

Computers and Control Systems: Pinpoint Tests

Adaptive Fuel DTC's Diagnostic Techniques

Adaptive Fuel Diagnostic Trouble Codes (**DTCs**) Diagnostic Techniques help isolate the root cause of the adaptive fuel concern. Before proceeding, attempt to verify if any driveability 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/Standard Models (Non BI-Fuel)/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 Mass Air Flow (**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 LONGFT1/2 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 Powertrain Control Module (**PCM**) Keep Alive Memory (**KAM**). Refer to Resetting Keep Alive Memory to reset KAM. See: Monitors, Trips, Drive Cycles and Readiness 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 driveability and have high Carbon Monoxide (**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).
- ^ 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

A: No Start
Introduction

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.

A : Introduction

A: No Start

A

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 Electrical Anti-Theft, Section 419 in the Workshop Manual for diagnosis and testing.	GO to <u>A2</u> .

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 <u>A3</u> .	REFER to the Starting Systems, Section 303 in the Workshop Manual.

A1 - A2

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 <u>Z2</u> .	KEY OFF. GO to <u>A4</u> .

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 <u>A5</u> .	KEY OFF. GO to <u>C1</u> .

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 the Wiring 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 <u>A17</u> . All others: KEY OFF. GO to <u>A6</u> .

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 . If returning from another pinpoint test or 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 [Section 2](#)) 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 H8 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 <u>A9</u> .	KEY OFF. GO to <u>H81</u> .

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 <u>A15</u> . All Others: GO to <u>A10</u> .	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.

- Release the fuel pressure.
- 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 Section 3 , Symptom Chart for further diagnosis.	REPLACE PCM (refer to Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).

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.
- Key on, engine off.
- Access FRP PID (fuel pressure).
- 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 <u>A16</u> .	KEY OFF. GO to <u>HB1</u> .

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	No
REPLACE PCM (refer to Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>). GO to <u>A6</u> .	No light or continuously bright light. GO to <u>HA47</u> .

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	No
KEY OFF. GO to <u>A6</u> .	KEY OFF. GO to <u>ID1</u> .

A16 - A17

Test B: Powertrain Control Module PCM Power Relay

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

Note

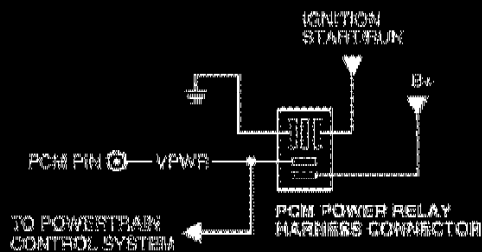
This Pinpoint Test is intended to diagnose the following:

- 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

For PCM connector views, refer to Section 1, Powertrain Control Hardware.

Focus, Taurus/Sable, Escape, Towncar

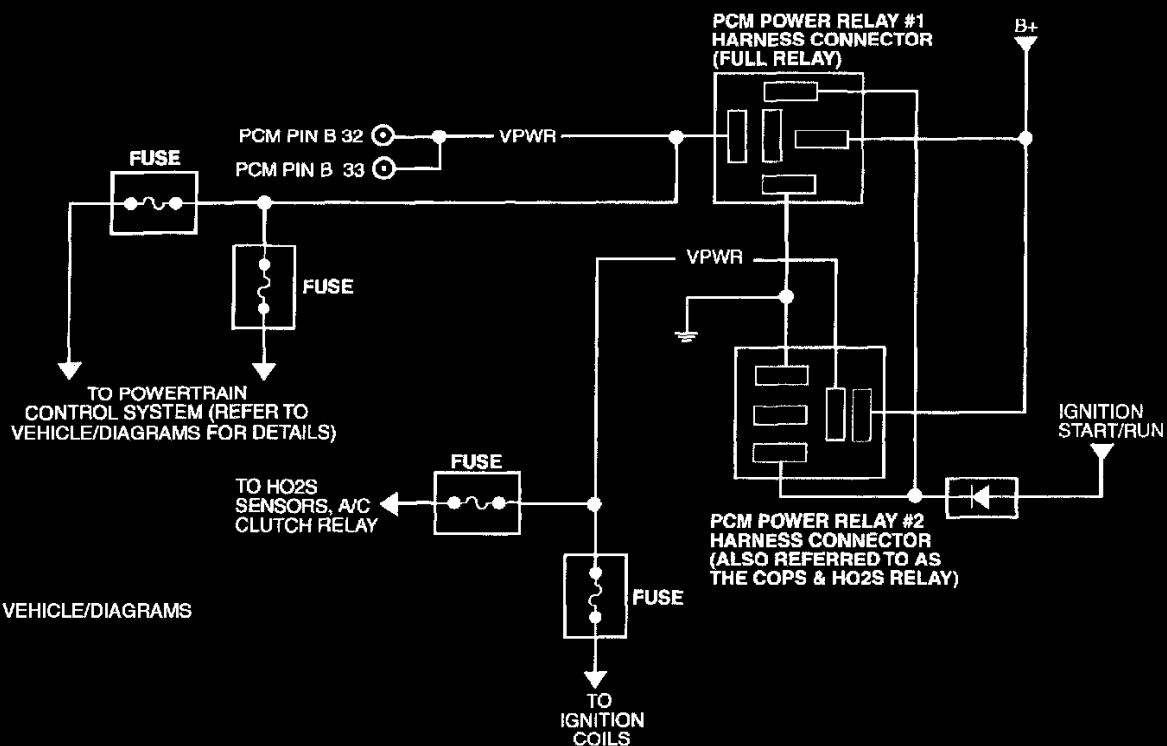


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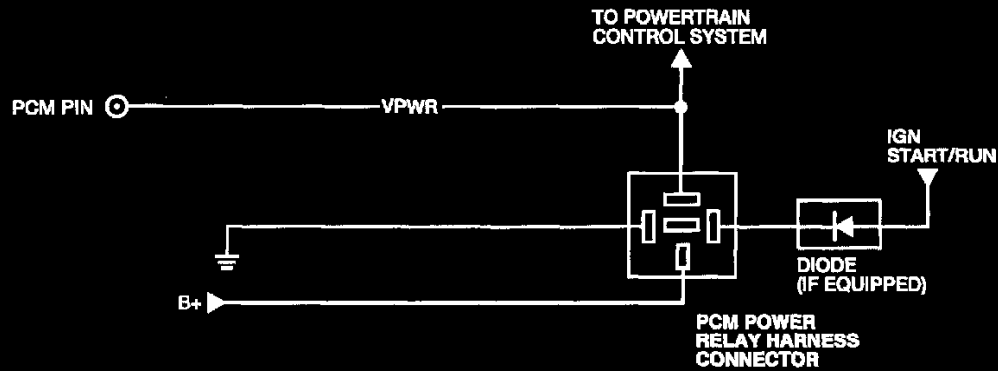
PCM CONNECTOR PIN NUMBERS

PCM TYPE	VPWR
150 PIN	B35, B36
All Others	71

Powertrain Control Module (PCM) Power Relay

B**LS6/LS8, Thunderbird**

A0049806

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

A0039298

B : Introduction Part 3 Of 4

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

PCM CONNECTOR PIN NUMBERS

PCM TYPE	VPWR
104 PIN	71
122 PIN	B34, B46
150 PIN	B32, B33

B : Introduction Part 4 Of 4

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

B

**B1 VPWR CHECK AT FUEL INJECTOR FAILED IN PINPOINT
TEST C: CHECK FOR OPEN VPWR CIRCUIT**

- Fuel injector 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 PCM power relay harness connector and fuel injector harness connector (the fuel injector where VPWR check failed).

Is resistance less than 5.0 ohms?

Yes	No
RECONNECT fuel injector. GO to <u>B2</u> .	REPAIR open VPWR circuit between PCM power relay and splice to the fuel injector.

**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 <u>B3</u> .	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.

B1 - B2

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?

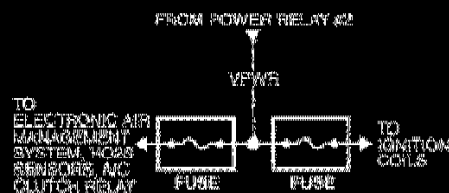
Yes	No
REPLACE PCM power relay.	REPAIR open ground circuit.

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 Wiring Diagrams to determine fuse locations.

- Remove and inspect VPWR circuit fuse that goes to the component where VPWR check failed.

Is the fuse OK?



AA3510-A

Yes	No
GO to <u>B6</u> .	CHECK VPWR circuit for short to ground between fuse and applicable component. REPAIR as necessary. REPLACE fuse.

**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	No
REPAIR open circuit between fuse and component where VPWR check failed.	If both voltages were less than 10.5 volts: KEY OFF. GO to <u>B7</u> . If only one voltage was less than 10.6 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	No
GO to <u>B2</u> . Make all indicated checks at PCM power relay #2.	REPAIR open VPWR circuit between splice and PCM power relay #2.

