clutch. - Measure resistance between Pin 41 at the PCM harness connector and the A/C clutch power circuit at the A/C clutch harness connector. Is resistance less than 5.0 ohms?	Yes → No →	REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuit.

KM6 - KM11

A/C Clutch Relay, A/C Circuits**KM**

Test Steps		Results	Action to Take
KM19	DTCP1464: CHECK ACCS PID		
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	→ E-Series (except 4.2L): GO to KM20 . All others: ACCS input to PCM is requesting A/C. REFER to Heating and Air Conditioning, to diagnose symptom (A/C always on).
		No	→ 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.
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. • Is ACCS PID off?		Yes	→ VERIFY operation of A/C demand switch. REFER to Heating and Air Conditioning. If OK, REPAIR short to power in A/C Demand circuit to A/C cycling switch.
		No	→ KEY OFF. GO to KM21 .
KM21	CHECK ACCS CIRCUIT FOR SHORT TO POWER IN HARNESS		
• Disconnect PCM. • Key on. • Measure voltage between PCM harness connector pin 41 and ground. • Is voltage less than 1.0 volt?		Yes	→ REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
		No	→ REPAIR short circuit.

KM19 - KM21

A/C Clutch Relay, A/C Circuits**KM**

Test Steps		Results	→	Action to Take
KM30	CONTINUOUS MEMORY DTC P1460: CHECK WAC CIRCUIT FOR INTERMITTENT SHORT TO GROUND			
	Note: If the vehicle is not equipped with A/C, the WAC circuit is not used and the P1460 can be ignored. Note: Refer to the beginning of this pinpoint test for PCM pin numbers. • Key on, engine off. • Check WAC circuit for short to ground while completing the following (the A/C clutch will click on when a fault is detected): — Shake, wiggle and bend the WAC circuit between the PCM and the A/C clutch relay. — Lightly tap on the A/C clutch relay (to simulate road shock). • Is a fault indicated?	Yes No	→ →	KEY OFF. ISOLATE fault and REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. START engine. Turn A/C on, WAIT 15 seconds. A/C off. RERUN Quick Test. GO to KM31.
KM31	CHECK WAC CIRCUIT FOR INTERMITTENT OPEN OR SHORT TO POWER			
	• Key on, engine off. • Access Output Test Mode on scan tool. • Turn outputs on. • Check WAC circuit for open or short to power while completing the following (the A/C clutch will click off when a fault is detected): — Shake, wiggle and bend the WAC circuit between the PCM and the A/C clutch relay. — Shake, wiggle and bend the VPWR circuit to the A/C clutch relay. — Lightly tap on the A/C clutch relay (to simulate road shock). • Is a fault indicated?	Yes No	→ →	KEY OFF. ISOLATE fault and REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. START engine. Turn A/C on, WAIT 15 seconds. A/C off. RERUN Quick Test. KEY OFF. Unable to duplicate or identify fault at this time. GO to Z1.

KM30 - KM31

Test KP: Charge Air Cooler Pump (CAC)

Charge Air Cooler Pump (CAC)

KP

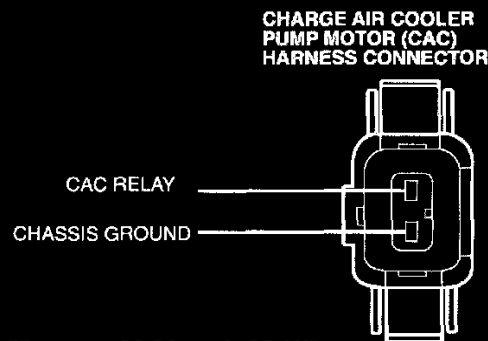
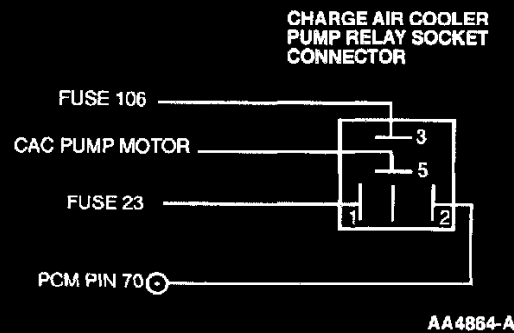
Note

This Pinpoint test is intended to diagnose the following:

- Charge Air Cooler Pump Relay (148192)
- Charge Air Cooler Pump Motor (8501)
- Harness circuits: CAC, Fuse 23, Fuse 106, vehicle power (VPWR) and power ground (PWR GND)

Pinpoint Test Schematics and Connector

5.4L Supercharged



**NOTE: HARNESS CONNECTOR AND
RELAY SOCKET VIEWED
INTO MATING SURFACE**

A0015027

Note, Schematics and Connector

Charge Air Cooler Pump (CAC)**KP**

Test Steps		Results	→	Action to Take
KP1	P1229: CHECK POWER FEED TO CAC PUMP RELAY COIL			
	• Check Fuse 23. • Is the fuse OK?	Yes No	→ →	GO to KP2 . CHECK Circuit 391 and 369 for short to ground.
KP2	CHECK POWER FEED TO CAC PUMP RELAY			
	• Check Fuse 106. • Is the fuse OK?	Yes No	→ →	GO to KP3 . CHECK Circuit 17 and 18 for short to ground.
KP3	CHECK INTEGRITY OF CAC PUMP GROUND CONNECTION			
	• Disconnect the CAC pump. • Measure the resistance between chassis ground circuit at the CAC pump connector and battery negative post. • Is the resistance less than 2 ohms?	Yes No	→ →	GO to KP4 . CHECK the tightness of the ground lug. If tight check wire back to the CAC connector.
KP4	CHECK CAC PUMP MOTOR RESISTANCE			
	• Disconnect the CAC pump motor. • Measure the resistance between the pins at the CAC connector to the pump motor. • Is the resistance less than 10 ohms?	Yes No	→ →	GO to KP5 . REPLACE CAC pump motor.
KP5	CHECK CAC PUMP RELAY			
	• Remove relay from power distribution box. • Measure resistance between pin 1 or 2 and all other pins. One reading must be between 65-90 ohms and all other readings must be greater than 10K ohms. • Are resistance checks OK?	Yes No	→ →	GO to KP6 . REPLACE CAC pump relay.
KP6	CHECK FOR OPEN CAC CIRCUIT BETWEEN PCM AND CAC RELAY			
	Note: Refer to PCM Pin numbers in the beginning of this pinpoint test. • Key off. • Disconnect the PCM and the CAC pump relay. • Measure the resistance of the CAC circuit at the PCM harness connector and pin 2 of the relay socket. • Is the resistance less than 5 ohms?	Yes No	→ →	GO to KP7 . REPAIR open circuit.
KP7	CHECK CAC CIRCUIT BETWEEN PCM AND CAC RELAY FOR SHORT TO GROUND			
	• Key off. • Measure the resistance of the CAC circuit at the PCM harness connector and the battery negative post. • Is the resistance greater than 10K ohms?	Yes No	→ →	GO to KP8 . REPAIR short to ground condition.

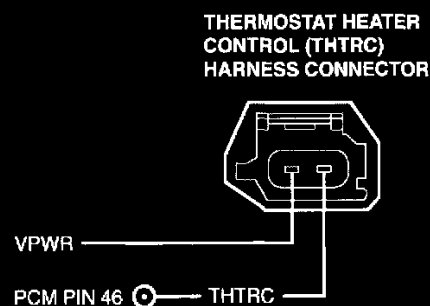
Charge Air Cooler Pump (CAC)**KP**

Test Steps		Results	Action to Take
KP8	CHECK CAC CIRCUIT BETWEEN PCM AND CAC RELAY FOR SHORT TO POWER		
	• Key on, engine off. • Remove CAC pump relay. • Measure the voltage between the CAC circuit at the PCM harness connector and the battery negative post. • Is the voltage less than 0.05 volt?	Yes → No →	GO to KP9 . REPAIR short to B+.
KP9	CHECK FOR OPEN CIRCUIT BETWEEN CAC PUMP RELAY COIL AND POWER FEED		
	• Remove the CAC pump relay and fuse 23. • Measure the resistance between relay socket pin 1 and fuse 23 (load side). • Is resistance less than 5 ohms?	Yes → No →	GO to KP10 . REPAIR open circuit.
KP10	CHECK FOR OPEN POWER FEED CIRCUIT AT CAC PUMP MOTOR RELAY		
	• Remove CAC Pump Relay and fuse 106 from their sockets. • Measure resistance between relay socket pin 3 and load side of fuse socket. • Is resistance less than 5 ohms?	Yes → No →	GO to KP11 . REPAIR open circuit.
KP11	CHECK FOR OPEN CAC CIRCUIT BETWEEN CAC, CAC PUMP RELAY AND PUMP MOTOR		
	• Disconnect the CAC pump motor. • Measure resistance between relay socket pin 5 and the CAC harness connector. • Is the resistance less than 5 ohms?	Yes → No →	Replace CAC relay, fuse 23, and fuse 106. GO to KP12 . REPAIR open circuit.
KP12	CHECK STATUS OF PID		
	• Key on, engine off. • Access SCIPC PID. • Does the SCIPC indicate PID on?	Yes → No →	If the CAC reservoir is full, no air flow blockage at the CAC radiator, the IAT 2 and connecting circuits are not high resistance or open circuited, intercooler hoses are not reversed and DTC P1229 is present in KOEO and KOER, then REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)) Unable to duplicate or identify fault at this time. GO to Z1 .

Thermostat Heater Control (THTRC)**KQ****Note**

This Pinpoint Test is intended to diagnose the following:

- Thermostat (8575)
- Harness circuits: THTRC and VPWR
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematic and Connector

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

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Test Steps		Results	Action to Take
KQ10	DTC P1432: CHECK VPWR AT THTRC HARNESS CONNECTOR		
Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Disconnect the thermostat harness connector. • Key on. • Measure VPWR circuit voltage at THTRC harness connector. • Is the voltage reading greater than 10.5 volts?		Yes →	KEY OFF. GO to KQ11 .
		No →	KEY OFF. REPAIR VPWR circuit.
KQ11	CHECK THERMOSTAT RESISTANCE		
• Measure resistance of the thermostat at the two pin terminal connector. • Is resistance between 14.0 and 16.0 ohms?		Yes →	GO to KQ12 .
		No →	REPLACE thermostat.

Note, Schematic and Connector and Test KQ10 - KQ11

Thermostat Heater Control (THTRC)**KQ**

Test Steps		Results	→	Action to Take
KQ12	CHECK THTRC CIRCUIT FOR OPEN IN HARNESS	Yes No	→ →	GO to KQ13 . REPAIR open circuit.
	• Disconnect PCM. • Measure resistance between THTRC circuit between PCM harness connector pin and the THTRC harness connector. • Is the resistance less than 5.0 ohms?			
KQ13	CHECK THTRC CIRCUIT FOR SHORT TO GROUND OR VPWR IN HARNESS	Yes No	→ →	For Continuous DTC P1432 only, GO to Z1 . For KOEO or KOER DTC P1432, REPLACE PCM. REPAIR short to GND or VPWR.
	• Measure resistance between THTRC PCM pin and PCM pins VPWR, SIG RTN and PWR GND. • Is each resistance greater than 10,000 ohms?			

KQ12 - KQ13

Malfunction Indicator Lamp (MIL)**NB****Note**

This Pinpoint Test is intended to diagnose only the following:

- Malfunction Indicator Lamp (MIL) circuit
- Powertrain Control Module (PCM)
- Fuse

Pinpoint Test Schematic

B+ (DURING RUN OR START)



MIL ——— ○ TEST PIN 2

AA0942-A

Test Steps		Results →	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 A1. • If any Key On Engine Off or Continuous Memory Diagnostic Trouble Codes are present, repair before proceeding. • Disconnect PCM. • Measure resistance between PCM harness connector Pin 2 and PCM harness connector Pin 51 or 103. • Is resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.

Note, Schematic and Test NB1

Malfunction Indicator Lamp (MIL)**NB**

Test Steps		Results	Action to Take
NB2	MALFUNCTION INDICATOR LAMP (MIL) NEVER ON		
	Note: If vehicle will not start, GO to A1. • Key on, engine off. • Measure voltage from battery negative post to Ground side of the MIL fuse. Refer to Vehicle/Diagrams for the specific location of the MIL fuse. • Is voltage greater than 10.5 volts?	Yes → No →	KEY OFF. GO to NB4. KEY OFF. 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. • Is voltage greater than 10.5 volts?	Yes → No →	REPLACE the fuse. VERIFY repair by turning ignition key to the on position. KEY OFF. REFER to Vehicle/Diagrams to repair power distribution (to the fuse) from the Power Distribution Box.
NB4	CHECK VOLTAGE ON THE B+ CIRCUIT		
	Note: Refer to Vehicle/Diagrams for connector location. • Disconnect Instrument Cluster harness connector. • Key on, engine off. • Measure voltage of B+ circuit between the Instrument Cluster harness connector and battery negative post. • Was voltage greater than 10.5 volts?	Yes → No →	KEY OFF. GO to NB5. REPAIR open circuit.
NB5	CHECK FOR OPEN MIL CIRCUIT BETWEEN PCM AND INSTRUMENT CLUSTER		
	• Disconnect PCM. • Measure resistance between PCM harness connector Pin 2 and MIL circuit at the instrument cluster connector. • Is resistance less than 5.0 ohms?	Yes → No →	REFER to Instrument Panel, Gauges and Warning Indicators, to diagnose Instrument Cluster and Bulb. If OK, REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). VERIFY the repair by turning key to the ON position. REPAIR open circuit. VERIFY repair by turning key to the ON position.

NB2 - NB5

Ignition Engine Speed Input Circuit**NC****Note**

This Pinpoint Test is intended to diagnose the following:

- Powertrain Control Module (PCM) (12A650)

Test Steps		Results	→	Action to Take
NC1	DTC P0320: ERRATIC IGNITION	Yes No	→	REPAIR as necessary.
Note: Verify all 2-way radio installations. Carefully follow manufacturer's installation instructions regarding the routing of antenna and power leads. • Are any faults present?			→	For No Starts: GO to A1. For Intermittent Faults: GO to Z1. All others: Loss of PIP. GO to JD1.

Note, Test NC1

Engine RPM/Vehicle Speed Limiter**ND**

Test Steps		Results →	Action to Take
ND1	DTC P1270: EXCESSIVE ENGINE RPM/VEHICLE SPEED		
Check for:		Yes →	OBD II system is OK. RETURN vehicle to customer with information about DTC P1270. GO to Symptom Charts, if there are other driveability concerns. If there are no other symptoms, RETURN vehicle to customer.
— Water, ice, mud and snow causing wheel slippage. - Note: 4x4 Vehicles. Verify proper 4x4 operation. Improper use or operation of the 4x4 system may cause the PCM to generate a P1270. Refer to Transmission and Drivetrain, Diagnosis and Testing. — Excessive engine rpm in NEUTRAL. — Vehicle driven at high rate of speed. • Was the vehicle operating in any of the above conditions?		No →	

ND1

Test QA: Unable to Activate Self-Test/SCP Comm. Error/DTC Not Listed

Unable To Activate Self-Test/SCP Communication Error/DTC Not Listed

QA

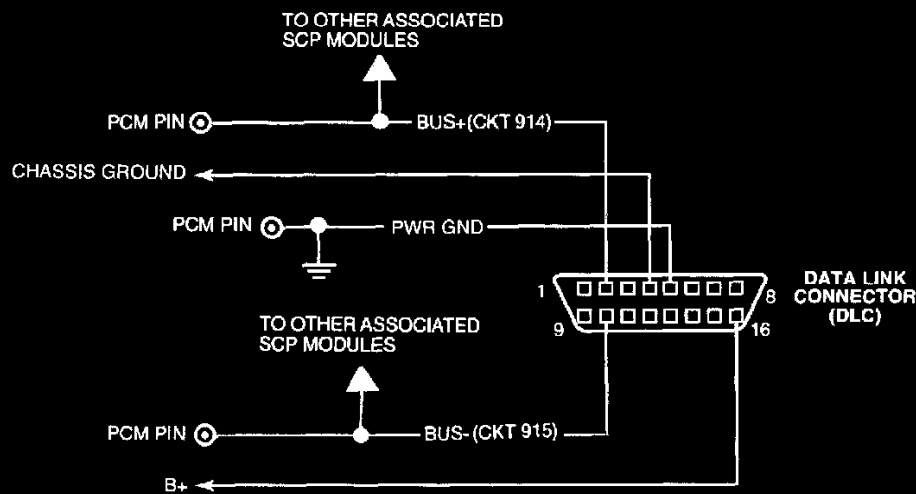
Note

This Pinpoint Test is intended to diagnose the following:

- Standard corporate protocol (SCP) communication bus harness circuits: BUS(+), BUS(-), between DLC and PCM
- Data link connector harness circuits: chassis ground, power ground (PWR GND), battery positive voltage (B+)
- Open VPWR to Powertrain control module (PCM) (12A650)
- Powertrain control module (PCM) (12A650)

Note: Concerns found that affect the entire network are referred to in the Module Communication Network.

Pinpoint Test Schematics and Connectors



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

AA0934-C

Note, Schematics and Connectors

Unable To Activate Self-Test/SCP Communication Error/DTC Not Listed

QA

PCM CONNECTOR PIN NUMBERS

Application	BUS (+)	BUS (-)	PWR GND
LS6/LS8, Thunderbird, Explorer/Mountaineer (150 pin PCM only)	A3	A4	A24,25,26
Mustang	16	15	51,76,103
All Others	16	15	51,77,103

Test Steps		Results	→	Action to Take
QA1	VERIFY SELF-TEST PROCEDURE			
• 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. — DTC P1001 KOER Self-Test cannot be completed. • 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 or associated modules. — Damaged PCM power relay circuit. — Damaged PCM. — PTO circuit, if equipped. • Disconnect scan tool from DLC. Inspect vehicle and scan tool 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 (refer to Diagnostic Methods).		Yes	→	Correct procedure was used for activating Self-Test. GO to QA2 .
		No	→	Correct procedure was not used for activating Self-Test. RETURN to Symptom Charts, Step 1: PCM Quick Test, and COMPLETE Self-Test using the correct procedure.
• Was the correct Self-Test procedure used?				

QA1

Unable To Activate Self-Test/SCP Communication Error/DTC Not Listed

QA

Test Steps		Results	→	Action to Take
QA2	CHECK VREF VOLTAGE TO TP SENSOR			
	- Disconnect throttle position (TP) sensor. - Note: GO to Pinpoint Test DH and refer to Pinpoint Test Schematics and Connectors for TP harness connector pin-out information. - Key on, engine off. - Measure voltage between VREF and SIG RTN circuits at the TP sensor harness connector. - Note: Loss of VREF caused by an open or short to power or ground can cause a SCP link communication error and/or unable to self-test. Is the voltage between 4.0 and 6.0 volts?	Yes	→	Voltage is in specification. GO to QA3 .
		No	→	Voltage is not in specification. RECONNECT the TP sensor. GO to C1 .
QA3	CHECK LINK COMMUNICATION WITH TP SENSOR DISCONNECTED			
	- TP sensor disconnected. - Scan tool connected. - Key on, engine off. - Attempt to access TP V PID. - Note: If TP V PID cannot be accessed. GO to QA4. - Reconnect TP sensor while monitoring PID. Does scan tool communication error occur only when TP sensor is reconnected?	Yes	→	VREF shorted to SIG RTN in the sensor. REPLACE TP sensor.
		No	→	GO to QA4 .
QA4	ABILITY TO ACCESS CONTINUOUS MEMORY DTCs			
	Can Continuous Memory DTCs be accessed?	Yes	→	GO to QA5 .
		No	→	UNABLE to access Continuous Memory DTCs. KEY OFF. GO to QA8 .
QA5	ABILITY TO ACTIVATE KOEO SELF-TEST			
	Can KOEO Self-Test be activated?	Yes	→	GO to QA6 .
		No	→	UNABLE to activate KOEO Self-Test. GO to QA7 .

QA2 - QA5

Unable To Activate Self-Test/SCP Communication Error/DTC Not Listed

QA

Test Steps		Results	Action to Take
QA6	ABILITY TO ACTIVATE KOER SELF-TEST		
	Can KOER Self-Test be completed?	Yes → No →	If here for P1001 and other KOER DTCs are present, GO to Diagnostic Trouble Code (DTC) Charts and Diagnostic Trouble Code (DTC) Descriptions, for Pinpoint Test direction. Begin diagnosis with the first KOER DTC outputted. If the DTC is not listed in the (DTC) Charts, CHECK that the correct PCM is installed in the vehicle. Also CHECK for a Technical Service Bulletin (TSB) or OASIS message that indicates a PCM change or calibration (flash) update. UNABLE to activate or complete KOER Self-Test. GO to QA7.
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 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. NOTE 2: For information on retrieving MIL and non-MIL DTCs, refer to Diagnostic Methods, Quick Test, Continuous Memory Self-Test. - 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. GO to Diagnostic Trouble Code (DTC) Charts and Diagnostic Trouble Code (DTC) Descriptions, for Pinpoint Test direction. UNABLE to retrieve any Self-Test DTCs. GO to QA8.
QA8	CHECK B+ VOLTAGE TO DATA LINK CONNECTOR (DLC)		
	- Disconnect scan tool from DLC. - Inspect the DLC for damage. Repair as necessary. - Measure voltage between B+ circuit cavity at the DLC and ground. Is voltage greater than 10.5 volts?	Yes → No →	GO to QA9. REPAIR open in DLC B+ circuit.

QA6 - QA8

Unable To Activate Self-Test/SCP Communication Error/DTC Not Listed

QA

Test Steps		Results	→	Action to Take
QA9	CHECK DLC CHASSIS GROUND CIRCUIT FOR OPEN HARNESS	Yes No	→ →	GO to QA10 . REPAIR open circuit.
	- Measure resistance between chassis ground circuit at the DLC and chassis ground. Is resistance less than 5.0 ohms?			
QA10	CHECK DLC PWR GND CIRCUIT FOR OPEN IN HARNESS	Yes No	→ →	GO to QA11 . REPAIR open circuit.
	- Measure resistance between PWR GND circuit at the DLC and battery negative post. Is resistance less than 5.0 ohms?			
QA11	DATA LINK DIAGNOSTIC NETWORK TEST	Yes No	→ →	GO to QA12 . Data link network test passed for PCM. RERUN PCM Quick Test. Refer to Symptom Charts, Step 1: PCM Quick Test, QT1.
	- Connect scan tool. - Key on, engine off. - Run Data Link Diagnostics. - NOTE: If scan tool does not have Data Link Diagnostic Network Test capability, GO to QA22. - Typical PCM network error messages: - PCM: NO RESPONSE/NOT EQUIPPED - PCM: NO RESPONSE CKT914BUS(+) - PCM: NO RESPONSE CKT915BUS(-) Are any PCM network error messages displayed?			

Unable To Activate Self-Test/SCP Communication Error/DTC Not Listed

QA

Test Steps		Results	Action to Take
QA12	NETWORK TEST RESULT — CIRCUIT 914BUS(+) AND CIRCUIT 915BUS(-) - Check the DATA LINK DIAGNOSTIC Network Test Results. - Typical ECU network error messages: - BUS(+)CKT914= ALL MODULE NO RESP/NOT EQUIP - BUS(-)CKT915= ALL MODULE NO RESP/NOT EQUIP Are there any messages indicating "ALL ECU modules are not responding" displayed?	Yes → No →	For BUS(+)CKT914= ALL MODULE NO RESP/NOT EQUIP. GO to QA13. For BUS(-)CKT915= ALL MODULE NO RESP/NOT EQUIP. GO to QA16. For both BUS(+)CKT914 and BUS(-)CKT915= ALL MODULE NO RESP/NOT EQUIP. GO to QA22. For BUS(+)CKT914= SOME MODULE NO RESP/NOT EQUIP, PCM: NO RESPONSE ON BUS(+)CKT914. GO to QA15. For BUS(-)CKT915= SOME MODULE NO RESP/NOT EQUIP, PCM: NO RESPONSE ON BUS(-)CKT915. GO to QA18. For both BUS(+)CKT914 and BUS(-)CKT915 = SOME MODULE NO RESP/NOT EQUIP, PCM: NO RESPONSE ON BUS(+) AND BUS(-). GO to QA23.
QA13	CHECK BUS(+) FOR SHORT TO GROUND IN HARNESS - Key off. - Disconnect PCM. - Measure resistance of BUS(+) circuit between PCM harness connector pin and chassis ground. Is resistance greater than 50 ohms?	Yes → No →	GO to QA14. REPAIR short circuit. Note: Short circuit can exist in harness or associated modules. REFER to Module Communication Network, for further diagnosis.
QA14	CHECK BUS(+) CIRCUIT FOR SHORT TO B+ IN HARNESS - Key on, engine off. - Measure voltage between BUS(+) circuit at the PCM harness connector pin and chassis ground. Is the voltage greater than 1.0 volt?	Yes → No →	REPAIR short circuit. Note: Short circuit can exist in harness or associated modules. REFER to Module Communication Network, for further diagnosis. GO to QA15.

QA12 - QA14

Unable To Activate Self-Test/SCP Communication Error/DTC Not Listed

QA

Test Steps		Results	→	Action to Take
QA15	CHECK DLC BUS(+) CIRCUIT FOR OPEN IN HARNESS			
	• Key off. • Disconnect PCM. • Measure resistance of BUS(+) circuit between PCM harness connector pin and BUS(+) circuit at the DLC. • Is resistance less than 5.0 ohms?	Yes No	→ →	GO to QA19 . REPAIR open circuit.
QA16	CHECK BUS(-) FOR SHORT TO GROUND IN HARNESS			
	• Key off. • Disconnect PCM. • Measure resistance of BUS(-) circuit between PCM harness connector pin and chassis ground. • Is resistance greater than 50 ohms?	Yes No	→ →	GO to QA17 . REPAIR short circuit. Note: Short circuit can exist in harness or associated modules. REFER to Module Communication Network, for further diagnosis.
QA17	CHECK BUS(-) CIRCUIT FOR SHORT TO B+ IN HARNESS			
	• Key on, engine off. • Measure voltage between BUS(-) circuit at the PCM harness connector pin and chassis ground. • Is the voltage greater than 6.0 volts?	Yes No	→ →	REPAIR short circuit. Note: Short circuit can exist in harness or associated modules. REFER to Module Communication Network, for further diagnosis. GO to QA18 .
QA18	CHECK DLC BUS(-) CIRCUIT FOR OPEN IN HARNESS			
	• Key off. • Disconnect PCM. • Measure resistance of BUS(-) circuit between PCM harness connector pin and BUS(-) circuit at the DLC. • Is resistance less than 5.0 ohms?	Yes No	→ →	GO to QA19 . REPAIR open circuit.

QA15 - QA18

Unable To Activate Self-Test/SCP Communication Error/DTC Not Listed

QA

Test Steps		Results	Action to Take
QA19	CHECK POWER RELAY VPWR TO PCM		
	- Key off. - Disconnect PCM. - Key on. - Measure voltage between VPWR and GND circuits at the PCM harness connector. Note: GO to Pinpoint Test B, and refer to Pinpoint Test Schematics and Connectors for PCM harness connector to Power Relay pin-out information. - Is the voltage greater than 10.5 volts?	Yes → No →	For scan tools with Data Link Diagnostic Network Test capability, GO to QA20. For scan tools without Data Link Diagnostic Network Test capability, REFER to Module Communication Network, for further diagnosis. NOTE: If after completing diagnosis and referred back to Computers and Control Systems, REPLACE PCM. Key off. REPAIR VPWR circuit from PCM relay.
QA20	POWER TAKE OFF (PTO) APPLICATIONS		
	Is the vehicle equipped with a Power Take Off?	Yes → No →	GO to QA21. Vehicle is not equipped with PTO. REPLACE PCM. (Refer to Diagnostic Methods, Flash EEPROM)
QA21	CHECK PTO ON/OFF INPUT		
	- Key on, engine off. - Measure the voltage between PCM harness connector Pin 4 and chassis ground while cycling the PTO switch/actuator. - Does 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 PCM. (Refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).) PTO circuit is not OK. GO to FB1 for further diagnosis.
QA22	CHECK FOR BUS(+) SHORT TO BUS-		
	- Key off. - Disconnect PCM. - Measure resistance between BUS(+) and BUS(-) circuits at the PCM harness connector. - Is resistance greater than 5.0 ohms?	Yes → No →	GO to QA23. REPAIR short circuit. Note: A short circuit can exist in the harness or associated SCP modules. REFER to Module Communication Network, for further diagnosis.

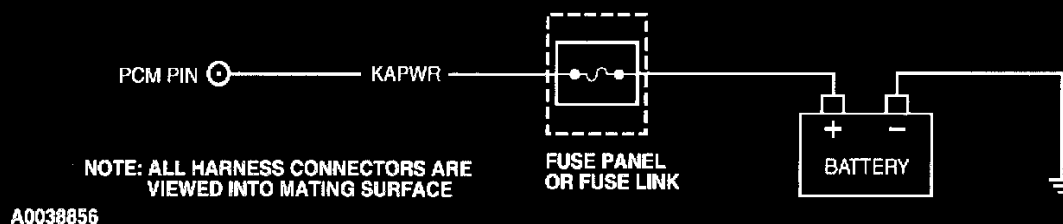
**Unable To Activate Self-Test/SCP
Communication Error/DTC Not
Listed****QA**

Test Steps		Results	→	Action to Take
QA23	CHECK FOR OPEN BUS(+/-) OPEN IN HARNESS			
• Measure resistance of BUS(+) circuit between PCM harness connector pin and BUS(+) circuit at the DLC. • Measure resistance of BUS(-) circuit between PCM harness connector pin and BUS(-) circuit at the DLC. • Are both resistances less than 5.0 ohms?		Yes	→	For scan tools with Data Link Diagnostic Network Test capability, GO to QA19 . For scan tools without Data Link Diagnostic Network Test capability, REFER to Module Communication Network, for further diagnosis. NOTE: If after completing diagnosis and referred back to Computers and Control Systems. REPLACE PCM.
		No	→	REPAIR open circuit.

**Diagnostic Trouble Code (DTC)
P0603/P1605/P1633****QB****Note**

This Pinpoint Test is intended to diagnose the following:

- Battery terminal condition
- Keep Alive Power (KAPWR) wire routing
- Harness circuit: KAPWR
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematics and Connectors**PCM CONNECTOR PIN NUMBERS**

PCM TYPE	KAPWR
104 PIN	55
150 PIN	A44

Test Steps		Results	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. • Inspect the battery cables for loose connections, corrosion. • Are the battery terminal connections in good condition?		Yes	→ KEY OFF. Battery terminals are OK. GO to QB2 .
		No	→ REPAIR battery terminals as necessary.