B6 - B7

Test C: Reference Voltage

C: Reference Voltage
Introduction

C**Note**

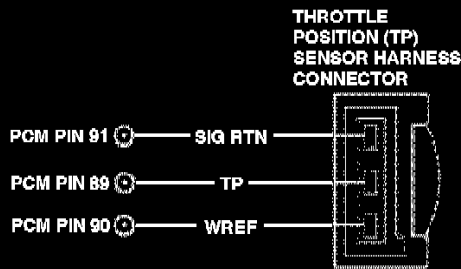
This Pinpoint Test is intended to diagnose the following:

- Sensor harness circuits: SIG RTN, VREF, ETCREF, ETCRTN
- 3-wire sensors: throttle position (TP)/(ETC 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) , swirl control valve monitor (SCVM) sensor, EGR system module (ESM) sensor, temperature manifold absolute (TMAP) sensor, and pedal position (PP) sensor.
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematics and Connectors

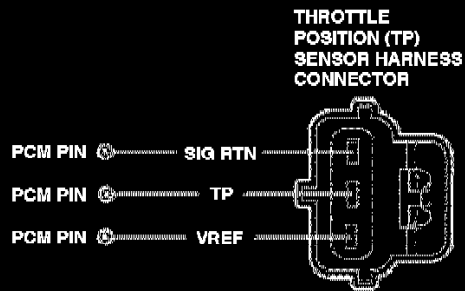
For PCM connector views, refer to Section 1, Power Control Hardware .

2.0L (4V) Escort



AC052901

2.0L (4V) Focus, 2.3L Ranger, 2.3L Focus

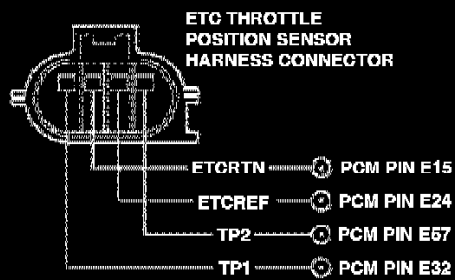


A/CN1749

PCM CONNECTOR PIN NUMBERS

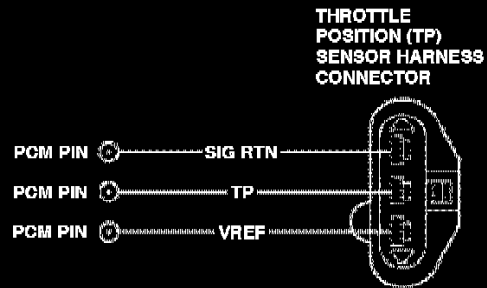
PCM TYPE	TP	VREF	SIG RTN
104 Pin	89	90	91
150 Pin	E19	E40	E41

LS6, LS8, Thunderbird



A/CN1749

All Others



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

ADD1372

PCM CONNECTOR PIN NUMBERS

PCM TYPE	TP	VREF	SIG RTN
104 Pin	89	90	91
122 Pin	B36	B44	B25
150 Pin	E20	E57	E17

SENSORS CONNECTED TO VREF									
Applications	TP or ETC TP	DPFE or TMAP or ESM	FTP	ACPT	PSPT	FRP	BARO	SCVM	PPS
2.0L 2V Escort	X	DPFE	X		X	X			
2.0L 4V Escort	X		X		X	X			
Focus	X	DPFE	X		X				
2.3L Escape	X	TMAP	X			X		X	
3.0L Escape	X		X			X			
2.3L Ranger	X	TMAP	X		X			X	
Mustang, Ranger	X	DPFE	X			X			
Ranger	X	DPFE	X						
Taurus/Sable	X	DPFE	X		X				
Explorer/Mountaineer	X	DPFE	X						
Crown Victoria (except NGV)	X	DPFE	X						
Grand Marquis,	X	DPFE	X						
Crown Victoria w/NGV	X X	DPFE	X X			X X			
Aviator	X	ESM	X						
Marauder	X	ESM	X	X	X	X			
Town Car	X	ESM	X	X	X	X			
LS6/LS8, Thunderbird	ETC TP	ESM	X		X	X			X
Windstar	X	DPFE	X	X					
5.4L SC F-Series	X	DPFE	X			X	X		
5.4L E/F Series w/NGV	X X	DPFE	X X			X X			
Expedition/Navigator /Blackwood/Excursion	X	DPFE	X						
E Series, F-Series 5.4L (except NGV)	X	DPFE	X		X				
F-Series 4.2L, 4.6L (except NGV)	X	ESM	X		X				

C: Reference Voltage**C****C1 WAS VREF GREATER THAN 6.0 VOLTS?****Was VREF greater than 6.0 volts when measured in the previous test step?**

Yes	No
KEY OFF. GO to <u>C35</u> (to check VREF for short to power).	GO to <u>C2</u> .

C2 CHECK VOLTAGE ON BATTERY

- Measure voltage across battery terminals.

Is voltage greater than 10.6 volts?

Yes	No
GO to <u>C3</u> .	Key off. REFER to Battery and Charging, Section 414 in the Workshop Manual to service discharged battery.

C3 CHECK VOLTAGE BETWEEN B+ AND SIG RTN

- Disconnect sensor where VREF check failed.(DTC indicates the failure location)
- Measure voltage between SIG RTN at the sensor harness connector where V-REF failed and battery positive post.

Is voltage greater than 10.6 volts and within 1.0 volt of battery voltage?

Yes	No
GO to <u>C4</u> .	SIG RTN/PWR GND fault present. GO to <u>C25</u> .

C1 - C3

C4 CHECK FOR VPWR TO THE PCM PID

- note: for 122 and 150 PCM harness connectors, VPWR PID can be accessed even though a fault exist.
- Attempt to access the VPWR PID.

Can the PID be accessed?

Yes	No
KEY OFF. GO to <u>C20</u> (to check VREF for opens).For 122 and 150 pin PCM harness connectors, disconnect the sensor harness connectors where a DTC indicates a failure, and GO to <u>C16</u> .	GO to <u>C5</u> (to check for VPWR, and VREF for shorts).

C5 CHECK VPWR VOLTAGE TO INJECTOR

- Disconnect injector harness connector. (any injector easily accessed)
- Key on.
- Measure voltage between the VPWR circuit at the injector harness connector and the battery negative post.

Is voltage greater than 10.6 volts?

Yes	No
KEY OFF GO to <u>C6</u> .	KEY OFF For application with Power Relay inside CCRM: GO to <u>X1</u> . All others: GO to <u>B1</u> .

C6 CHECK VREF CIRCUIT SHORT TO SIG RTN IN THE TP or ETC TP sensor

- Note: For the following test steps, refer to the chart at the beginning of pinpoint C to determine which sensors are connected to VREF. ETC applications name VREF as ETCREF, and SIGRTN as ETCRTN.
- Disconnect TP sensor harness 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 TP OR ETC TP WHERE APPLICABLE.	GO to <u>C7</u> .

C7 CHECK VREF CIRCUIT SHORT TO SIG RTN IN THE DPFE or ESM or TMAP sensor

- Note: For the following test steps, refer to the chart at the beginning of pinpoint C to determine which sensors are connected to VREF. If vehicle is not equipped with DPFE, ESM, or TMAP Go To C8.
- TP sensor disconnected.
- Disconnect DPFE or ESM or TMAP sensor where applicable.
- 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 DPFE or ESM or TMAP sensor	GO to <u>C8</u> .

C8 CHECK FOR VREF CIRCUIT SHORT TO SIG RTN IN FTP SENSOR

- Note: If vehicle is not equipped with FTP sensor, Go To C9
- TP and DPFE or ESM or TMAP sensors disconnected.
- Disconnect FTP 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 FTP sensor.	GO to <u>C9</u> .

C9 CHECK VREF CIRCUIT SHORT TO SIG RTN IN ACP SENSOR

- Note: If vehicle is not equipped with ACP sensor, Go To C10
- TP, FTP, DPFE or ESM or TMAP sensor disconnected.
- Disconnect ACP sensor.
- Key on.
- Measure voltage between the VREF and SIG RTN circuits at the TP sensor harness connector.
- Key off.

Is voltage between 4.0 and 6.0 volts?

Yes	No
REPLACE the ACP sensor.	GO to <u>C10</u> .

C10 CHECK VREF CIRCUIT SHORT TO SIG RTN IN PSP SENSOR

- Note: If vehicle is not equipped with PSP sensor, Go To C11
- TP, FTP, ACP, DPF EGR or TMAP sensor 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.	GO to <u>C11</u> .

C11 CHECK VREF CIRCUIT SHORT TO SIG RTN IN FRP SENSOR

- Note: If vehicle is not equipped with FRP sensor, Go To C12
- TP, FTP, ACP, PSP, DPFE or ESM or TMAP sensor 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
REPLACE the FRP sensor.	GO to <u>C12</u> .

C12 CHECK VREF CIRCUIT SHORT TO SIG RTN IN BARO OR MAP SENSOR IF APPLICABLE

- Note: If vehicle is not equipped with a BARO or MAP sensor, Go To C13
- TP, D.P.F. EGR, TMAP, 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 <u>C13</u> .