Note, Schematics and Connectors and Test QB1

Diagnostic Trouble Code (DTC) P0603/P1605/P1633

QB

Test Steps		Results	Action to Take
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. Engine compartment wire routing is OK. GO to QB3 .
QB3	CHECK KEEP ALIVE POWER (KAPWR) TO PCM		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Disconnect PCM. - Measure voltage between KAPWR circuit at the PCM harness connector 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. No open in KAPWR harness circuit detected. GO to QB4 .
QB4	CHECK FOR REPEAT OF DTC P0603/P1605/P1633		
	- Reconnect PCM. - Clear all DTCs that may have been caused by PCM disconnect. - Start engine and allow it to reach operating temperature. - Run Key On Engine Off Self-Test. - Retrieve Continuous Memory DTCs. Is DTC P0603, P1605 or P1633 present?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). Unable to duplicate or identify fault at this time. GO to Z1 (Also refer to Diagnostic Trouble Code (DTC) Descriptions for a list of possible causes.)

QB2 - QB4

OBD II Monitor Testing Not Complete - DTC P1000

QC

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.

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. To complete this requirement in the shortest amount of time, refer to Diagnostic Methods, Drive Cycles.

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 repair process.
- The PCM has been flashed and the vehicle has not yet completed an OBD II Drive Cycle.

DTC P1000 cannot be cleared from the PCM when:

- The vehicle has a PTO and the circuit is shorted to VPWR or B+ or the PTO is on during testing.

Test Steps		Results	→	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.		Yes	→	GO to Powertrain Diagnostic Trouble Code (DTC) Charts, for Pinpoint Test direction and REPAIR other DTCs.
DTC P1000 indicates that all of the OBD II monitors have not yet been successfully tested.		No	→	For vehicles with PTO: GO to QC2 . All others: GO to QC3 .
• Were any other DTCs received with the P1000?				

Note, Test QC1

**OBD II Monitor Testing Not Complete
- DTC P1000****QC**

Test Steps		Results	→	Action to Take
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	→	PTO circuit is OK. GO to QC3 .
		No	→	GO to 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.	Yes	→	COMPLETE an OBD II Drive Cycle (REFER to Diagnostic Methods, Drive Cycles).
	• Has the customer requested the DTC P1000 be cleared from the PCM memory?	No	→	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 completed before an inspection/maintenance test.

QC2 - QC3

Diagnostic Trouble Code (DTC) P1260**QD****Note**

The Passive Anti-Theft (PATS) system is also known as SecuriLock® in North America. The PATS uses radio frequency identification technology to deter a drive away theft. Passive means that it does not require any activity from the user. The PATS uses a specially encoded ignition key. Each encoded ignition key contains a permanently installed electronic device called a transponder. Each transponder contains a unique electronic identification code. Each encoded ignition key must be programmed into the vehicle before it can be used to start the engine. P1260 will be stored any time the PCM disables the vehicle because of the PATS system.

Test Steps		Results	→	Action to Take
QD1	CHECK FOR PATS DTCs	Yes No	→ →	GO to QD2 . REFER to Antitheft and Alarm Systems for DTC diagnosis.
	- Repair all Passive Anti-Theft (PATS) DTCs before P1260. (Refer to Antitheft and Alarm Systems for System Description and Operation). - Have all PATS DTCs been diagnosed?			
QD2	CHECK FOR OTHER POWERTRAIN DTCs	Yes No	→ →	GO to QD3 . REFER to Powertrain Diagnostic Trouble Code (DTC) Charts, for Pinpoint Test direction and REPAIR other DTCs.
	- Repair all powertrain DTCs other than P1260. - Have all other powertrain DTCs been diagnosed?			

Note, Test QD1 - QD2

Diagnostic Trouble Code (DTC) P1260**QD**

Test Steps		Results	→	Action to Take
QD3	ATTEMPT TO START ENGINE			
• Complete Keep Alive Memory Reset to clear DTC P1260. Refer to Diagnostic Methods, Powertrain Control Module (PCM) Reset for instructions. • Attempt to start the engine. • Will the engine start?		Yes	→	No system faults exist at present time. For intermittent No Starts or Start Stalls, CHECK for intermittent PATS faults. (PATS cannot stall the engine after 1 second of operation.) For intermittent stalls while driving, VERIFY scan tool-to-PCM communication during concern. If PCM communication error occurs, possible causes are: • Loss of PWRS or GNDS to PCM • Faulty PCM PWR relay • Faulty EEC PWR diode • Shorted VREF signal REPAIR as necessary. RETURN vehicle to customer.
		No	→	DTC P1260 is not the cause of the No Start. GO to Symptom Charts to diagnose the No Start symptom.

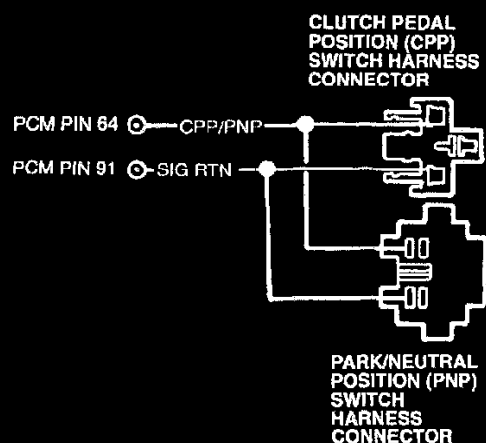
QD3

Test TA: Park/Neutral Position/Clutch Pedal Position Switches

**Park/Neutral Position (PNP)/Clutch
Pedal Position (CPP) Switches****TA****Note**

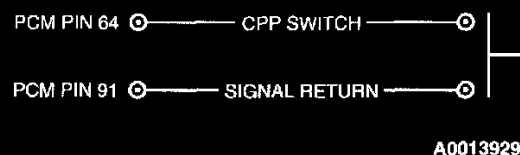
This Pinpoint Test is intended to diagnose the following:

- Clutch Pedal Position Switch (11A152)
- Park Neutral Position Switch (7A247)
- Harness circuits: CPP, PNP and SIG RTN
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematic**Escort**

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AA3079-C

Focus

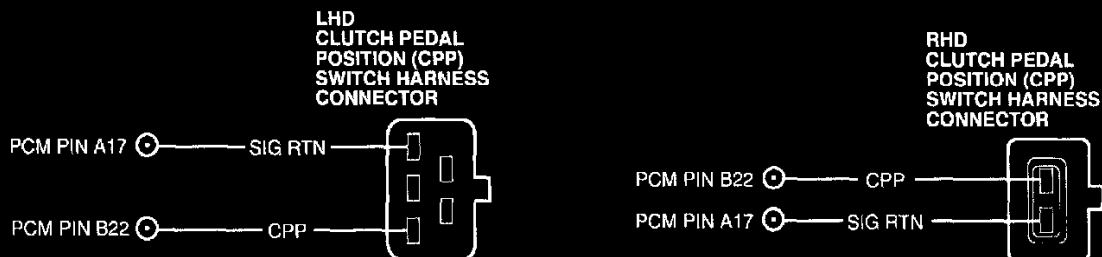
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Note, Schematic

Park/Neutral Position (PNP)/Clutch Pedal Position (CPP) Switches

TA

LS6

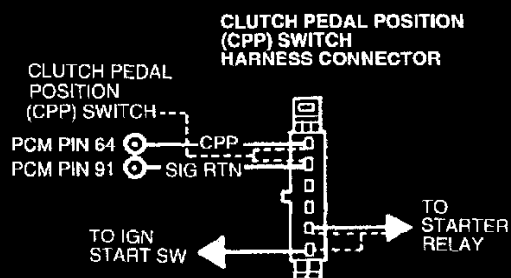


NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

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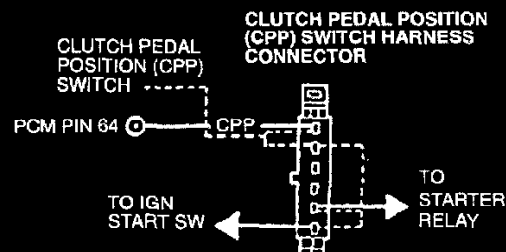
Ranger/Explorer

F-Series



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

AA3076-C



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

AA3077-C

Test Steps		Results	Action to Take
TA1	CHECK CPP OR PNP SWITCH FUNCTION		
	P0704, P1709 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 → No →	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 (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). GO to TA2.

Schematic, Test TA1

Park/Neutral Position (PNP)/Clutch Pedal Position (CPP) Switches

TA

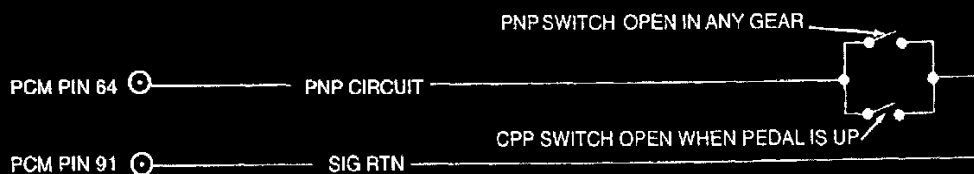
Test Steps		Results	→	Action to Take
TA2	CHECK CPP OR PNP SWITCH RESISTANCE	Yes No	→ →	GO to TA3 . REPLACE the CPP or PNP switch.
	• Key off. • Locate the CPP switch or the PNP switch near the transmission shift linkage. • Inspect switch and bracket for damage, bent or broken conditions. Repair as required. • 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?			
TA3	CHECK CPP/PNP CIRCUIT FOR OPEN IN HARNESS	Yes No	→ →	GO to TA4 . REPAIR open circuit.
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Disconnect scan tool. • Disconnect PCM. • Measure resistance of the (CPP/PNP) circuit between PCM harness connector pin and CPP or PNP switch harness connector. • Where applicable, measure resistance of the SIG RTN circuit between PCM harness connector pin and CPP or PNP switch harness connector. • Are both resistances less than 5.0 ohms?			
TA4	CHECK CPP OR PNP CIRCUIT FOR SHORT TO SIG RTN OR CHASSIS GROUND IN HARNESS	Yes No	→ →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
	• Measure resistance between CPP and SIG RTN circuits at the PCM harness connector. • Measure resistance of CPP circuit between PCM harness connector pin and chassis ground. • Are both resistances greater than 10,000 ohms?			

TA2 - TA4

Park/Neutral Position (PNP)/Clutch Pedal Position (CPP) Switches

TA

Test Steps		Results	Action to Take
TA5	CHECK CPP/PNP SWITCH FUNCTION		
P0704, P1705, P1709 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. • Does reading change from ON to OFF for both switches?		Yes → 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 (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). No → GO to TA6.	



AA4556-A

TA6	CHECK CPP/PNP SWITCHES RESISTANCE		
• The CPP switch is near the clutch pedal and the PNP switch is 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 → GO to TA7. No → REPLACE damaged CPP or PNP switch.	
TA7	CHECK CPP/PNP CIRCUIT FOR OPEN IN HARNESS		
Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Disconnect scan tool. • Disconnect PCM. • Measure resistance of the SIG RTN circuit between PCM harness connector pin and CPP or PNP switch harness connector. • Measure resistance of the CPP/PNP circuit between PCM harness connector pin and CPP or PNP switch harness connector. • Are both resistances less than 5.0 ohms?		Yes → GO to TA8. No → REPAIR open circuit.	

TA5 - TA7

**Park/Neutral Position (PNP)/Clutch
Pedal Position (CPP) Switches****TA**

Test Steps		Results	Action to Take
TA8	CHECK CPP/PNP CIRCUIT FOR SHORT TO SIG RTN OR CHASSIS GROUND IN HARNESS		
	• Measure resistance between CPP/PNP and SIG RTN circuits at the PCM harness connector. • Measure resistance of CPP/PNP circuit between the PCM harness connector pin and chassis ground. • Are both resistances greater than 10,000 ohms?	Yes No	→ REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). → REPAIR short circuit.

TA8

Test TB: Trans Control Switch/Trans Control Indicator Lamp

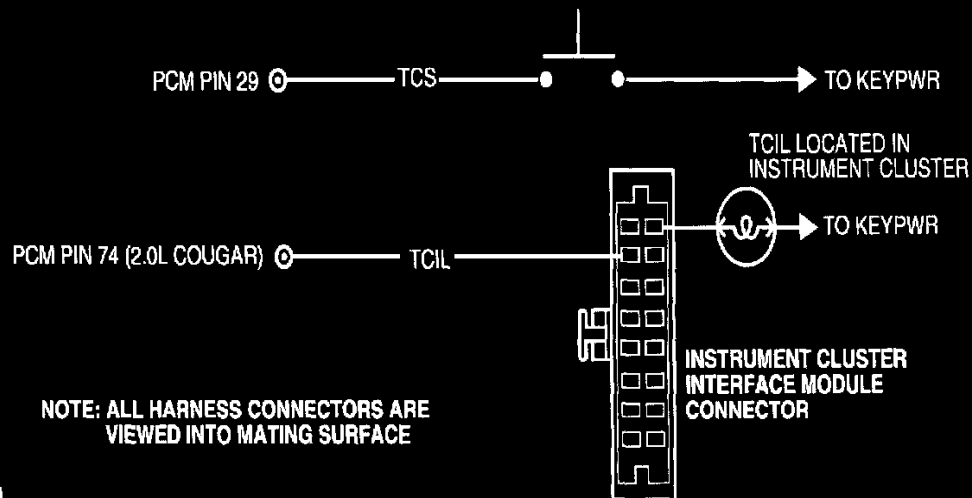
Transmission Control Switch (TCS)/Transmission Control Indicator Lamp (TCIL)

TB**Note**

This Pinpoint Test is intended to diagnose the following:

- Harness circuits: Transmission Control Indicator Lamp (TCIL) and transmission Control Switch (TCS)
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematics and Connectors

Cougar

A0028391

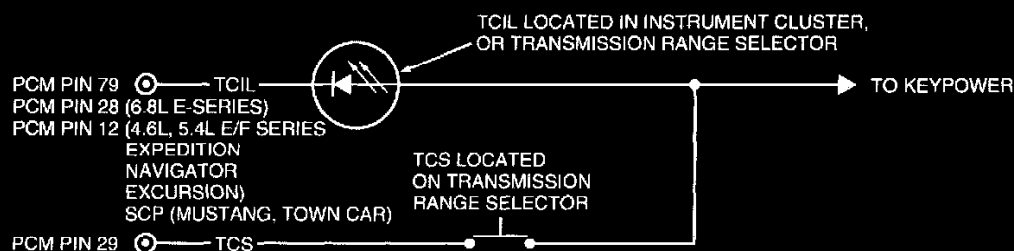
LS6/LS8, Explorer/Mountaineer with 150pin PCM

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

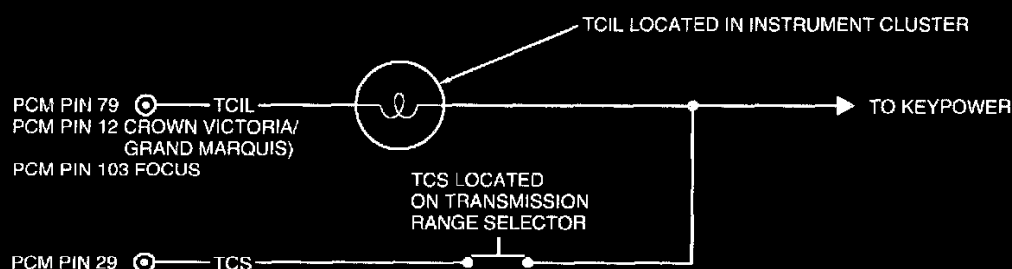
AA4557-B

Note, Schematics and Connectors

Transmission Control Switch (TCS)/Transmission Control Indicator Lamp (TCIL)

TB**Heavy Duty Trucks, E/F-Series, Expedition/Navigator, Excursion****NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE**

A0041364

All Others**NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE**

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Test Steps		Results	Action to Take
TB1	CHECK TCS FUNCTION		
DTC P1780		Yes	→ RERUN KOER Self-Test to cycle TCS.
• Key on, engine off. • Access the TCS PID. • Cycle the TCS switch button, then hold it depressed for three seconds. Release the button • Key off. • Did TCS PID reading switch from ON to OFF, and did reading indicate ON when button was held depressed?		No	→ GO to TB2. FOR WINDSTAR, REFER to Automatic Transmission/Transaxle External Controls.