C13 CHECK VREF CIRCUIT SHORT TO SIG RTN IN SVCM SENSOR IF APPLICABLE

- Note: If vehicle is not equipped with a SVCM sensor, Go To C14
- TP, FTP, ACP, PSP, BARO or MAP, DPFE or ESM or TMAP sensor disconnected.
- Disconnect SVCM sensor 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 SVCM sensor if Applicable.	KEY OFF. GO to <u>C14</u> .

C14 CHECK VREF CIRCUIT SHORT TO SIG RTN IN APP SENSOR IF APPLICABLE

- Note: If vehicle is not equipped with a PP sensor, GO to **C15**.
- TP, FTP, ACP, PSP, BARO or MAP, DPFE or ESM or TMAP, and SVCM sensor disconnected.
- Disconnect PP sensor if Applicable.
- Measure voltage between VREF and SIG RTN circuits at the ETC TP sensor harness connector.

Is voltage between 4.0 and 6.0 volts?

Yes	No
KEY OFF. REPLACE PP sensor if Applicable.	KEY OFF. GO to C15 .

C15 CHECK VPWR VOLTAGE TO PCM

Note: Refer to the PCM connector pin numbers in Section 1, PCM control hardware.

- 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
KEY OFF. GO to C16 .	KEY OFF. REPAIR open VPWR circuit between PCM and splice to Injector harness connector.

C16 CHECK VREF FOR SHORT TO GROUND OR SIG RTN

- If directed to C16 from C4, proceed with the sensors that are already disconnected.
- If directed to C16 from C15, proceed with the TP sensor is 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.

Is each resistance greater than 10,000 ohms?

Yes	No
If directed to C16 from C4, reconnect the disconnected sensor harness connectors, GO to C5 , for all others, REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR VREF short to ground.

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	No
KEY OFF. REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open VREF circuit. REFER to the EVTM 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	No
GO to C26 .	GO to C27 .

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 Wiring Diagrams, Engine Controls.)

Yes	No
KEY OFF. GO to C27 .	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	No
RECONNECT sensor. GO to C28 .	REPAIR open SIG RTN circuit. REFER to the EVTM and DTCs received to help pinpoint the location of the open.

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	No
GO to C29 .	REPAIR open circuit.

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	No
SIG RTN/PWR GND circuits are OK in the PCM. Verify results of previous test steps. RERUN Quick Test to verify DTC/symptom.	REPLACE PCM (refer to Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).

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	No
KEY OFF. REPLACE PCM (refer to Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	KEY OFF. REPAIR VREF short to power in harness.

C29 - C35

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

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

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

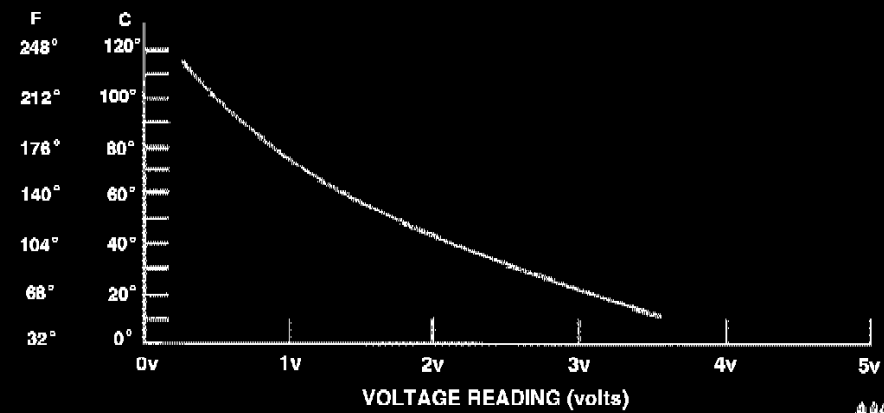
Note: Engine coolant temperature must be greater than 10°C (50°F) to pass the KOEO Self-Test and greater than 82°C (180°F) to pass the KOER Self-Test. To accomplish this, the engine must be at normal operating temperature.

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.

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

TEMPERATURE



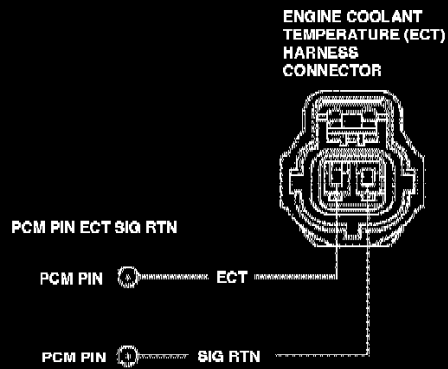
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TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS

Temperature		Temperature Sensor Values		
°C	°F	Voltage (volts)		Resistance
		w/o Resistor	w/ Resistor	K ohms
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

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware .
ENGINE COOLANT TEMPERATURE SENSOR



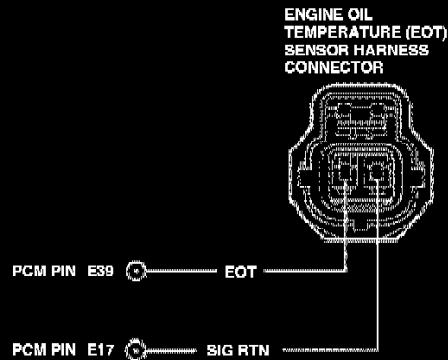
NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

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PCM CONNECTOR PIN NUMBERS		
PCM TYPE	ECT	SIG RTN
104 PIN	38	91
122 PIN	E32	E25
150 PIN	E46	E17

ENGINE OIL TEMPERATURE SENSOR

LS6/LS8, Thunderbird



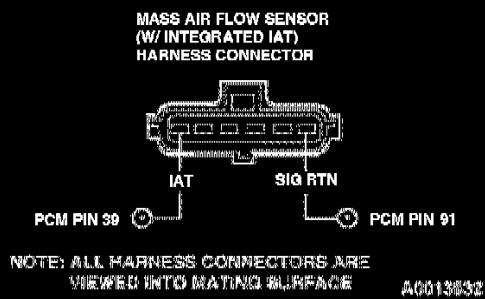
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

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INTAKE AIR TEMPERATURE SENSOR

Focus

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

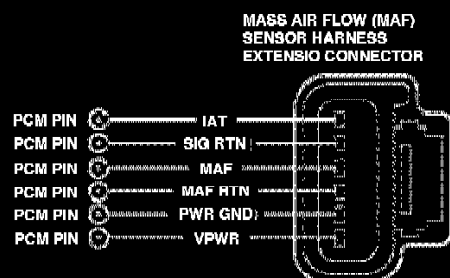


NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

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2.3L Focus (w/integrated IAT)

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



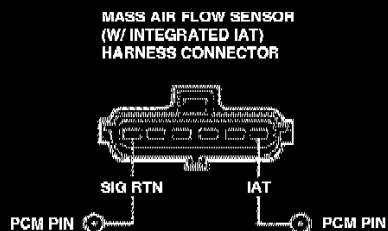
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PCM CONNECTOR PIN NUMBERS

PCM TYPE	IAT	SIGRTN	MAF	MAFRTN	PWRGND	VPWR
150 PIN	B20	B41	B32	B43	B47	B35

Escort 4V, Taurus/Sable, FF Taurus, 3.8L/4.6L 2V, 4V Mustang, Crown Victoria/Grand Marquis, Crown Victoria NGV, Marauder, Town Car, Windstar, Ranger, Escape, Explorer/Mountaineer, Explorer Sport/Sport Trac, Aviator, Econoline, Excursion, 4.6L F150, 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.



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

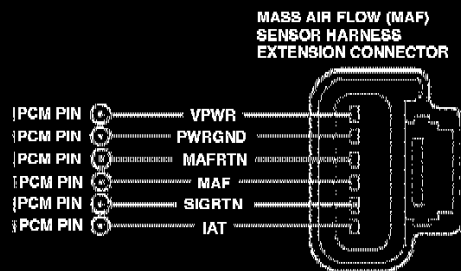
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PCM CONNECTOR PIN NUMBERS

APPLICATION	IAT	SIG RTN
104 PIN	39	91
150 PIN	B51	B17

LS6/LS8, Thunderbird (w/integrated IAT)

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

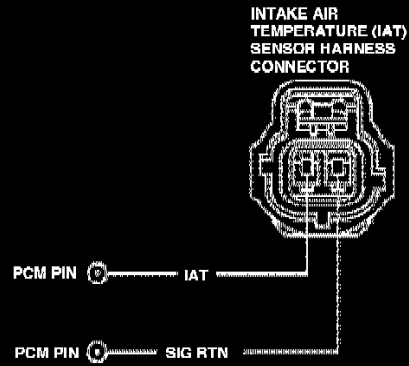


NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

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PCM CONNECTOR PIN NUMBERS

PCM TYPE	VPWR	PWRGND	MAFRTN	MAF	SIGRTN	IAT
150 PIN	B32-33	B24-27	B38	B31	B5	B51

All Others

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

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PCM CONNECTOR PIN NUMBERS

PCM TYPE	IAT	SIG RTN
104 PIN	39	91
122 PIN	B19	E25

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

DA

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 [Section 3](#), 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.

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 .

DA1 - DA2

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 <u>Section 3</u> , 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 <u>Section 3</u> , Symptom Charts. All others: GO to <u>DA4</u> .	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 <u>Section 2</u> , <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>). RESTORE vehicle.	REPLACE suspect sensor.

DA10 DTC P0118 OR P0113: CHECK VOLTAGE BETWEEN VREF AND SIG RTN

Note: For LS6/LS8 and Thunderbird with Electronic Throttle Control GO to DA11 . All Others continue with this test step.

- 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 <u>DA11</u> .	GO to <u>C1</u> .

DA11 SIMULATE OPPOSITE SIGNAL TO PCM

Diagnostic Trouble Codes (DTC) P0113 (IAT) or P0118 (ECT) indicates the sensor signal is greater than the Self-Test maximum.

Possible causes:

- Open in harness (IAT or ECT).
- Improper harness connection or damaged sensor (IAT, MAF w/integrated IAT or ECT).
- Damaged 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 0.2 volts or less?

Yes	No
REPLACE suspect sensor.	REMOVE jumper wire. GO to <u>DA12</u> . KEY OFF.

DA12 CHECK TEMPERATURE SENSOR SIGNAL AND SIG RTN CIRCUITS FOR OPEN IN HARNESS

Note: Refer to the PCM connector pin numbers on this pinpoint test cover page.

- 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 Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	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 Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	REPAIR short to VREF.

DA20 DTC P0112 OR P0117: SIMULATE OPPOSITE SIGNAL TO PCM

Diagnostic Trouble Code (DTC) P0112 (IAT) or P0117 (ECT) indicates the sensor signal is less than Self-Test minimum.

Possible causes:

- Grounded circuit in harness.
- Improper harness connection or damaged sensor (IAT, MAF w/integrated IAT or ECT).
- Damaged 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 4.2 volts or greater?

Yes	No
REPLACE sensor.	For LS6/LS8 and Thunderbird with Electronic Throttle Control: GO to DA22 . All Others: GO to DA21 .

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 on this pinpoint test cover page.

- 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 Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	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 Section 4 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.
- Once engine temperature is stabilized, allow engine to idle.
- 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 Section 2, Drive Cycles). Retest if necessary.	Verify thermostat and cooling system for correct operation. If OK, REPLACE suspect sensor.

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	No
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 Section 2, Drive Cycles).	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	No
ISOLATE fault. REPAIR as necessary. For Continuous DTCs P1112 and P1117, COMPLETE OBDII Drive Cycle to verify repair (REFER to Section 2, <u>Drive Cycles</u>).	GO to <u>DA92</u> .

DA92 CHECK PCM AND VEHICLE HARNESS CONNECTOR

- Disconnect PCM.
- Disconnect sensor connector.

Are connectors and terminals OK?

Yes	No
Fault is not present at this time. For Continuous Memory DTCs P1112 and P1117, COMPLETE OBDII Drive Cycle (REFER to Section 2, <u>Drive Cycles</u>).	REPAIR as necessary. For Continuous Memory DTCs P1112 or P1117, COMPLETE OBDII Drive Cycle to verify repair (REFER to Section 2, <u>Drive Cycles</u>).

DA100 DTC P0125, P0128: CHECK ENGINE COOLANT LEVEL

Diagnostic Trouble Code (DTC) P0125 or P0128 indicates the engine coolant temperature has not achieved the required calibrated temperature level since engine start up within a specified amount of time.

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; STEAM 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	No
REFER to Engine Cooling, Section 303 in the Workshop Manual for further diagnostics.	REPAIR cooling system as necessary. Fill engine coolant to proper level. COMPLETE OBDII Drive Cycle to verify repair (REFER to Section 2, <u>Drive Cycles</u>).

DA100

DA105 DTC P0217: ENGINE COOLANT OVER TEMPERATURE

An engine overheat condition was sensed by the Engine Coolant Temperature sensor (ECT).

Possible causes:

- Blockage of radiator (air or coolant flow).
- Water pump or hose problems.
- Internal or external coolant leaks.
- Low engine coolant level.



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; STEAM AND HOT LIQUID CAN COME OUT FORCEFULLY WHEN THE CAP IS LOOSENEED SLIGHTLY.

- Check engine coolant level.

Is the engine coolant level fill correct?

Yes	No
REFER to Engine Cooling, Section 303 in the Workshop Manual for further diagnostics.	REPAIR cooling system as necessary. Fill engine coolant to proper level. COMPLETE OBDII Drive Cycle to verify repair (REFER to Section 2, Drive Cycles).

DA110 DTC P0196, 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 P0196 or P1184 present?

Yes	No
GO to DA111 .	Engine oil temperature was not at operating temperature. REPAIR any other DTCs as necessary.

DA111 DTC P0196, P0197, P0198, P1184 OR P0298: CHECK TEMPERATURE SENSOR SIGNAL

- Connect scan tool.
- Key on.
- Access EOTV PID.

Is EOTV PID less than 0.3 volts?

Yes	No
GO to <u>DA112</u> .	GO to <u>DA115</u> .

DA112 SIMULATE OPPOSITE EOT SIGNAL TO PCM

- Again access EOTV PID.
- Disconnect EOT sensor.

Is EOTV PID greater than 4.2 volts?

Yes	No
REPLACE suspect sensor.	GO to <u>DA113</u> .

DA113 CHECK EOT SIGNAL CIRCUIT FOR SHORT TO GROUND IN HARNESS

Note: Refer to the PCM connector pins numbers on this pinpoint test cover page.

- 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 Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	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 <u>DA116</u> .	GO to <u>DA120</u> .

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 <u>DA117</u> .

DA117 CHECK TEMPERATURE SENSOR SIGNAL AND SIG RTN CIRCUIT FOR OPEN IN HARNESS

Note: Refer to the PCM connector pins numbers on this pinpoint test cover page.

- 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 Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	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 <u>DA121</u> .

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.	GO to <u>DA122</u> .

DA122 CHECK TEMPERATURE SENSOR RESISTANCE WITH ENGINE RUNNING

- Run engine for two minutes at 1,500 rpm.

Note: Verify that engine is at correct operating temperature before taking reading.

- Measure temperature sensor resistance. Refer to the chart at the beginning of this Pinpoint Test for resistance specifications.

Is resistance within specification for the given engine temperature?

Yes	No
Fault is not present at this time. GO to <u>Z1</u> .	REPLACE suspect sensor.

**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. REFER to Engine System — General Information, Section 303 in the Workshop Manual.	GO to <u>DA131</u> .

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 <u>DA111</u> .	IDENTIFY customer driving habits. Advise customer improper transmission gear selection and high rpm for extended period will initialize engine protection strategy.

DA130 - DA131

Test DB: Engine Fuel Temperature (EFT) Sensor

DB: Engine Fuel Temperature (EFT) Sensor
Introduction

DB**Note**

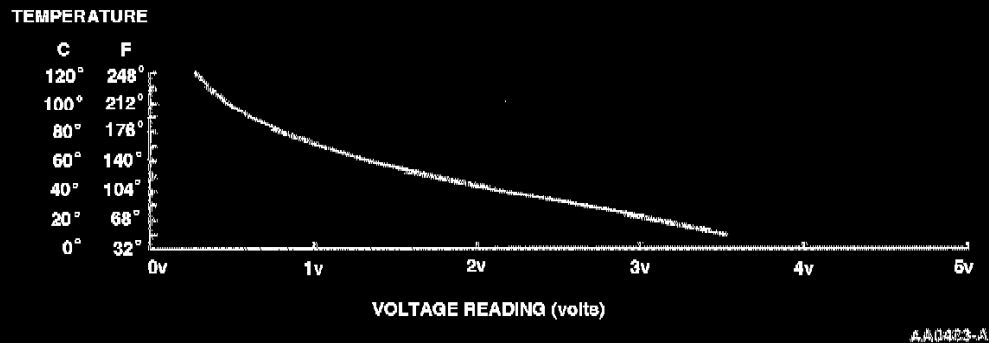
This Pinpoint Test is intended to diagnose the following:

- 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.