Schematic, Test TB1

Transmission Control Switch (TCS)/Transmission Control Indicator Lamp (TCIL)

TB

Test Steps		Results	Action to Take
TB2	CHECK VOLTAGE TO TCS		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Disconnect PCM. • Key on, engine off. • Measure the voltage between the PCM harness connector pin and battery negative post while cycling the TCS several times. • Key off. • Did the voltage cycle?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). GO to TB3.
TB3	CHECK TCS CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	• Disconnect TCS. • Measure the resistance TCS circuit between PCM harness connector pin and battery negative post. • Is resistance greater than 10,000 ohms?	Yes → No →	GO to TB4. REPAIR short circuit.
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 harness connector pin and the transmission control switch harness connector. • Are both resistances less than 5.0 ohms?	Yes → No →	GO to TB5. REPAIR open circuit.
TB5	CHECK TCS CIRCUIT FOR SHORTS TO POWER IN HARNESS		
	• Measure the resistance between TCS and VPWR circuits at the PCM harness connector. • Is resistance greater than 10,000 ohms?	Yes → No →	REPLACE damaged transmission control switch. REPAIR short circuit.
TB6	CHECK TCIL FUNCTION		
	• Key on, engine off. • Cycle the transmission control switch (TCS). • Did the TCIL lamp change state?	Yes → No →	GO to Z1 to check for an intermittent fault. GO to TB7.
TB7	CHECK TCIL CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	• Key off. • Disconnect PCM. • Key on, engine off. • Did the TCIL lamp change state?	Yes → No →	TCIL turns off when PCM is disconnected. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit between bulb and the TCIL Test Pin. VERIFY a symptom no longer exists.

TB2 - TB7

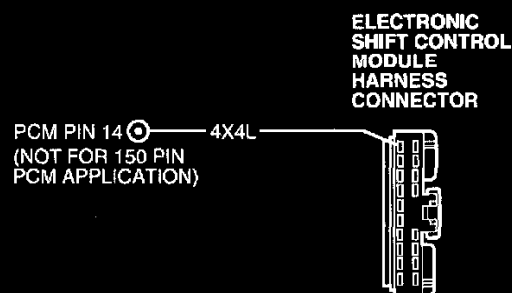
TB

Test Steps		Results	Action to Take
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		
	Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - Key off. - Disconnect PCM. - Key on, engine off. - Measure voltage between TCIL circuit at PCM harness connector pin and battery negative post. Are voltage readings greater than 2.0 volts?	Yes → No →	Using proper Wiring Diagram, verify integrity of wiring between the TCIL indicator and the PCM harness connector pin. If no concern exists, REPLACE PCM. (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). 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.

4x4 Low (4x4L) Range**TG****Note**

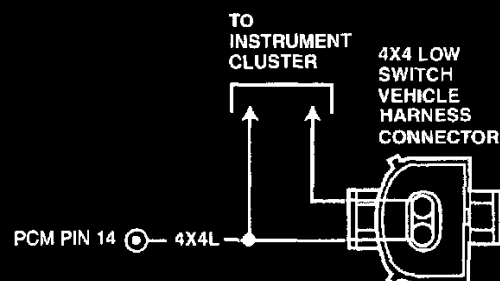
This Pinpoint Test is intended to diagnose the following:

- Harness circuits from Electronic Shift Control Module
- Harness circuit for mechanical 4x4L
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematic and Connectors**Electronic Shift**

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

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Mechanical Shift

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

AA0915-B

PCM CONNECTOR PIN NUMBERS

PCM TYPE	4X4 LOW Pin
104 Pin	14
150 Pin	A23

Test Steps		Results	Action to Take
TG1	VERIFY 4x4L SELECTOR POSITION		
	DTC P1729, P1781		
	Note: The transmission range (TR) sensor must indicate NEUTRAL position before 4x4L shift.		
	• Verify vehicle is equipped with 4x4. • Verify selector is in 4x2 or 4x4H. • Is the selector in 2WD or 4x4H mode during Quick Test ?	Yes → No →	GO to TG2. VERIFY transmission shift lever is in neutral position. SELECT 2WD or 4x4H. Rerun Quick Test.

Note, Schematic and Connectors and Test TG1

4x4 Low (4x4L) Range**TG**

Test Steps		Results →	Action to Take
TG2	CHECK 4x4L CIRCUIT FOR INTERMITTENT FAULT		
	• Connect scan tool. • Key on, engine off. • Access 4x4L PID. • Cycle the 4x4L switch to 2WD. • Grasp the vehicle harness starting at the transfer case vehicle harness connector. Shake and bend a small section of the harness all the way to the PCM. • Tap the vehicle harness connector at the transfer case. • Shake and bend a small section of the harness between the Instrument Cluster Connector and the PCM. • Key off. • Did the 4x4L PID reading go ON/OFF during harness and connector movement?	Yes → No →	ISOLATE fault and REPAIR as necessary. GO to TG3.
TG3	CHECK 4X4L SIGNAL VOLTAGE TO PCM		
	• Disconnect PCM. • Key on, engine off. • Observe voltage between 4x4L circuit at PCM harness connector and battery negative post while cycling the switch. • Key off. • Did the voltage cycle?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). GO to TG4.
TG4	CHECK 4X4L CIRCUIT FOR OPEN IN HARNESS		
	• Disconnect the electronic shift control module. • Measure resistance of 4x4L circuit between PCM harness connector pin and 4x4L switch harness connector pin. • Is the resistance less than 5.0 ohms?	Yes → No →	GO to TG5. REPAIR open circuit.
TG5	CHECK 4x4L CIRCUIT FOR SHORT TO POWER OR GROUND IN HARNESS		
	• Connect electronic shift control module. • Measure resistance between 4x4L circuit at PCM harness connector pin and battery negative post. • Measure resistance between 4x4L and VPWR circuits at PCM harness connector. • Are both resistances greater than 10,000 ohms?	Yes → No →	REFER to Transfer Case for diagnosis. REPAIR short circuit.

Reverse Switch (RS)**TH****Note**

This Pinpoint Test is intended to diagnose the following:

- Reverse Switch (RS)
- RS harness circuits RS and SIG RTN
- PCM

Pinpoint Test Schematics and Connectors

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

AA4859-A

Test Steps		Results	Action to Take
TH1	DTC P0812: CHECK RS SWITCH FUNCTION		
Note: During KOEO Self-Test, gearshift lever in NEUTRAL. • Key on, engine off. • Access RS PID and observe PID cycling ON/OFF with gear shift lever in and out of REVERSE. • Does reading change from ON to OFF?		Yes	→ KEY OFF. 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 (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
		No	→ KEY OFF. GO to TH2.
TH2	CHECK RS SWITCH RESISTANCE		
• Locate the reverse switch (RS) near the transmission shift linkage. • Inspect switch and bracket for damage, bent or broken conditions. Repair as required. • Disconnect RS harness connector. • Measure the resistance between the reverse switch terminals with the shift lever in reverse. • Is the resistance less than 5.0 ohms?		Yes	→ GO to TH3.
		No	→ REPLACE the RS switch.

Note, Schematics and Connectors and Test TH1 - TH2

Reverse Switch (RS)**TH**

Test Steps		Results	→	Action to Take
TH3	CHECK RS CIRCUIT FOR OPEN IN HARNESS	Yes No	→ →	GO to TH4. REPAIR open circuit.
	• Disconnect scan tool. • Disconnect PCM. • Measure resistance of the RS circuit between PCM harness connector pin and RS harness connector. • Where applicable, measure resistance of the SIG RTN circuit between PCM harness connector pin and RS harness connector. • Are both resistances less than 5.0 ohms?			
TH4	CHECK RS CIRCUIT FOR SHORT TO SIG RTN OR CHASSIS GROUND IN HARNESS	Yes No	→ →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.
	• Measure resistance between RS and SIG RTN circuits at the PCM harness connector. • Measure resistance between RS circuit at the PCM harness connector and chassis ground. • Are both resistances greater than 10,000 ohms?			

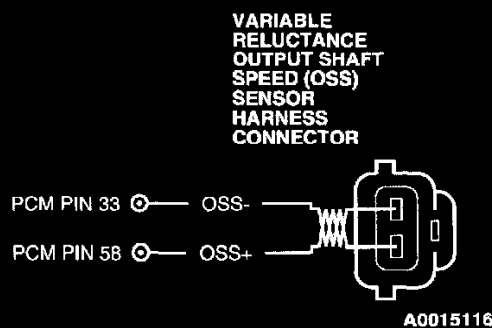
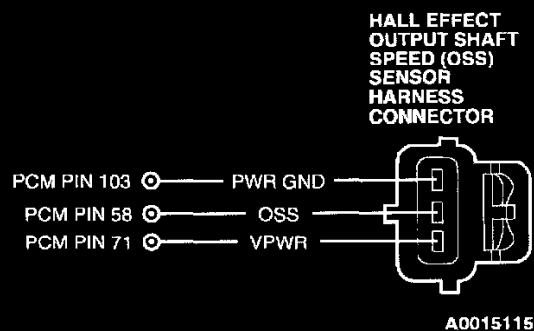
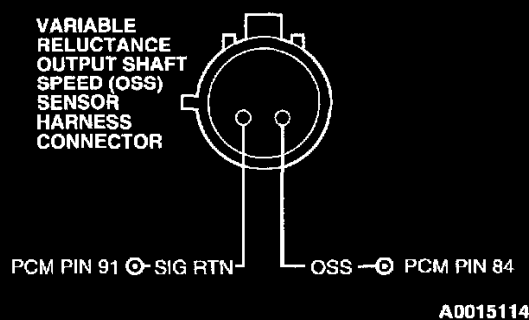
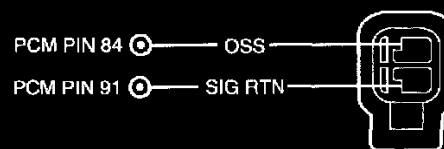
TH3 - TH4

Test TJ: Output Shaft Speed (OSS) Sensor

Output Shaft Speed (OSS) Sensor**TJ****Note**

This Pinpoint Test is intended to diagnose the following:

- OSS harness circuits OSS and SIG RTN
- OSS Sensor
- PCM

Pinpoint Test Schematics and Connectors**Focus (Automatic Transmission)****2.0L (MTX) , Focus, Cougar****Windstar, Escape****F, E series, Expedition, Mustang,
Explorer/Mountaineer****4R70W APPLICATIONS**

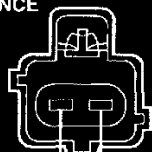
Note, Schematics and Connectors

Output Shaft Speed (OSS) Sensor

TJ

Ranger, Explorer/Mountaineer, LS6/LS8

VARIABLE RELUCTANCE
OUTPUT SHAFT
SPEED (OSS)
SENSOR
HARNESS
CONNECTOR



PCM PIN 6  OSS+
PCM PIN 91  SIG RTN

All Others

VARIABLE RELUCTANCE
OUTPUT SHAFT
SPEED (OSS)
SENSOR
HARNESS
CONNECTOR

PCM PIN 84  OSS
PCM PIN 91  SIG RTN



A0015030

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0015029

PCM CONNECTOR PIN NUMBERS

PCM TYPE	OSS	Sig Ret
104 Pin	84	91
150 Pin	B26	B17

Test Steps		Results	Action to Take
TJ1	DTC P0720, P0721, P0722, P0723, AND P1900: VERIFY DRIVE CYCLE		
	- Access the OSS PID. - Drive vehicle. - Through all gear ranges, shift up and down. Does PID reading increase and decrease with engine and vehicle speed?	Yes → No →	OSS performed as expected. GO to TJ2. For Hall Effect Type OSS: KEY OFF. GO to TJ3. For VR Type OSS: GO to TJ5.
TJ2	VISUAL INSPECTION		
	- Disconnect OSS sensor. - Inspect OSS harness for damage. Inspect OSS vehicle harness connector for damage and proper seating. - If possible, complete wiggle test. Have any problems been found?	Yes → No →	REPAIR fault. GO to Z1 for intermittent fault diagnosis.
TJ3	CHECK VPWR TO OSS SENSOR		
	- Key on. - Disconnect OSS sensor. - Measure VPWR circuit voltage at OSS sensor harness connector. Is voltage greater than 10.5 volts?	Yes → No →	KEY OFF. GO to TJ4. KEY OFF. Repair open circuit.
TJ4	CHECK VPWR GND TO OSS SENSOR		
	- Measure resistance of PWR GND circuit between OSS sensor harness connector and negative battery post. Is resistance less than 5.0 ohms?	Yes → No →	GO to TJ5. Repair open circuit.

Schematic, Test TJ1 - TJ4

Output Shaft Speed (OSS) Sensor**TJ**

Test Steps		Results	Action to Take
TJ5	CHECK HARNESS FOR SHORT TO PWR		
	- Key on. - Disconnect OSS sensor. - Measure voltage between the OSS signal circuit at the OSS sensor harness connector and ground. Is voltage less than 1.0 volt?	Yes No	→ KEY OFF. GO to TJ6. → KEY OFF. REPAIR short circuit.
TJ6	CHECK HARNESS FOR OPEN		
	- Disconnect PCM. - Measure resistance of the OSS signal circuit between the OSS sensor harness connector and the PCM harness connector. - Measure resistance of the OSS SIG RTN circuit between the OSS sensor harness connector and the PCM harness connector. Is each resistance less than 5.0 ohms?	Yes No	→ GO to TJ7. → REPAIR open circuit.
TJ7	CHECK HARNESS FOR SHORT TO GROUND		
	- Measure resistance between OSS signal and SIG RTN circuits at the OSS sensor harness connector. - Measure resistance between the OSS signal at the the OSS sensor harness connector and chassis ground. Is each resistance greater than 10,000 ohms?	Yes No	→ For VR Type OSS: GO to TJ8. For Hall Effect Type OSS: GO to TJ9. → REPAIR short circuit.
TJ8	CHECK RESISTANCE OF OSS SENSOR		
	- Measure resistance of the OSS sensor between the pins of the OSS sensor. Is resistance between 400 and 1.1K ohms?	Yes No	→ REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). → REPLACE OSS sensor.
TJ9	CHECK OSS SIGNAL OUTPUT TO PCM, HALL TYPE OSS		
	- Disconnect PCM. - Raise vehicle to allow rotation of the front drive wheel. - Key on, transmission in neutral. - Measure voltage between OSS+ and PWR GND circuits at the PCM harness connector while slowly rotating the drive wheel. Note: Opposite wheel must be held stationary. - The voltage should rise above 5.0 volts and fall below 1.0 volts in a regular cycle. Observe several cycles. Does the OSS output voltage rise and fall as specified?	Yes No	→ REPLACE PCM (REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). → REPLACE OSS sensor. REFER to Transmission Speed Sensor.