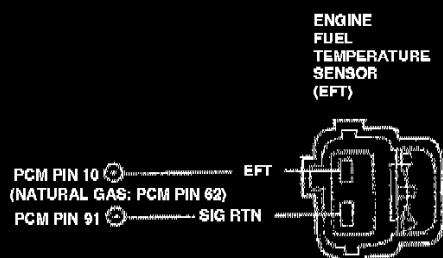


ENGINE FUEL TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS

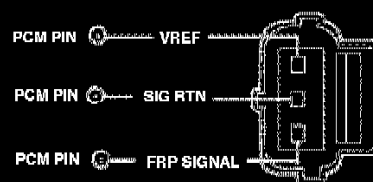
Temperature		Engine Fuel Temperature (EFT) Sensor Values	
°C	°F	Voltage (volts)	Resistance (K ohms)
150	302	0.13	0.56
135	275	0.19	0.81
120	248	0.27	1.18
110	230	0.35	1.55
100	212	0.46	2.07
90	194	0.60	2.80
80	176	0.78	3.84
70	158	1.02	5.37
60	140	1.33	7.70
50	122	1.70	10.97
40	104	2.13	16.15
30	86	2.60	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

For PCM connector views, refer to Section 1, [Powertrain Control Hardware](#)

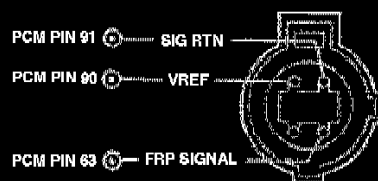


NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE AA1605-D

Gasoline Vehicles**FUEL RAIL PRESSURE (FRP)
SENSOR HARNESS CONNECTOR**

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A3052739

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

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AA4503-A

DB Introduction Part 3 Of 3**DB: Engine Fuel Temperature (EFT)
Sensor****DB****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 Section 2, 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 EFT-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.

Is the original reading of the EFTA-V PID with the harness disconnected greater than 4.5 volts or (-40°C/-40°F) and less than 0.21 volts or (135°C/275 °F) with the jumper installed?

Yes	No
KEY OFF. REPLACE EFTA sensor. REFER to Electronic Engine Controls, Section 303 in the Workshop Manual.	KEY OFF. FOR EFTA-V reading less than 4.54 volts with harness disconnected and jumper removed: GO to <u>DB3</u> . FOR DTC P0182: GO to <u>DB3</u> . FOR EFTA-V reading greater than 0.2 volt with harness disconnected and jumper installed: GO to <u>DB5</u> . FOR DTC P0183: GO to <u>DB5</u> .

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 <u>DB4</u> .	GO to <u>C1</u> .

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 Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	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 <u>DB6</u> .	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 Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	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 <u>DB8</u> .

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	No
REPAIR as necessary.	Fault is not present at this time.

DB7 - DB8

Test DC: Mass Air Flow (MAF) Sensor

DC: Mass Air Flow (MAF) Sensor
Introduction

DC**Note**

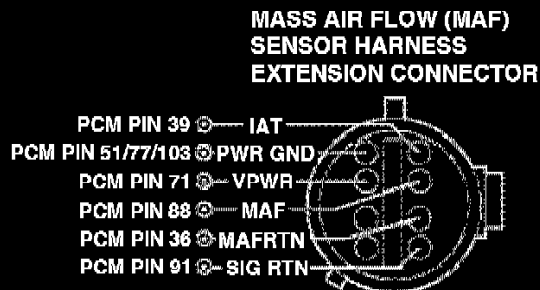
This Pinpoint Test is intended to diagnose the following:

- 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

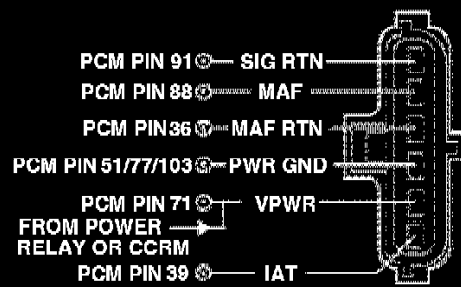
For PCM connector views, refer to Section 1, Powertrain Control Hardware

Escort (4V)



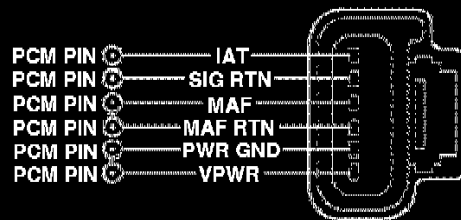
NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0039684

Focus**MASS AIR FLOW (MAF)
SENSOR HARNESS
CONNECTOR**

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

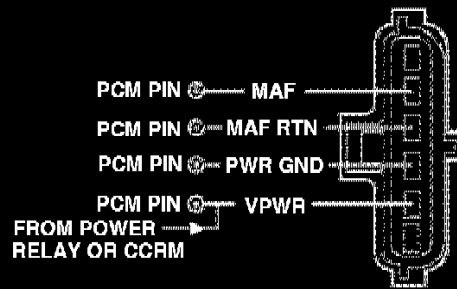
A000917

2.3L Focus**MASS AIR FLOW (MAF)
SENSOR HARNESS
EXTENSION CONNECTOR**

A003054

PCM TYPE	IAT	SIGRTN	MAF	MAFRTN	PWRGND	VPWR
150 PIN	B20	B41	B32	B43	B47	B35

4.6L SC Mustang, 4.2L/5.4L F-Series, Expedition, Navigator, Blackwood

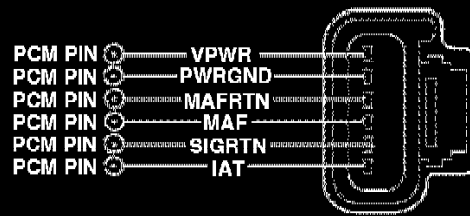
**MASS AIR FLOW (MAF)
SENSOR HARNESS
CONNECTOR**

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A2051440

PCM TYPE	MAF	MAF RTN	PWR GND	VPWR
104 PIN	88	36	51/77/103	71
122 PIN	B31	B30	B1/B11/B23	B34/B46

LS6/LS8, Thunderbird

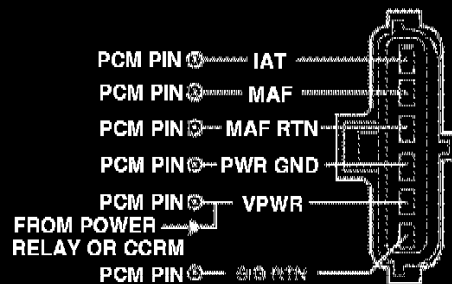
MASS AIR FLOW (MAF)
SENSOR HARNESS
EXTENSION CONNECTOR

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0052693

PCM TYPE	VPWR	PWRGND	MAFRTN	MAF	SIGRTN	IAT
150 PIN	B32/B33	B24-B27	B38	B31	B5	B51

All Others (NOTE: For Mustang, PCM PWR GND Pin 76 replaces Pin 77)

MASS AIR FLOW (MAF)
SENSOR HARNESS
CONNECTOR

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0051436

PCM TYPE	IAT	MAF	MAF RTN	PWR GND	VPWR	SIG RTN
104 PIN	39	88	36	51/77/103	71	91
150 PIN	E51	E31	E38	E24-E27	E32/E33	E17

Tables and Chart**BAROMETRIC PRESSURE REFERENCE CHART**

Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP 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

DC: Mass Air Flow (MAF) Sensor**DC****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 <u>DC2</u> .	KEY OFF. GO to <u>DC3</u> .
For Continuous Memory DTC P0103: GO to <u>DC20</u> .	
All other Continuous Memory DTCs: GO to Section 4, Powertrain <u>Diagnostic Trouble Code (DTC) Charts</u> .	

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. Verify MAF sensor is connected. Repair as necessary.
- Start engine and bring to idle.
- If a KOER DTC P0505 is present, go to Section 4, Powertrain 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 <u>DC5</u> .	KEY OFF. GO to <u>DC4</u> .

DC1 - DC2

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 <u>DC4</u> .	KEY OFF. GO to <u>DC5</u> .

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 Section 2, <u>Resetting The Keep Alive Memory</u>

DC6 CHECK PWR GND CIRCUIT TO MAF SENSOR

- 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 DC7 .	REPAIR open circuit. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) .

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/IAT 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 Section 2, Resetting The Keep Alive Memory (KAM) .

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
GO to <u>DC9</u> .	REPAIR short circuit. RESET the keep alive memory (KAM). REFER to Section 2, <u>Resetting The Keep Alive Memory (KAM)</u> .

DC9 CHECK MAF CIRCUIT SHORT TO PWR GND IN THE PCM

- Reconnect PCM.
- 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
GO to <u>DC10</u> .	REPLACE PCM (refer to Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).

DC8 - DC9

DC10 CHECK MAF CIRCUIT VOLTAGE CYCLING INTEGRITY

- Key on, engine off.
- Access MAF V PID.
- Record the MAF V PID reading.
- Connect a 5 amp jumper between MAF RTN and PWR GND circuits at the MAF sensor harness connector.
- Connect a 5 amp jumper between 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 Section 2, <u>Resetting The Keep Alive Memory (KAM)</u> .	For DTC P1101 without P0102 present: KEY OFF. GO to <u>DC12</u> . For DTC P0102: KEY OFF. GO to <u>DC11</u> .

DC11 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 <u>DC12</u> .	REPAIR open circuit. RESET the keep alive memory (KAM). REFER to Section 2, <u>Resetting The Keep Alive Memory (KAM)</u> .

DC12 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 <u>DC13</u> .	REPAIR open circuit. RESET the keep alive memory (KAM). REFER to Section 2, <u>Resetting The Keep Alive Memory (KAM)</u> .