TJ5 - TJ9

Test X: Constant Control Relay Module (CCRM)

**Constant Control Relay Module
(CCRM)****X****Note**

This Pinpoint Test is intended to diagnose the following:

- Constant Control Relay Module (CCRM) (12B581 (w/ bracket), 12B577 (module only))
- Harness circuits: B+, FC, LFC, HFC, ACCS, WAC, VPWR (TO CCRM), A/C Clutch PWR, (Low/High) Fan PWR, GND
- Powertrain Control Module (PCM) (12A650)

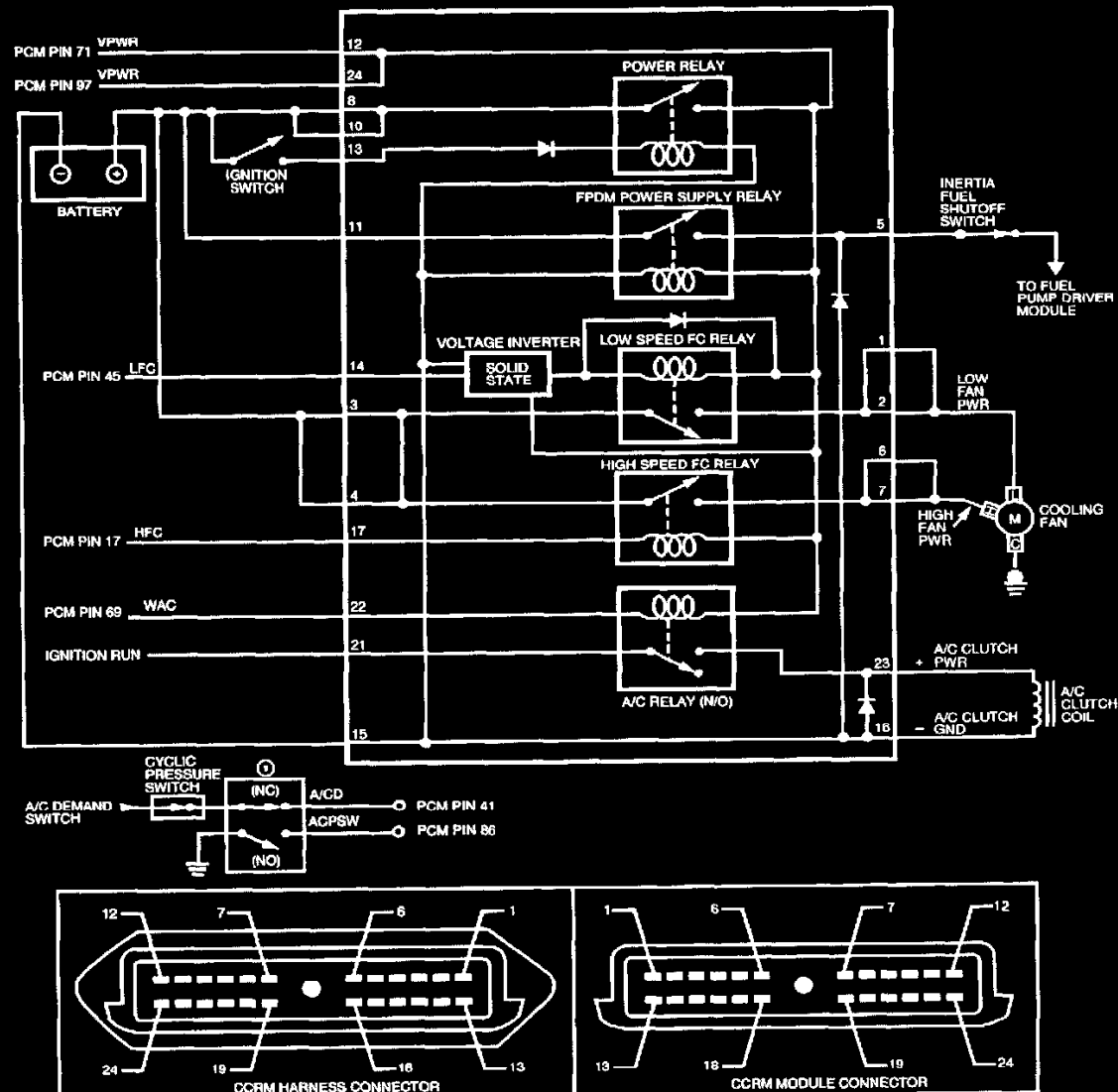
Test Note

Constant Control Relay Module (CCRM)

X

Pinpoint Test Schematics and Connectors

Escort



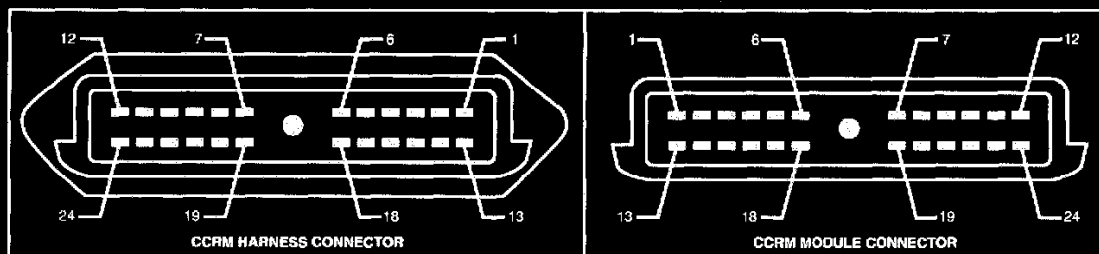
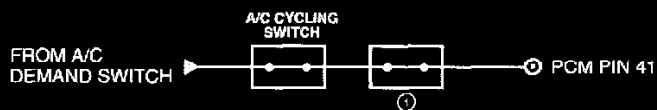
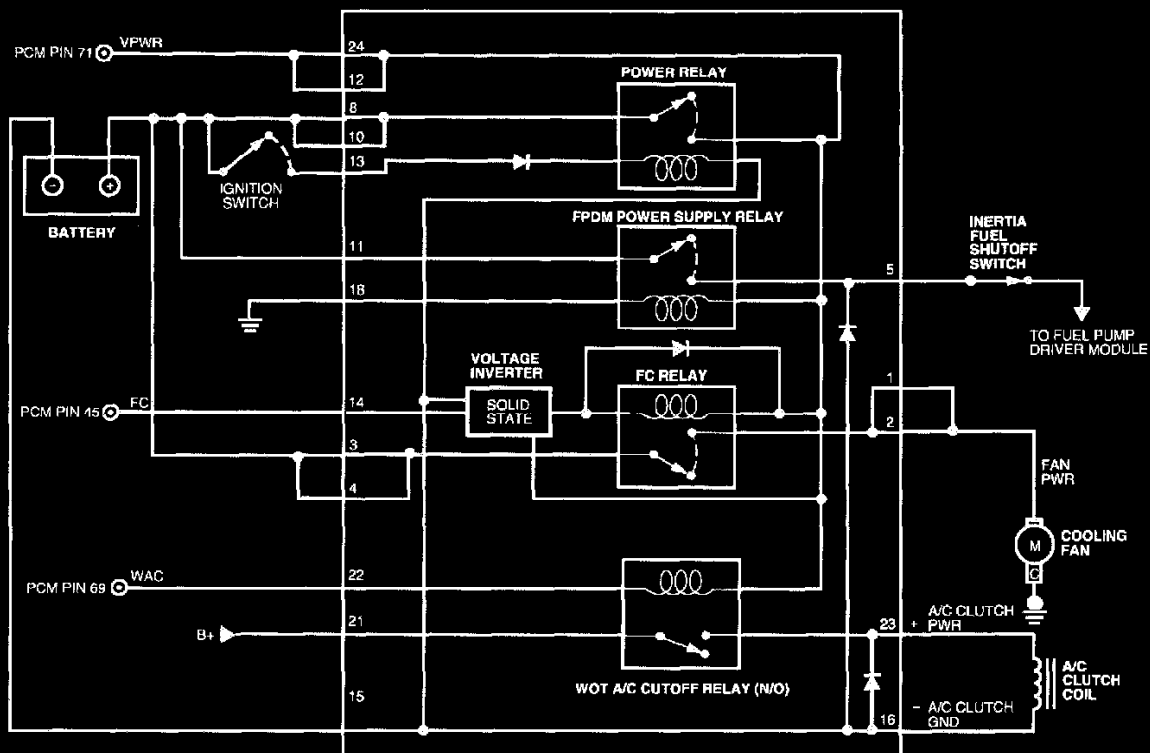
* A/C High Pressure Switch

AA0922-E

Constant Control Relay Module (CCRM)

X

3.8L Mustang



① A/C High Pressure Switch

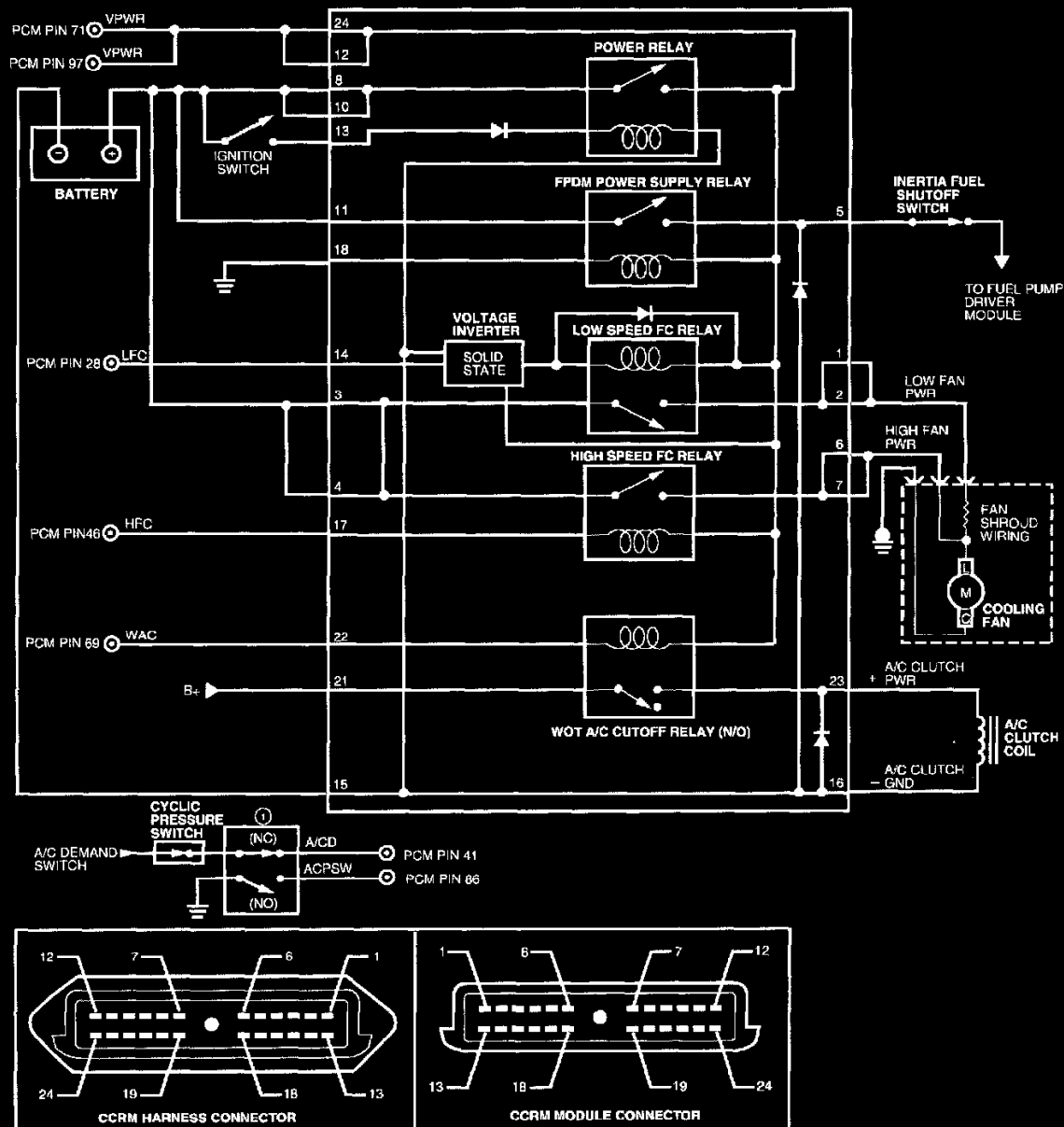
A0031610

Test Schematic

Constant Control Relay Module (CCRM)

X

4.6L Mustang



1 A/C High Pressure Switch
A0038678

Test Schematic

Constant Control Relay Module (CCRM)

X

Test Steps		Results	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.
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. Are all voltages greater than 10.5 volts?	Yes → No →	KEY OFF. 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.
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. REPAIR open ground circuit to CCRM (pin 15).
X15	DTC P1479: CHECK HIGH SPEED FAN CONTROL (FC) RELAY AND HFC CIRCUIT IN CCRM		
	Note: For one-speed fan applications, disregard DTC P1479. - 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.

Constant Control Relay Module (CCRM)

X

Test Steps		Results	Action to Take						
X16	CHECK FOR OPEN HFC CIRCUIT - Disconnect PCM. - Measure resistance of HFC circuit between PCM harness connector and pin 17 of CCRM harness connector. Is resistance less than 5.0 ohms? <table><tr><th>Application</th><th>HFC PCM Pin</th></tr><tr><td>Escort</td><td>17</td></tr><tr><td>Mustang</td><td>46</td></tr></table>	Application	HFC PCM Pin	Escort	17	Mustang	46	Yes No	→ GO to X17 . → REPAIR open circuit.
Application	HFC PCM Pin								
Escort	17								
Mustang	46								
X17	CHECK HFC CIRCUIT FOR SHORT TO POWER IN HARNESS - Key on. - Measure voltage between HFC circuit at PCM harness connector and chassis ground. Is voltage less than 1.0 volt?	Yes No	→ KEY OFF. GO to X18 . → REPAIR short circuit.						
X18	CHECK HFC CIRCUIT FOR SHORT TO GROUND IN HARNESS - Disconnect scan tool from DLC. - Measure resistance between HFC circuit at PCM harness connector and chassis ground. Is resistance greater than 10,000 ohms?	Yes <							

Constant Control Relay Module (CCRM)

X

Test Steps		Results	Action to Take						
X21	CHECK FC/LFC CIRCUIT FOR SHORT TO GROUND IN HARNESS								
	- Disconnect scan tool from DLC. - Disconnect PCM. - Disconnect CCRM. - Measure resistance between pin 14 of the CCRM harness connector and chassis ground. - Is resistance greater than 10,000 ohms?	Yes No	→ GO to X22. → REPAIR short circuit.						
X22	CHECK FAN RUNNING MODE								
	- Connect CCRM. - Key on, engine off. - Is fan running with the key on?	Yes No	→ REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). → REPLACE CCRM.						
X24	CHECK FOR OPEN FC/LFC CIRCUIT IN HARNESS								
	- Disconnect PCM. - Disconnect CCRM. - Measure resistance of the FC/LFC circuit between PCM harness connector and pin 14 of the CCRM harness connector. - Is resistance less than 5.0 ohms? <table><tr><th>Application</th><th>FC/LFC PCM Pin</th></tr><tr><td>4.6L Mustang</td><td>28</td></tr><tr><td>All Others</td><td>45</td></tr></table>	Application	FC/LFC PCM Pin	4.6L Mustang	28	All Others	45	Yes No	→ GO to X25. → REPAIR open circuit.
Application	FC/LFC PCM Pin								
4.6L Mustang	28								
All Others	45								
X25	CHECK FC/LFC CIRCUIT FOR SHORT TO POWER IN HARNESS								
	- Key on. - Measure voltage between pin 14 of the CCRM harness connector and chassis ground. - Is voltage less than 1.0 volt?	Yes No	→ KEY OFF. GO to X26. → REPAIR short circuit.						
X26	FC/LFC CIRCUIT FAULT ISOLATION CHECK								
	- Reconnect CCRM. - Jumper FC/LFC circuit at PCM harness connector to chassis ground. - Key on, engine off. - Does fan continue to run?	Yes No	→ KEY OFF. REPLACE CCRM. → KEY OFF. REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).						

X21 - X26

Constant Control Relay Module (CCRM)

X

Test Steps		Results	Action to Take
X30	CONTINUOUS MEMORY DTC P1474: CHECK FAN CONTROL (FC) OR LOW FAN CONTROL (LFC) CIRCUIT FOR OPEN OR SHORT TO POWER		
	- 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 completing 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. GO to X31.
X31	CHECK FC/LFC CIRCUIT FOR SHORT TO GROUND		
	- Key on, engine off. - Access Output Test Mode on scan tool. - Command Low Speed Fan on. - Observe test lamp for an indication of a fault while completing 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. Is a fault indicated?	Yes → No →	ISOLATE fault and REPAIR as necessary. KEY OFF. GO to Z1.

X30 - X31

Constant Control Relay Module (CCRM)

X

Test Steps		Results	→	Action to Take
X35	DTC P1479: CHECK HIGH FAN CONTROL (HFC) CIRCUIT FOR OPEN OR SHORT TO POWER			
	Note: For one-speed fan applications, disregard DTC P1479. • 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 completing 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. GO to X36.
X36	CHECK HFC CIRCUIT FOR SHORT TO GROUND			
	• Key on, engine off. • Command high speed fan off. • Observe test lamp for an indication of a fault while completing 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. • Is a fault indicated?	Yes No	→ →	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. KEY OFF. GO to Z1.
X40	ELECTRIC COOLING FAN FUNCTIONAL CHECK			
	Note: For the proper results of these pinpoint tests, no DTCs must have been present during PCM Quick Test. • Key on, engine off. • Access Output Test Mode on scan tool. • Command of the cooling fan on and check for fan operation. For two speed fan applications, check both fan speeds (wait 30 seconds after commanding high speed fan on). • Does the fan operate (all speeds)?	Yes No	→ →	KEY OFF. Cooling fan circuits OK. RETURN to Symptom Charts. COMMAND cooling fan off. REMAIN in Output Test Mode. GO to X41.

Constant Control Relay Module (CCRM)

X

Test Steps		Results	Action to Take
X41	ELECTRIC COOLING FAN CONCERN: DID THE FAN OPERATE AT ANY SPEED?		
	- For 3.8L Mustang, GO to X42. 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 X42 .
X42	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. - 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 harness connector and chassis ground. Is voltage greater than 10.0 volts?	Yes → No →	KEY OFF. Power is being supplied to fan. GO to X45 . KEY OFF. GO to X43 .
X43	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 X44 . B+ fault. CHECK condition of related fuses. If OK, REPAIR open circuit. If fuse is damaged, CHECK B+ and FAN PWR circuits for short to ground before replacing.
X44	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. REPAIR open circuit(s).

Constant Control Relay Module (CCRM)

X

Test Steps		Results	Action to Take
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. REPAIR open circuit.
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.
X51	LOW SPEED FAN INOPERATIVE: COMMAND LOW SPEED FAN ON AND CHECK FOR VOLTAGE TO COOLING FAN		
	- Key on, engine off. - Disconnect cooling fan. - Command low speed fan on. - Measure LOW FAN PWR circuit voltage at the cooling fan harness connector. Is voltage greater than 10.0 volts?	Yes → No →	KEY OFF. For 4.6L Mustang: GO to X54. All others: REPLACE fan. KEY OFF. 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.
X54	CHECK FOR OPEN DROPPING RESISTOR ON FAN SHROUD ASSEMBLY		
	- Measure resistance between the LOW FAN PWR and HIGH FAN PWR pins of the fan shroud assembly. Is resistance less than 6.0 ohms?	Yes → No →	REPLACE fan. Verify condition of dropping resistor, replace as necessary (use care when removing resistor from mounts). If OK, replace fan assembly.

X45 - X54

Constant Control Relay Module (CCRM)

X

Test Steps		Results →	Action to Take
X65	HIGH SPEED FAN INOPERATIVE: COMMAND HIGH SPEED FAN ON AND CHECK FOR VOLTAGE TO COOLING FAN		
	- Key on, engine off. - Disconnect cooling fan. - Command high speed fan on. - Measure HIGH FAN PWR circuit voltage at the cooling fan harness connector. Is voltage greater than 10.5 volts?	Yes → No →	KEY OFF. REPLACE fan. KEY OFF. 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.
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. 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 X16.

Constant Control Relay Module (CCRM)

X

Test Steps		Results	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 indicate no fault (or NO). - Command the Low Speed Fan on (the LFC PID will now be on). - The LFCF PID must still indicate no fault. 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 indicate no fault (or NO). - Command the high speed fan on (the HFC PID will now be on). - The HFCF PID must still indicate no fault (or NO). Does the HFCF or LFCF PID indicate a fault (or YES) with the fan commanded on or off?	Yes → No →	KEY OFF. An HFC or LFC primary fault is detected. If the HFCF PID indicated a fault: GO to X15 and follow DTC P1479 diagnosis. If the LFCF PID indicated a fault: GO to X20 and follow DTC P1474 diagnosis. Primary circuits OK. REPLACE CCRM. VERIFY applicable FAN PWR circuit is not short to ground.
X73	CHECK FC/LFC CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	- Disconnect scan tool from DLC. - Disconnect PCM. - Measure resistance between pin 14 of the CCRM harness connector and chassis ground. Is resistance greater than 10,000 ohms?	Yes → No →	REPLACE CCRM. VERIFY applicable FAN PWR circuit is not shorted to ground. REPAIR short circuit.
X80	LOW AND/OR HIGH SPEED COOLING FAN ALWAYS RUNS (NO DTCS): VERIFY FAN IS NOT ON BECAUSE OF A/C HIGH PRESSURE SWITCH INPUT TO PCM		
	- Start engine. - Access ACP PID. Is the ACP PID "CLOSED"?	Yes → No →	The PCM will turn the cooling fan on when the A/C high pressure switch input is "closed". Leave engine running. GO to X81. Input OK. GO to X82.

X71 - X80

X

Test Steps		Results	Action to Take
X81	CHECK A/C HIGH PRESSURE SWITCH (THE MEDIUM PRESSURE, NORMALLY OPEN CONTRACTS)		
	- Disconnect A/C high pressure switch. - Again, view ACP PID. Is the ACP PID still "CLOSED"?	Yes → No →	KEY OFF. GO to X135 (to check A/C high pressure switch input to PCM). KEY OFF. RECONNECT A/C high pressure switch. REFER to Heating and Air Conditioning, to check for proper A/C high pressure switch function, over-pressurized A/C system and other checks as directed.
X82	DISCONNECT CCRM AND CHECK IF FAN STILL RUNS		
	- 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. For all others: GO to X83. Key off. GO to X84.
X83	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 →	KEY OFF. No fault is indicated at this time. VERIFY results of previous test steps. If OK, RECONNECT all components and RETURN to Symptom Charts for further diagnosis of this or any other symptom. REPAIR short circuit.

Constant Control Relay Module (CCRM)

X

Test Steps		Results	Action to Take
X84	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. - Access LFC and LFCF PIDs. With LFC PID off (low speed fan commanded off by PCM), the LFCF PID must indicate no fault (or NO). - For all except 3.8L Mustang, access HFC and HFCF PIDs. With HFC PID off (high speed fan commanded off by PCM), the HFCF PID must indicate no fault (or NO). Does the HFCF or LFCF PID indicate a fault (or YES) with the fan commanded off?	Yes → No →	KEY OFF. An HFC or LFC primary circuit fault is detected. If the HFCF PID indicated a fault: GO to X15 and follow DTC P1479 diagnosis. If the LFCF PID indicated a fault: GO to X20 and follow DTC P1474 diagnosis. Primary circuits OK. REPLACE CCRM.
X98	LACK OF COOLING (A/C)/A/C NOT FUNCTIONING: CHECK FOR VOLTAGE TO A/C CLUTCH		
	Note: If the A/C clutch will engage, follow the "YES" Action to Take of this test step. If not, or unsure, continue this test step. - Key off. - Disconnect A/C cycling switch. - Install a jumper wire in the A/C cycling switch harness connector (to complete the circuit). - Disconnect A/C clutch. - Connect digital multimeter between the power pin and ground pin at the A/C clutch vehicle harness connector. - Start engine. - Turn A/C on, wait 15 seconds. - Check voltage reading. - After testing, turn key off and reconnect A/C clutch. Was voltage greater than 10.5 volts?	Yes → No →	REMOVE jumper. RECONNECT A/C cycling switch. For all except 3.8L Mustang with the symptom "poor A/C system performance in hot ambient temperature": GO to X145 to check A/C high pressure switch input to PCM. All others: REFER to Heating and Air Conditioning, to diagnose symptom. Also be aware that if the engine coolant temperature is detected high, the PCM will disengage the A/C clutch. No voltage to A/C clutch. GO to X99.
X99	CHECK ACCS INPUT TO PCM WITH A/C ON		
	- Start engine. - A/C on. - Access and view ACCS PID. - After testing, remove jumper reconnect A/C cycling switch and turn key OFF. Was the ACCS PID "ON"?	Yes → No →	GO to X110. The PCM is not receiving the ACCS signal, and as a result will not allow the A/C to turn on. GO to X100.

Constant Control Relay Module (CCRM)

X

Test Steps		Results	→	Action to Take
X100	ACCS PID OFF WITH A/C ON: CHECK FOR VOLTAGE TO A/C CYCLING SWITCH	Yes No	→ →	KEY OFF. GO to X101. KEY OFF. REFER to Heating and Air Conditioning, to check for causes of no voltage to the 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. • Is voltage greater than 10.5 volts?				
X101	CHECK IF A/C CYCLING SWITCH CONTACTS ARE CLOSED	Yes No	→ →	GO to X102. REFER to Heating and Air Conditioning, to check the operation of the A/C cycling switch and proper refrigerant charge. REPAIR as necessary.
• Measure resistance of the A/C cycling switch contacts at the A/C cycling switch connector. • Is resistance less than 5.0 ohms?				
X102	CHECK FOR VOLTAGE TO DUAL FUNCTION A/C HIGH PRESSURE SWITCH	Yes No	→ →	KEY OFF. GO to X103. REPAIR open between A/C cycling switch and 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. • Is voltage greater than 10.5 volts?  A/C HIGH PRESSURE SWITCH HARNESS CONNECTOR FROM A/C DEMAND SWITCH (AND A/C CYCLING SWITCH) AA0924-B				

X100 - X102

Constant Control Relay Module (CCRM)

X

Test Steps		Results	Action to Take
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? A/C HIGH PRESSURE SWITCH  AA0925-B	Yes → No →	GO to X104 . REFER to Heating and Air Conditioning, to check for overpressurized A/C system, etc. If OK, REPLACE A/C high pressure switch, following instructions in the Heating and Air Conditioning.
X104	CHECK FOR VOLTAGE TO PCM ON ACCS CIRCUIT		
	- Reconnect A/C high pressure switch. - Disconnect PCM. - Key on. - A/C ON. - Measure voltage at PCM harness connector pin 41. Is voltage greater than 10.5 volts?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR open circuit between the A/C high pressure switch and PCM.
X105	KOEO/KOER DTC P1460: VERIFY ACCS PID IS OFF		
	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. - 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).

X103 - X105

Constant Control Relay Module (CCRM)

X

Test Steps		Results	→	Action to Take
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	→	GO to X107 .
		No	→	REPLACE CCRM. Start engine. TURN A/C on, WAIT 15 seconds. A/C off. RERUN Quick Test.
X107	CHECK WAC CIRCUIT FOR SHORT TO POWER IN HARNESS			
	- Disconnect PCM. - Key on. - Measure voltage between pin 22 of the CCRM harness connector and chassis ground. Is voltage less than 1.0 volts?	Yes	→	KEY OFF. GO to X108 .
		No	→	REPAIR short circuit. START engine. TURN A/C on, WAIT 15 seconds. A/C off. RERUN Quick Test.
X108	CHECK WAC CIRCUIT FOR SHORT TO GROUND IN HARNESS			
	- Disconnect scan tool from DLC. - Measure resistance between pin 22 of the CCRM harness connector and chassis ground. Is resistance greater than 10,000 ohms?	Yes	→	GO to X109 .
		No	→	REPAIR short circuit. START engine. TURN A/C on, WAIT 15 seconds. A/C off. RERUN Quick Test.
X109	CHECK FOR OPEN WAC CIRCUIT			
	- Measure resistance of WAC circuit between PCM harness connector pin 69 and pin 22 of the CCRM harness connector. Is resistance less than 5.0 ohms?	Yes	→	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). START engine. TURN A/C on, WAIT 15 seconds. A/C off. RERUN Quick Test.
		No	→	REPAIR open circuit. START engine. TURN A/C on, WAIT 15 seconds. A/C off. RERUN Quick Test.

Constant Control Relay Module (CCRM)

X

Test Steps		Results	→	Action to Take
X110	NO/LOW VOLTAGE TO A/C CLUTCH (ACCS PID IS ON WITH A/C ON AND NO DTCS): CHECK FOR VOLTAGE TO CCRM			
	- Disconnect CCRM. - Key on. - Measure voltage to pin 21 of the CCRM harness connector. Is voltage greater than 10.5 volts?	Yes	→	KEY OFF, A/C OFF. GO to X111 .
		No	→	Voltage is not being supplied to pin 21 of the CCRM. CHECK condition of any related fuses. If OK, REPAIR open circuit. If fuse is damaged, check IGN RUN/B+ and A/C CLUTCH PWR circuits for short to ground before replacing.
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	→	VERIFY engine is not overheating when there is no voltage to A/C clutch (if engine coolant temperature is high, the PCM will turn off the A/C). If OK, REPLACE CCRM. VERIFY A/C Clutch PWR circuit is not shorted to ground.
		No	→	REPAIR open circuit.
X115	DTC P1469: CHECK FOR CAUSES OF FAST A/C COMPRESSOR CLUTCH CYCLING			
	- Refer to Heating and Air Conditioning, to test A/C compressor clutch cycle times, and to check causes of fast A/C compressor clutch cycling. Is a fault indicated?	Yes	→	REPAIR as required. COMPLETE PCM Reset to clear DTC(s). START engine and turn A/C on for about 2 minutes. A/C off. RERUN Quick Test.
		No	→	GO to X116 to CHECK for intermittent electrical concern.