DC13 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 Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	REPAIR open circuit. RESET the keep alive memory (KAM). REFER to Section 2, <u>Resetting The Keep Alive Memory (KAM)</u> .

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

- Start engine and bring it to idle.
- If idle is not stable, GO to [Section 3](#) , 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 Section 2, Resetting The Keep Alive Memory (KAM) .	GO to DC17 .

DC17 CHECK FOR MAF SENSOR CIRCUIT FOR INTERMITTENT OPENS OR SHORTS

- Key on, engine running.
- Again access the MAF V PID.
- Complete the following:
 - Grasp the MAF sensor harness and MAF sensor harness connector.
 - Wiggle, shake and bend the harness from the MAF sensor 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 Section 2, Resetting The Keep Alive Memory (KAM) .	Unable to duplicate or identify fault at this time. GO to Z1 .

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 Section 4, Powertrain 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 original reading to below 0.23 volt?

Yes	No
REMOVE jumper. REPLACE MAF sensor. RESET the keep alive memory (KAM). REFER to Section 2, <u>Resetting The Keep Alive Memory (KAM)</u> .	KEY OFF. REMOVE jumper. GO to <u>DC21</u> .

DC20**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 Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>). If a fault was not detected and an idle concern is still present: Disregard DTC P0102 at this time. RETURN to <u>Section 3</u> , Symptom Charts.	REPAIR short circuit.

DC21

DC25 DTC P0171, P0172, P0174, P0175, P1131, P1132, P1151, P1152, P1130, P1150, P2195, P2196, P2197, P2198 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 [Section 6](#), 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, P1150, P2195, P2196, P2197 or P2198 : Unable to duplicate or identify the fault at this time, GO to Z1 (or GO to HA42 for natural gas vehicles only). For driveability symptoms without DTCs : RETURN to Section 3 , Symptom Charts for further diagnosis.	KEY OFF. GO to DC26 .

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 Section 2, <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, P1150, P2195, P2196, P2197 or P2198 : 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 <u>Section 3</u> , Symptom Charts for further diagnosis.

DC26

Test DD: Fuel Rail Pressure (FRP) Sensor

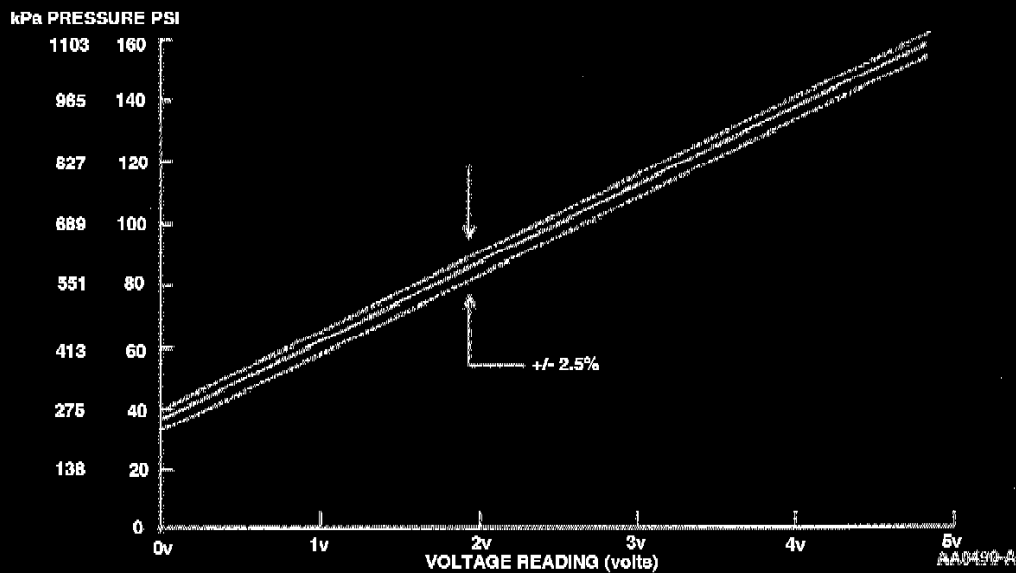
DD: Fuel Rail Pressure (FRP) Sensor**DD****Introduction****Note**

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)

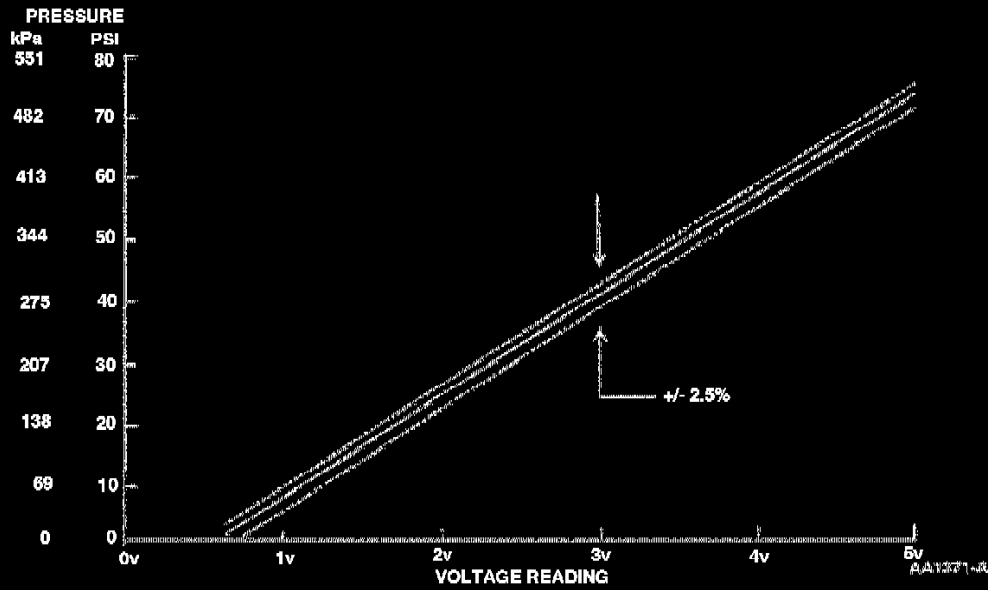
Tables and Graphs

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

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

Gasoline Vehicles

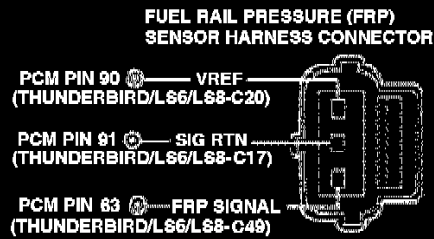


Gasoline Vehicles — FUEL RAIL PRESSURE SENSOR EXPECTED VOLTAGE

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

Pinpoint Test Schematics and Connectors

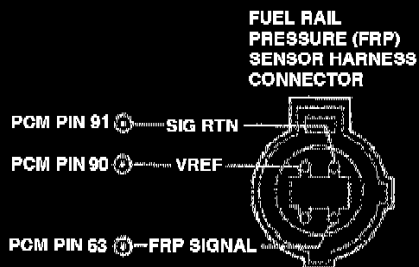
Gasoline Vehicles



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A604493-1

NG Vehicles



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AA4508-A

WARNING

VEHICLE FUEL SYSTEMS ARE PRESSURIZED EVEN WHEN THE ENGINE IS NOT RUNNING. TO AVOID FIRE OR PERSONAL INJURY, DISABLE THE FUEL DELIVERY SYSTEM AND RELIEVE FUEL SYSTEM PRESSURE BEFORE REMOVING ANY FUEL SYSTEM COMPONENT.

REFER GASOLINE VEHICLES TO SECTION HC, NATURAL GAS SECTION HB

DD: Fuel Rail Pressure (FRP) Sensor**DD****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 volts?

Yes	No
KEY OFF. For NG vehicles: GO to <u>DD2</u> . Gasoline: Fault is present, GO to <u>DD3</u> .	Fault is intermittent. Gasoline: GO to <u>DD13</u> . NG: GO to <u>DD14</u> .

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 <u>DD3</u> .	GO to <u>HB1</u> .

DD1 - DD2

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 DD25.

- Key ON, engine OFF.
- Access FRP V PID.

Is the FRP V PID voltage greater than 4.6 volts?

Yes	No
No starts: GO to <u>DD5</u>	GO to <u>DD4</u> .
All others: REPLACE FRP sensor.	
Note: Refer to fuel system WARNING text at the beginning of this section.	

DD4 CHECK VREF VOLTAGE TO FRP SENSOR

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

Is the voltage between 4.0 and 6.0 volts?

Yes	No
Key OFF. GO to <u>DD5</u> .	GO to <u>C1</u> .

DD5 CHECK FRP 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 FRP circuit between PCM harness connector pin and FRP sensor harness connector.

Is the resistance less than 5.0 ohms?

Yes	No
GO to DD6 .	REPAIR open circuit.

DD6 CHECK FRP CIRCUIT FOR SHORTS TO SIG RTN AND PWR GND IN HARNESS

- 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 (-) terminal.

Are both resistances greater than 10K ohms?

Yes	No
No starts: GO to HB19 All others: REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

DD7 DTC P0193: CHECK FUEL PRESSURE PID VALUE

- Key ON.
- Access FRP V PID.

Is the FRP voltage PID greater than 4.5 volts for NG and 4.8 volts for all others?

Yes	No
Key OFF. Gasoline: GO to <u>DD8</u> . NG: GO to <u>DD9</u> .	Fault is intermittent. GO to <u>DD15</u> .

DD8 CHECK FUEL RAIL PRESSURE SENSOR FOR FUEL LEAKS

- Remove vacuum hose from fuel rail pressure sensor.
- Inspect sensor and hose for fuel.

Is fuel present?

Yes	No
REPLACE FRP sensor. Note: Refer to fuel system WARNING text at the beginning of this section.	GO to <u>DD10</u> .

DD9 CHECK FUEL PRESSURE (NATURAL GAS)

- Install fuel pressure gauge.
- Key ON, engine RUNNING.
- Obtain a pressure reading.

Is the fuel pressure reading greater than 1034 kPa (150 psi)?

Yes	No
Key OFF. GO to <u>HB1</u> .	Key OFF. GO to <u>DD10</u> .

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 DD25.

Is the FRP V PID voltage less than 0.2 volt?

Yes	No
Key OFF. REPLACE FRP sensor.	Key OFF. GO to <u>DD12</u> .
Note: Refer to fuel system WARNING text at the beginning of this section.	

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	No
Key OFF.	Key OFF. GO to <u>DD12</u> .
Gasoline:	
GO to <u>DD13</u> .	
NG:	
GO to <u>DD14</u> .	

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	No
Gasoline: GO to <u>DD13</u> . NG: GO to <u>DD14</u> .	REPAIR open circuit.

DD13 CHECK FRP VOLTAGE PID DURING FUEL RAIL PRESSURE RELIEF (GASOLINE)

- Disable inertia fuel shutoff switch.
- Connect PCM.
- Connect FRP sensor.
- Key ON.
- Access the FRP V PID while cranking the engine to relieve the fuel rail pressure. FRP voltage will decrease as the fuel rail pressure drops and will stabilize when the fuel rail pressure reaches atmospheric pressure.
- Monitor FRP voltage level.

After FRP voltage PID stabilizes is voltage between 0.3 and 0.7 volts DC?

Yes	No
For continuous memory DTC P0190 only: GO to <u>DD16</u> . For DTC P0192: REPLACE PCM (refer to Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	DTC P0193: GO to <u>DD15</u> . Key OFF. REPLACE FRP sensor. Note: Refer to fuel system WARNING text at the beginning of this section.

DD14 CHECK FRP VOLTAGE PID AFTER FUEL RAIL PRESSURE RELIEF (NATURAL GAS)

- Connect PCM.
- Connect FRP sensor.
- Key ON engine running.
- Access the FRP voltage PID and monitor voltage.
- Disconnect FRP sensor.
- Disable inertia fuel shutoff switch.

Note: Engine will reduce the fuel pressure then stall.

- Crank engine for 6 seconds to insure complete fuel pressure relief.
- Connect FRP sensor.
- Access FRP voltage PID and monitor voltage.

Is FRP voltage between 0.4 and 0.6 volts DC?

Yes	No
For continuous memory DTC P0190 only: GO to <u>DD16</u> . For DTC P0192: <u>REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).</u>	DTC P0193: GO to <u>DD15</u> . Key OFF. REPLACE FRP sensor. Note: Refer to fuel system WARNING text at the beginning of this section.

DD15 CHECK FRP CIRCUIT FOR SHORT TO VREF OR 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 10K ohms?

Yes	No
<u>REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).</u>	REPAIR short circuit.

DD16 PERFORM WIGGLE TEST ON 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 .

DD17 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 [Section 4](#)

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 DD18 .	REMOVE pressure gauge. GO to HC1 for gasoline or GO to HB1 for NG vehicles.

DD18 CHECK FUEL PRESSURE WITH FRP PID

- Connect scan tool.
- Install fuel pressure gauge.
- Key ON.
- Access FRP PID.

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

Yes	No
For DTCS P1168 or P1169: Clear the DTCs. DRIVE vehicle 3-5 minutes at a steady speed state. CHECK for Continuous Memory DTC P1168 or P1169. If P1168 or P1169 is displayed, GO to <u>DD19</u> .	NG: GO to <u>DD19</u> . Gasoline: GO to <u>DD20</u> .
For DTC P0191 in Continuous Memory only: GO to <u>DD16</u> .	
All others: RERUN Quick Test.	

DD19 VERIFY FUEL RAIL SOLENOID SHUT-OFF VALVE OPERATES

- Key ON.
- Access and enter the Output Test Mode.
- Cycle output ON and then OFF several times.

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

Yes	No
Key OFF. EXIT Output Test Mode. RECONNECT solenoid valve. GO to <u>DD20</u> .	Key OFF. GO to <u>DD23</u> .

DD20 CHECK VREF VOLTAGE TO FRP SENSOR

- Disconnect FRP sensor.
- Key ON, engine OFF.
- Measure voltage between VREF and SIG RTN circuits at the FRP sensor harness connector.

Is the voltage reading between 4.0 and 6.0 volts?

Yes	No
Key OFF. GO to DD21 .	GO to C1 .

DD21 CHECK FRP CIRCUIT RESISTANCE

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

- Disconnect PCM.
- Measure resistance of FRP circuit between PCM harness connector pin and the 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	No
GO to DD22 .	REPAIR as necessary.

DD22 MONITOR FRP V PID WITH SCAN TOOL

- Connect PCM.
- 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. Note: Refer to fuel system WARNING text at the beginning of this section.	REPLACE PCM (refer to Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).

DD23 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 DD24 .	Key OFF. REPAIR open circuit.

DD24 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.
Note: Refer to fuel system WARNING text at the beginning of this section.	

DD25 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 DD26 .	VREF is out of range. GO to C1 .

DD26 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 (-) terminal.

Is the resistance greater than 10K ohms?

Yes	No
REPLACE PCM (refer to Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	REPAIR short circuit.

DD26

Test DF: Vehicle Speed Circuit Check

DF: Vehicle Speed Circuit Check Introduction

DF

Note

This Pinpoint Test is intended to diagnose the following:

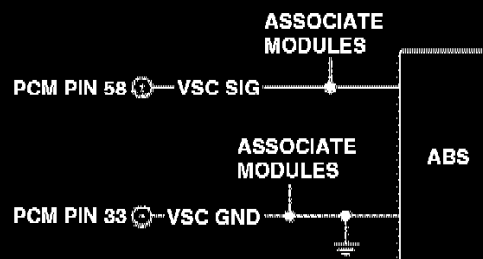
- Harness circuits: vehicle speed circuit signal (VSC SIG), vehicle speed circuit ground (VSC GND)
- Powertrain control module (PCM) (12A650)

For additional information on the Anti-Lock Brake System and its circuits, refer to **Brake System, Anti-Lock** in the Workshop Manual and Wiring Diagram Manual.

Pinpoint Test Schematic and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware.

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



A0051374

DF Introduction

DF: Vehicle Speed Circuit Check**DF****DF1 DTC P0500/P0501/P1502: CEHCK VEHICLE SPEED CIRCUIT FOR INTERMITTENT CONCERNS**

- Powertrain control module (PCM) detected an error in the vehicle speed information received from the anti-lock brake system (ABS) control module. This test step checks for recurrence of this vehicle speed error.
- Key on.
- Connect scan tool.
- Clear all DTCs.
- Obeying all local traffic laws, complete the following drive cycle :
 - Take the vehicle to a suitable location and gradually increase the vehicle speed to 80 km/h (50 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.

Is DTC P0500, P0501 or P1502 present?

Yes	No
KEY OFF. The vehicle speed input was not as expected. GO to <u>DF2</u> .	KEY OFF. The vehicle speed input was as expected. The fault that produced the original DTC may be intermittent. GO to <u>DF5</u> .

DF2 CHECK VSC FOR SHORT TO POWER IN HARNESS

- Disconnect PCM.
- Disconnect ABS module.
- Key on.
- Measure voltage between VSC SIG circuit at PCM harness connector and ground.
- Measure voltage between VSC GND circuit at PCM harness connector and ground.
- Key off.

Was voltage(s) less than 1.0 volt?

Yes	No
GO to <u>DF3</u> .	GO to <u>DF6</u> .

DF1 - DF2

DF3 CHECK FOR OPEN VSC BETWEEN PCM AND ABS CONTROL MODULE

- Measure resistance of VSC circuit between PCM harness connector pin and the ABS module harness 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 Control, Section 206 in the Workshop Manual, 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 Section 2, 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 ABS module.
 - Loose harness connection of vehicle speed circuits at the PCM.
 - Incorrect harness routing of vehicle speed circuits.