X110 - X115

**Constant Control Relay Module
(CCRM)****X**

Test Steps		Results	→	Action to Take
X116	CHECK FOR INTERMITTENT OPEN IN ACCS CIRCUIT			
• Key on. • Access ACCS PID. • A/C on. • Observe ACCS PID for an indication of a fault while completing 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 PCM and the source of the circuit (such as A/C switch, EATC module). — Lightly tap any pressure switches in the circuit to simulate road shock. • Disconnect and inspect the A/C cycling switch connector. • Is a fault indicated?		Yes	→	KEY OFF. ISOLATE fault and REPAIR as necessary. COMPLETE PCM Reset to clear DTC(s). START engine and TURN A/C on for about two minutes. A/C off. RERUN Quick Test.
		No	→	UNABLE to duplicate fault at this time. COMPLETE PCM Reset to clear DTC(s). RETURN to Symptom Charts to service any additional symptoms.

Constant Control Relay Module (CCRM)

X

Test Steps		Results	Action to Take
X120	DTC P1460: CHECK FOR INTERMITTENT OPEN OR SHORT IN WAC CIRCUIT		
Note: If vehicle is not equipped with A/C, the WAC circuit is not used and the DTC P1460 can be ignored. • 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 Mustang, A/C demand switch on. • For Escort: — Access Output Test Mode on scan tool (refer to Diagnostic Methods). — Turn outputs on (this will engage the A/C clutch). • Check WAC circuit for open or short to power while completing the following (the A/C clutch will click on (off for Escort)) 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 completing the following (the A/C clutch will click off (on for Escort) 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 → No →	ISOLATE fault and REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. START engine. TURN AC on, WAIT 15 seconds. A/C off. RERUN Quick Test. REMOVE jumper wire. GO to Z1.
X124	DTC P1464: CHECK ACCS PID		
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 P1464 was received.

X120 - X124

X

Test Steps		Results	Action to Take
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 (REFER to Heating and Air Conditioning). If OK, REPAIR short to power in A/C demand circuit to A/C cycling switch. KEY OFF. For Escort: 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. Is voltage less than 1.0 volt?	Yes → No →	KEY OFF. 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 Escort) disconnected. - Disconnect PCM. - Key on. - Measure voltage between PCM harness connector pin 41 and ground. Is voltage less than 1.0 volt?	Yes → No →	For Escort: REPLACE PCM. All others: KEY OFF. GO to X128. REPAIR short circuit.
X128	CHECK ACCS CIRCUIT VOLTAGE TO PCM WITH CCRM CONNECTED		
	- Reconnect CCRM. - Key on. - Again, measure voltage between PCM harness connector pin 41 and ground. Is voltage less than 1.0 volt?	Yes → No →	REPLACE PCM. REPLACE CCRM.
X130	DOES THE A/C TURN OFF WHEN THE A/C DEMAND SWITCH IS TURNED OFF?		
	Does the A/C turn off when the A/C demand switch is turned off?	Yes → No →	GO to X131. GO to X140.

Constant Control Relay Module (CCRM)

X

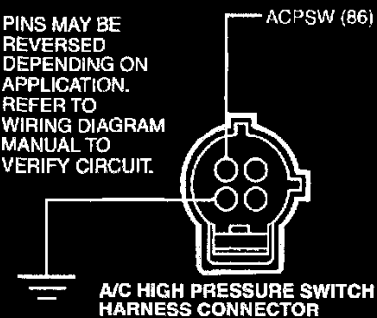
Test Steps		Results	Action to Take
X131	CHECK IF A/C CUTS OFF DURING WOT		
	- Start engine. - A/C on. - Initiate brief Wide Open Throttle (WOT) and return to idle. Listen for the A/C clutch to disengage during the WOT, then re-engage a few seconds after returning to idle (a "click" sound will be heard when the clutch re-engages). Note: If the clicking sound cannot be heard, disconnect the A/C clutch. With a test lamp connected between the power pin and ground pin of the A/C clutch harness connector, observe the test lamp while performing the brief WOT. The test lamp must go off during the brief WOT, then come back on a few seconds after returning to idle. - Repeat test, if necessary, to verify results. Does A/C clutch or test lamp operate as indicated?	Yes → No →	KEY OFF. RECONNECT A/C clutch (if necessary). The WAC circuit is operating properly. At this time the A/C will cut-off during WOT. GO to Z1 to diagnose intermittent concerns, or RETURN to Symptom Charts to service any other concerns. GO to X132.
X132	NO WOT A/C CUTOFF, NO DTCS PRESENT: CHECK CCRM		
	- Reconnect A/C clutch (if necessary). - 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 Z1. Otherwise, testing is complete. RETURN to Symptom 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.
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. - Disconnect PCM. - Measure resistance between PCM harness connector pin 86 and ground. Is resistance greater than 10,000 ohms?	Yes → No →	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). REPAIR short circuit.

**Constant Control Relay Module
(CCRM)****X**

Test Steps		Results	→	Action to Take
X140	A/C ALWAYS ON: CHECK FOR VOLTAGE AT A/C CLUTCH WITH A/C OFF			
	• A/C and defroster OFF. • Disconnect A/C clutch. • Connect a digital multimeter between the power pin and ground pin at the A/C clutch harness connector. • Start engine. • Monitor voltage. • After testing, turn key off and reconnect A/C clutch. • Was voltage less than 2.0 volts?	Yes	→	The electrical portion of the A/C system is not at fault. REFER to Heating and Air Conditioning.
		No	→	A fault is indicated in the A/C electrical system. GO to X141 .
X141	CHECK ACCS INPUT TO PCM WITH A/C OFF			
	• Key off. • Connect scan tool to data link connector. • Start engine. • A/C and defrost off. • Access ACCS PID (Powertrain Menu). • Is the ACCS PID "OFF"?	Yes	→	KEY OFF. REFER to Heating and Air Conditioning.
		No	→	KEY OFF. GO to X125 .

Constant Control Relay Module (CCRM)

X

Test Steps		Results	Action to Take
X145	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 WIRING DIAGRAM MANUAL TO VERIFY CIRCUIT.  A/C HIGH PRESSURE SWITCH HARNESS CONNECTOR AA0818-C		Yes	→ KEY OFF. A/C high pressure switch medium pressure circuits are OK. REMOVE jumper. RECONNECT A/C high pressure switch. REFER to Heating and Air Conditioning, to diagnose symptom.
		No	→ An A/C high pressure switch medium pressure circuit concern may exist. GO to X146.
X146	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.
		No	→ KEY OFF. REMOVE jumper wire. GO to X147.

**Constant Control Relay Module
(CCRM)****X**

Test Steps		Results	→	Action to Take
X147	CHECK FOR OPEN A/C HIGH PRESSURE SWITCH (ACPSW) CIRCUIT BETWEEN A/C HIGH PRESSURE SWITCH AND PCM			
	• Disconnect PCM. • Measure resistance of the ACPSW circuit between the PCM harness connector pin 86 and the A/C high pressure switch harness connector. • Is resistance less than 5.0 ohms?	Yes	→	REPLACE PCM (refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).
		No	→	REPAIR open circuit.

X147

Test Z: Intermittent

Intermittent**Z****Note**

This Pinpoint Test is intended to diagnose and isolate intermittent concerns for the following:

- All Electronic EC subsystems
- Coil Pack ignition systems using the Distributorless Ignition System Tester (DIST)

This chart is used to determine which test to run for the suspect circuit. Corresponding PIDs to each circuit are listed. Some circuits do not have an associated PID or the PID may not be available and will to be measured with a digital multimeter. More specific PIDs can be found in Reference Values. If the vehicle has a coil pack system with no start, perform the ignition test with the distributorless ignition system tester. Do not use the DIST for coil on plug applications.

INTERMITTENT TEST CHART

PID	Associated Circuit	Test Type
4X4L	4X4L	input
ACCS	A/CCS	input
ACP, ACP V	A/CP	input
Use digital multimeter	AFC	input
AIR	AIR	output
AIR B	AIRB	output
AIR D	AIRD	output
AIRM	AIRM	input
BARO	BARO	input
BPP/BOO	BPP	input
Use digital multimeter	BPS	input
CAMDCR	CAMDCR	output
CAMERRR	CAMERRR	input
CAS GND	Case GND	input
CCS	CCS	output
Use digital multimeter	CD-A (primary)	output
Use digital multimeter	CD-B (primary)	output
Use digital multimeter	CD-C (primary)	output
Use digital multimeter	CD-D (primary)	output
Use digital multimeter	CD-E (primary)	output
Use digital multimeter	CD-F (primary)	output
Use digital multimeter	CD-G (primary)	output
Use digital multimeter	CD-H (primary)	output
Use digital multimeter	CD-I (primary)	output
Use digital multimeter	CD-J (primary)	output

(Continued)

Note, Intermittent Test Chart, Part 1

Intermittent**Z****INTERMITTENT TEST CHART**

PID	Associated Circuit	Test Type
CFCIL	CFCIL	output
CHT, CHT V	CHT	input
CHTIL	CHTIL	output
Use digital multimeter	CKP+	input
Use digital multimeter	CMP	input
CPP/PNP	CPP	input
Use digital multimeter	CTO	output
Use digital multimeter	DOL	output
DPFEGR	DPFEGR	input
ECT, ECT V	ECT	input
EFTA, EFTA V	EFT-A	input
EFTB, EFTB V	EFT-B	input
Use digital multimeter	EGRMC 1	output
Use digital multimeter	EGRMC 2	output
Use digital multimeter	EGRMC 3	output
Use digital multimeter	EGRMC 4	output
EGRMDS	EGRMDS	output
EGRVR	EGRVR	output
EOT, EOT V	EOT	input
EPC, EPC V	EPC	output
Use digital multimeter	EPC 2	output
Use digital multimeter	EPC 3	output
EVAPCP, EVAPPC	EVAPCP	output
EVAPCV	EVAPCV	output
EVAPPF	EVAPPF	input
LFC	FC	output
FF	FF	input
FLI, FLI V	FLI	input
FP	FP	output
FPM, FPM	FPM	input
FRP, FRP V	FRP	input
FSV	FSV	output
FSVM	FSVM	input
FTP, FTP V	FTP	input
GEAR	GEAR	input
GENFDC	GENFDC	output
GFS	GFS	input
Use digital multimeter	HCDS	input
HFC	HFC	output

(Continued)

Intermittent**Z****INTERMITTENT TEST CHART**

PID	Associated Circuit	Test Type
O2S11	HO2S-11	input
O2S12	HO2S-12	input
O2S21	HO2S-21	input
O2S22	HO2S-22	input
HTR11	HTR-11	output
HTR12	HTR-12	output
HTR21	HTR-21	output
HTR22	HTR-22	output
IAC	IAC	output
IAT, IAT V	IAT	input
IAT2	IAT2	input
IAT2 V	IAT2 V	output
Use digital multimeter	ILC	input
IMRC	IMRC	output
IMRCM	IMRCM	input
IMRCM2	IMRCM2	input
Use digital multimeter	IMSC	output
IMTV	IMT Valve	output
FUELPW1	INJ-1	output
FUELPW1	INJ-2	output
FUELPW1	INJ-3	output
FUELPW1 or FUELPW2	INJ-4	output
FUELPW1 or FUELPW2	INJ-5	output
FUELPW2	INJ-6	output
FUELPW2	INJ-7	output
FUELPW2	INJ-8	output
FUELPW2	INJ-9	output
FUELPW2	INJ-10	output
Use digital multimeter	KAPWR	volts
KS1, KS2	KS	input
LFC	LFC	output
Use digital multimeter	LFP	output
MAF, MAF V	MAF	input
MAP, MAP V	MAP	input
MFC	MFC	output
MIL	MIL	output
OCTADJ	OCTADJ	input
OSS	OSS	input
Use digital multimeter	PATSIL	output

(Continued)

Intermittent**Z****INTERMITTENT TEST CHART**

PID	Associated Circuit	Test Type
Use digital multimeter	PATSIN	input
Use digital multimeter	PATSOUT	output
Use digital multimeter	PATSTRT	output
CPP/PNP	PNP	input
PSP, PSP V	PSP	input
PTO	PTO	input
SCB	SCB	output
Use digital multimeter	SCC	output
Use digital multimeter	SCCS	input
Use digital multimeter	SCMA	output
Use digital multimeter	SCMB	output
Use digital multimeter	SCMC	output
SCICP	SCICP	output
Use digital multimeter	SCVM	input
Use digital multimeter	SIL	output
SPARKADV	SPARKADV	output
SS1	SS1	output
SS2	SS2	output
SS3	SS3	output
TCC	TCC	output
TCIL	TCIL	output
TCS	TCS	input
TFT, TFT V	TFT	input
Use digital multimeter	THTRC	output
TMAP	TMAP	input
TP, TP V	TP	input
TPB, TPB V	TPB	input
Use digital multimeter	TPO	output
TR, TR V	TR	input
TSS/ISS	TSS	input
CAMDCR, RCAM	VCT	output
VFCDL	VFCDL	output
VPWR	VPWR	input
Use digital multimeter	VREF	output
Use digital multimeter	VSO	output
VSS	VSS+	input
WAC	WAC	output

Intermittent Test Chart, Part 4

Intermittent

Z

Test Steps		Results	→	Action to Take
Z1	DIRECTION FOR INTERMITTENT DIAGNOSTIC PATH			
	- There are two main procedures used to isolate and repair an intermittent concern. One will utilize the Rotunda Distributorless Ignition System Tester (DIST) and the other, a scan tool with digital multimeter. - The DIST is only available for use on vehicles with coil pack ignition systems. If a DIST is not available, GO to Z2. Is this a predetermined ignition concern?	Yes	→	GO to Z50 for a coil pack application except 2.0L Cougar/Focus, GO to Z2 . GO to Z2 for coil on plug application.
		No	→	GO to Z2 .
Z2	PERFORM PCM RESET TO CLEAR FMEM			
	Note: Proceed with this step only if a PCM Reset was not done earlier; otherwise, GO to Z3. Eliminating FMEM will insure reproduction of any PCM related symptom. - Connect scan tool to Data Link Connector (DLC). - Key on, engine off. Note: Be sure freeze frame data has been recorded before resetting the PCM. - Complete a PCM reset. Is the PCM Reset complete?	Yes	→	GO to Z3 .
		No	→	Complete PCM Reset. GO to Z3 .
Z3	SELECT PIDS RELATED TO THE SYMPTOM			
	- A list of PIDs and/or Signals is needed for use with the scan tool to indicate the area of fault. Obtain the customer symptom description. Use the Reference Value Symptom Chart and proceed to the Reference Value PID/Measurement Signal Chart. These are located in the beginning of Reference Values. - Highlight each PID/Signal recommended by the charts under the PID/Signal selection menu on the scan tool. Have all PIDs and/or Signals related to the symptom been chosen?	Yes	→	GO to Z4 .
		No	→	REPEAT Z3 .
Z4	DECISION TO VERIFY SYMPTOM			
	- The path to symptom verification is optional, but is recommended for several reasons; some are because: - Vehicle is in for repeat repair. - No DTC is present. - Customer has difficulty describing the symptom. Does symptom need to be verified?	Yes	→	GO to Z5 .
		No	→	GO to Z11 .

Intermittent**Z**

Test Steps		Results →	Action to Take
Z5	COLLECT ANY AVAILABLE DATA TO AID IN SYMPTOM VERIFICATION		
	Note: Only MIL codes will trigger freeze frame data. Refer to scan tool instruction manual to retrieve freeze frame information. • Prepare freeze frame data for use which was recorded earlier from the Symptom Charts. • Continuous Memory DTCs should already be recorded from an earlier pinpoint test. • Access information from the customer worksheet or any other available data from the customer. • Has all data been recorded?	Yes → No →	GO to Z6 . GATHER as much data as possible to aid in isolation of the intermittent fault area. REPEAT Z5 .
Z6	RECREATE SYMPTOM USING ALL THE DATA		
	Note: Vehicle may require some driving to proceed with this test step. The concern must be verified by recreating the conditions that originally set the DTC or caused the symptom. • With the scan tool, select and monitor the same PIDs as displayed in freeze frame along with the previous highlighted PIDs and/or Signals from Step Z3. Using freeze frame data recorded earlier, recreate the conditions described by each freeze frame PID. Pay special attention to ECT, LOAD, RPM and VSS. Also, use any available customer data to aid in producing the correct conditions for recreating the symptom. • When the symptom occurs, press trigger to begin recording (Refer to the scan tool instruction manual for recorder function). • Could symptom be reproduced?	Yes → No →	GO to Z11 . GO to Z7 .

Intermittent**Z**

Test Steps		Results →	Action to Take
Z7	RECREATE SYMPTOM USING KOEO ROAD TEST PROCEDURE		
	- The road test is the last attempt to locate the area of concern before physically disturbing vehicle circuits. - Note: PIDs for outputs in the Reference Value Charts represent commanded values only. Circuit measurements with digital multimeter indicate actual output status. Therefore, in the case of a fault, the PID and circuit reading on the vehicle may not correspond with each other. PIDs for PCM inputs with a mismatch to the circuit measurement indicate a possible PCM concern. - The Intermittent Road Test Procedure is a set of instructions for monitoring PIDs and/or Signals with a scan tool and circuit measurements with a digital multimeter. This is done under four different conditions - KOEO, HOT IDLE, 48 and 88 kmh (30 and 55 mph). Use the Typical Diagnostic Reference Values from Reference Values, Reference Values to compare with the actual vehicle values. For 48 and 88 kmh (30 and 55 mph) procedures, a planned route with passenger is required. - Locate the corresponding Reference Value chart in Reference Values. - Set vehicle up to measure circuits with a digital multimeter and scan tool. - Connect scan tool to DLC. - Key on, engine off. - With the scan tool, select and monitor PIDs and also measure circuits shown in the Reference Value Chart in Reference Values. - Compare the scan tool PIDs and digital multimeter values to the Reference Value Charts. Are any values out of range?	Yes → No →	GO to Z11 . GO to Z8 .
Z8	RECREATE SYMPTOM USING HOT IDLE ROAD TEST PROCEDURE		
	- Key on, engine running and at least 87°C (195°F). - Continue to monitor the same PIDs and circuits as in the previous step at hot idle. Are any values out of range?	Yes → No →	GO to Z11 . GO to Z9 .

Z

Test Steps		Results	Action to Take
Z9	RECREATE SYMPTOM USING 48 KM/H (30 MPH) SLOW CRUISE ROAD TEST PROCEDURE		
	• Drive vehicle on preplanned route. • Continue to monitor the same PIDs and circuits during slow cruise as in the previous step. • Are any values out of range?	Yes → No →	GO to Z11 . GO to Z10 .
Z10	RECREATE SYMPTOM USING 88 KM/H (55 MPH) HIGH CRUISE ROAD TEST PROCEDURE		
	• Continue to drive vehicle on preplanned route. • Continue to monitor the same PIDs and circuits during high cruise as in the previous step. • Are any values out of range?	Yes → No →	GO to Z11 . It is now necessary to physically disturb selected vehicle circuits in an attempt to recreate the intermittent concern. GO to Z11 .
Z11	SELECT CIRCUITS FROM THE INTERMITTENT TEST CHART		
	• Remain in the PID and/or Signal selection menu with the scan tool. • If the Intermittent Road Test was used to verify the symptom, highlight PIDs or signals that displayed a mismatch to the Reference Values. Otherwise, highlight only the PIDs and/or Signals from Step Z3. • Proceed to the Intermittent Test Chart located at the beginning of this pinpoint test. • Match selected PIDs and/or Signals to the corresponding circuit in the chart. There may be more than one circuit to test. If a PID recording was made with the scan tool, it may be helpful to replay at this time (refer to the scan tool instruction manual for recorder function). • From the same chart, select and proceed to the appropriate test: — Input Test - Used on sensing devices such as temperature, position or oxygen. — Output Test - Used on output devices such as relays, coils or solenoids. • Has a test been chosen?	Yes → No →	For Input Test : GO to Z12 . For Output Test: GO to Z16 . To diagnose other driveability symptoms, GO to Symptom Charts.

Intermittent**Z**

Test Steps		Results	Action to Take
Z12	KOEO INPUT TEST PROCEDURE FOR PCM SENSORS		
WARNING: WHEN PERFORMING ANY OF THE TEST STEPS, ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS, OR HOT SURFACES. - Using circuits chosen from the Intermittent Test Chart, select only the recommended PIDs and/or Signals to monitor with the scan tool. If a PID is not available for the circuit, use a digital multimeter. - Proceed to the area of the suspect wiring or component fault. - Key on, engine off. - If the input is a switch-type component, turn on manually. - Monitor the PID or digital multimeter values while tapping on component. - Monitor while wiggling sensor harness wire from component to PCM. - Look for abrupt changes in values. Compare the actual values to the KOEO Typical Diagnostic Reference Values in Reference Values. Are values fluctuating in and out of range?		Yes → No →	REPAIR as necessary. VERIFY repair. GO to Z13.
Z13	KOER INPUT TEST PROCEDURE FOR PCM SENSORS		
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. - Key on, engine running. - Continue to monitor PIDs or circuits as in Step Z12. - Proceed to the area of the suspect wiring or component fault. - If the input is a switch-type component, turn on manually. - Monitor the PID or digital multimeter values while tapping on component. - Monitor while wiggling sensor harness wire from component to PCM. - Look for abrupt changes in values. Compare the actual values to the HOT IDLE Typical Diagnostic Reference Values in Reference Values. Are any values fluctuating in and out of range?		Yes → No →	REPAIR as necessary. VERIFY repair. GO to Z14.

Intermittent**Z**

Test Steps		Results	→	Action to Take
Z14	KOEO WATER SOAK TEST PROCEDURE FOR PCM SENSORS			
	WARNING: WHEN PERFORMING ANY OF THE TEST STEPS, ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS OR HOT SURFACES. • Key on, engine off. • Continue to monitor PIDs or circuits scan tool as in Step Z13. • Proceed to the area of the suspect wiring or component fault. • If the input is a switch-type component, turn on manually. • Monitor the PID or digital multimeter values while lightly spraying a water mist on the component. • Monitor while spraying sensor harness wire from component to PCM. • Look for abrupt changes in values. Compare the actual values to the KOEO Typical Diagnostic Reference Values in Reference Values. • Are any values fluctuating in and out of range?	Yes No	→ →	REPAIR as necessary. VERIFY repair. GO to Z15 .
Z15	KOER WATER SOAK TEST PROCEDURE FOR PCM SENSORS			
	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. • Key on, engine running. • Continue to monitor PIDs or circuits scan tool as in Step Z14. • Proceed to the area of the suspect wiring or component fault. • If the input is a switch-type component, turn on manually. • Monitor the PID or digital multimeter values while lightly spraying a water mist on the component. • Monitor while spraying sensor harness wire from component to PCM. • Look for abrupt changes in values. Compare the actual values to the KOEO Typical Diagnostic Reference Values in Reference Values. • Are values fluctuating in and out of range?	Yes No	→ →	REPAIR as necessary. VERIFY repair. GO to Z16 .

Intermittent

Z

Test Steps		Results	→	Action to Take
Z16	KOEO OUTPUT TEST PROCEDURE FOR PCM ACTUATORS			
WARNING: WHEN PERFORMING ANY OF THE TEST STEPS, ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS OR HOT SURFACES. Note: PIDs selected from the Intermittent Test Chart will display commanded values only. Digital multimeter measurements will display actual values. - Using circuits chosen from the Intermittent Test Chart, select the recommended PIDs and/or Signals to monitor using the scan tool. Also, use a digital multimeter to compare circuit values with the scan tool PID values. If PIDs are not available for a particular circuit, look for a digital multimeter fluctuation to occur when doing any of the following tests. Note: Output Test Mode may not control some outputs, such as injectors and ignition coils. To test these output types, GO to Z17. Caution must be used for the next steps. Cooling fans or fuel pump may turn on. - Key on, engine off. - With the scan tool, turn all outputs on using Output Test Mode (refer to scan tool instruction manual). - Proceed to the area of the suspect wiring or component fault. - Monitor the PID and digital multimeter values while tapping on component. - Monitor while wiggling actuator harness wire from component to PCM. - Look for abrupt changes or PID to digital multimeter value mismatches. Also, compare the actual values to the KOEO Typical Diagnostic Reference Values in Reference Values. Is there a mismatch or are any values fluctuating in and out of range on the Reference Value Charts?		Yes	→	REPAIR as necessary. VERIFY repair.
		No	→	GO to Z17 .

Intermittent**Z**

Test Steps		Results →	Action to Take
Z17	KOER OUTPUT TEST PROCEDURE FOR PCM ACTUATORS		
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.		Yes →	REPAIR as necessary. VERIFY repair.
• Key on, engine running. • Proceed to the area of the suspect wiring or component fault. • Monitor PIDs with the scan tool (if PIDs are available) using the PID monitor function. Compare the digital multimeter values with scan tool or look for a fluctuation in idle while tapping on the component. • If a coil for a coil on plug application has been tapped and is suspect, with key off, it may be helpful to remove the coil and measure continuity from the spark plug terminal to the signal terminal while tapping the coil. A large fluctuation in resistance will indicate an intermittent open. Otherwise, monitor while wiggling actuator harness wire from component to PCM. • Look for abrupt changes in idle or PID to digital multimeter value mismatches or fluctuation. Also, compare the actual values to the HOT IDLE Typical Diagnostic Reference Values in Reference Values. • Is there an idle fluctuation, a digital multimeter value mismatch or fluctuation?		No →	GO to Z18.

Intermittent**Z**

Test Steps		Results	→	Action to Take
Z18	KOEO WATER SOAK TEST PROCEDURE FOR PCM ACTUATORS			
WARNING: WHEN PERFORMING WATER SOAK TEST ON ELECTRICAL COMPONENTS AND/OR HARNESSSES, AVOID CONTACT WITH EEC, GEM AND OTHER MODULES IF POSSIBLE. ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS OR HOT SURFACES.		Yes	→	REPAIR as necessary. VERIFY repair.
		No	→	GO to Z19.
Note: Output Test Mode may not control some outputs, such as injectors. To test these output types, GO to Z19 .				
• Key on, engine off. • With the scan tool, turn all outputs on using Output Test Mode (refer to scan tool instruction manual). • Proceed to the area of the suspect wiring or component fault. • Monitor the PID and digital multimeter value while spraying a light mist of water on the component. • Monitor while spraying actuator harness wire from component to PCM. • Look for abrupt changes or PID to digital multimeter value mismatches. Also, compare the actual values to the KOEO Typical Diagnostic Reference Values in Reference Values. • Is there a PID to digital multimeter value mismatch or fluctuation in and out of range according to the Reference Value Charts?				

Intermittent

Z

Test Steps		Results	Action to Take
Z19	KOER WATER SOAK TEST PROCEDURE FOR PCM ACTUATORS		
WARNING: WHEN PERFORMING WATER SOAK TEST ON ELECTRICAL COMPONENTS AND/OR HARNESSSES, AVOID CONTACT WITH EEC, GEM AND OTHER MODULES IF POSSIBLE. ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS, ENGINE DRIVE BELTS OR HOT SURFACES. • Key on, engine running. • Monitor PIDs (if available) with the scan tool using the PID monitor function and continue to compare with the digital multimeter. • Proceed to the area of the suspect wiring or component fault. • Monitor the PID and digital multimeter value while spraying water mist on the component. • Monitor while lightly spraying actuator harness wire from component to PCM. • Look for abrupt changes in idle or PID to digital multimeter value mismatches. Also, compare the actual values to the Hot Idle Typical Diagnostic Reference Values in Reference Values. • Is there an idle fluctuation, value mismatch or values fluctuating in and out of range according to the Reference Value Charts?		Yes → REPAIR as necessary. VERIFY repair. No → KEY OFF. GO to Z20.	
Z20	INSPECT FOR INTERMITTENT MECHANICAL CONCERNS		
Note: It is possible for an intermittent mechanical concern to cause a good PCM system to react abnormally. • An inspection of mechanical systems relating to the DTC or symptom should have been performed earlier. If not, visually inspect at this time. • Look for the possibility of wires, vacuum lines or hoses that may short or kink during normal engine operation, such as: — Engine rock during acceleration. — Components moving during conditions of vibrations (high rpm or rough road). — Accelerator or transmission linkage contact or interference. • Is a mechanical concern detected?		Yes → REPAIR as necessary. VERIFY repair. No → It is necessary to seek additional help. REFER to the OASIS system or Hotline. A customer flight recorder may also be useful.	

Intermittent**Z**

Test Steps		Results	→	Action to Take
Z50	INTERMITTENT IGNITION PROCEDURE			
	PRELIMINARY CHECKS			
	Note: This pinpoint test must be used with the Rotunda DIST Tester 418-F024 (007-00075) or equivalent for non coil on plug applications. The DIST cannot be used on the 2.0L Cougar/Focus coil pack application. Quick Test must be performed and instructions in Pinpoint Test steps completed before starting the intermittent ignition procedure.	Yes	→	GO to Z51.
		No	→	REPEAT Z50.
	• 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?			

Intermittent

Z

Test Steps		Results	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. Does the tester perform Self-Test and is the VPWR LED on?	Yes → No →	GO to Z223 . REFER to warranty supplied with the DIST tester.
Z223	RECREATE THE CONCERN		
	- 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. Are any FAULT MEMORY LEDs on during crank or engine run?	Yes → No →	KEY OFF. GO to Z234 . RECREATE the fault with Freeze Frame data or information from the customer. GO to Z234 .

Intermittent**Z**

Test Steps		Results	→	Action to Take
Z234	WIGGLE TEST MODE			
- Place WIGGLE TEST switch to ON. - Place MODE switch to A. - Press RESET button. - Wait for WIGGLE TEST ACTIVE LED to light. - Wiggle Test and tap circuit components. - Repeat procedure with mode switch to B and C. 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. VERIFY repair.
		No	→	REPLACE PCM (REFER to Diagnostic Methods , Flash EEPROM). VERIFY repair.