Note: Refer to Wiring Diagrams Manual 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 Control, Section 206 in the Workshop Manual, for diagnosis of intermittent control module and wheel speed sensor concern.

DF6 VERIFY IF VSC IS SHORTED IN HARNESS OR ANOTHER MODULE

- Determine which, if any, modules are connected to the VSC (Refer to Wiring Diagrams Manual). 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 Workshop Manual 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 Section 4, Powertrain <u>Diagnostic Trouble Code (DTC) Charts</u> .	Testing is complete. The repair has been verified.

DF7

Test DG: Knock Sensor (KS)

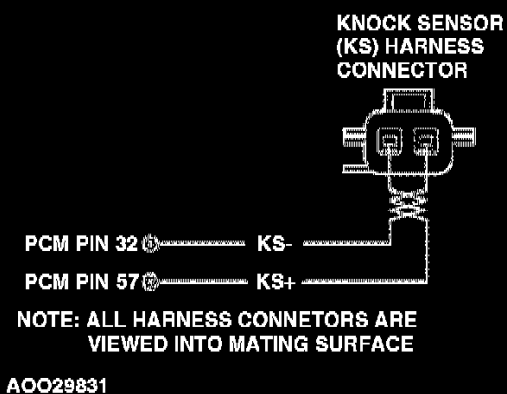
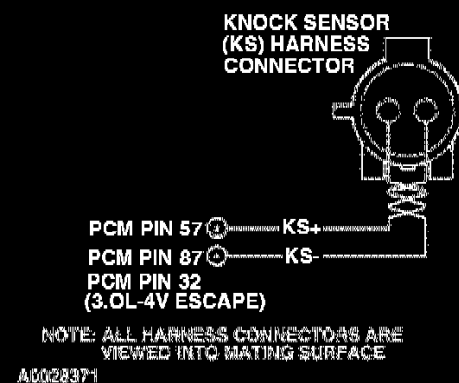
DG: Knock Sensor (KS)**Introduction****DG****Note**

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

For PCM connector views, refer to Section 1, Powertrain Control Hardware.

3.0L-4V Taurus/Sable**DG Introduction 1 Of 6****3.0L-4V Escape, 2.0L-2V Escort, 2.0L-2V Focus****DG Introduction 2 Of 6**

4.6L-4V Mustang

**BANK 1
CYL 1-4
KNOCK SENSOR
(KS) HARNESS
CONNECTOR**

PCM PIN 57  KS+
PCM PIN 32  KS-

**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE** AA4811-A

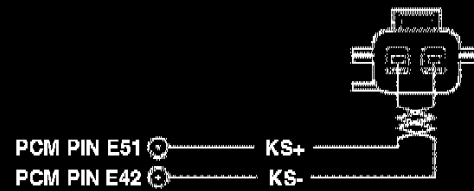
**BANK 2
CYL 5-8
KNOCK SENSOR
(KS) HARNESS
CONNECTOR**

PCM PIN102  KS+
PCM PIN 23  KS-

**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**
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LS/Thunderbird

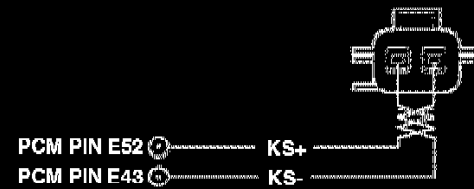
**BANK 1
CYL 1-4
KNOCK SENSOR
(KS) HARNESS
CONNECTOR**



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

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**BANK 2
CYL 5 - 8
KNOCK SENSOR
(KS) HARNESS
CONNECTOR**

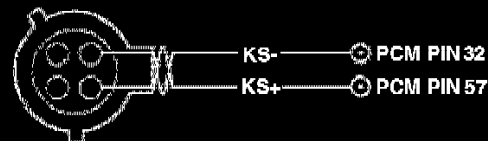


**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

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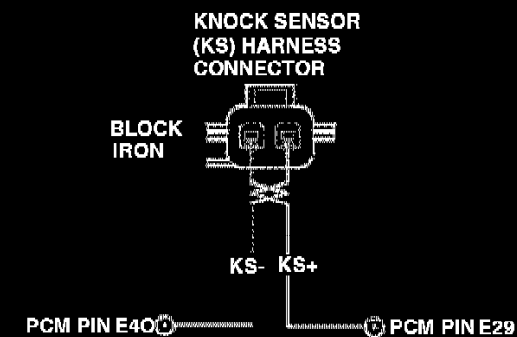
Marauder

**KNOCK SENSOR
(KS) HARNESS
CONNECTOR**



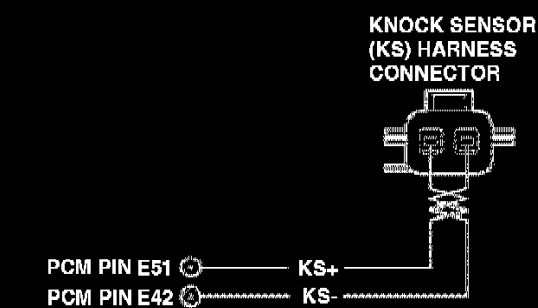
**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

AOO52O37

4.6L IRON BLOCK Expedition, ALL BLOCK 5.4L Expedition/Navigator

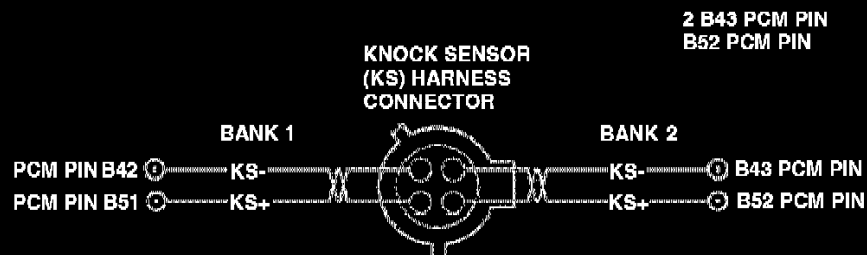
AOO52052

LS6



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AOO52035

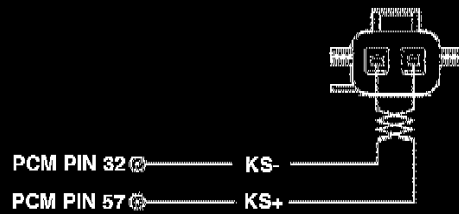
Aviator, Explorer 4.6L SOHC, 4.6L Expedition with aluminum block

AOO52036

PCM CONNECTOR PIN NUMBERS

PCM TYPE	KS- Bank 1	KS+ Bank 1	KS- Bank 2	KS+ Bank 2
122 Pin	E43	E29	E39	E28
150 Pin	E42	E51	E43	E52
150 Pin Expedition	B40	B29	B39	B28

All Others

KNOCK SENSOR
(KS) HARNESS
CONNECTOR

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AOO29831

DG: Knock Sensor (KS)**DG****DG1 CHECK KS SENSOR RESISTANCE**

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

- Verify that KS is connected and installed properly. Then complete comprehensive repair verification drive cycle. Refer to Section 2, **Drive Cycles**.
- Disconnect KS, measure resistance through the KS harness connector pins

Is resistance between 4.39 and 6.35 megohms?

Yes	No
GO to DG2	For resistance less than 4.39 megohm: GO to DG3

DG2 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 Section 2, Drive Cycles)

DG1 - DG2

DG3 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 DG4	SERVICE short circuit. COMPLETE Comprehensive Component Repair Verification Drive Cycle. (REFER to Section 2, Drive Cycles .)

DG4 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	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). COMPLETE Comprehensive Component Repair Verification Drive Cycle. (REFER to Section 2, Drive Cycles .) For Continuous DTC'S GO to DG5	SERVICE short circuit. COMPLETE Comprehensive Component Repair Verification Drive Cycle. (Refer to Section 2, Drive Cycles .)

DG3 - DG4

DG5 CHECK KS CIRCUIT FOR INTERMITTANT FAULT

- Key off.
- Measure the resistance for KS+ between the PCM and KS harness connectors, while viewing the ohm meter, 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.
- Measure the resistance for KS- between the PCM and KS harness connectors, while viewing the ohm meter, 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.

Are the resistance readings changing?

Yes	No
ISOLATE fault and SERVICE as required. COMPLETE Comprehensive Component Repair Verification Drive Cycle. (REFER to Section 2, Drive Cycles.)	GO to DG6

DG6 CHECK INTERNAL PCM RESISTANCE

- Disconnect knock sensor (KS) harness connector.
- Measure resistance between KS+ and KS- pins through the harness connector.

Is resistance greater than 10,000 ohms?

Yes	No
REPLACE KS. If concern is still present, REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). COMPLETE Comprehensive Component Repair Verification Drive Cycle. (REFER to Section 2, Drive Cycles .)	REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). COMPLETE Comprehensive Component Repair Verification Drive Cycle. (REFER to Section 2, Drive Cycles .)

DG5 - DG6

Test DH: Throttle Position (TP) Sensor

 DH: Throttle Position (TP) Sensor
 Introduction

DH

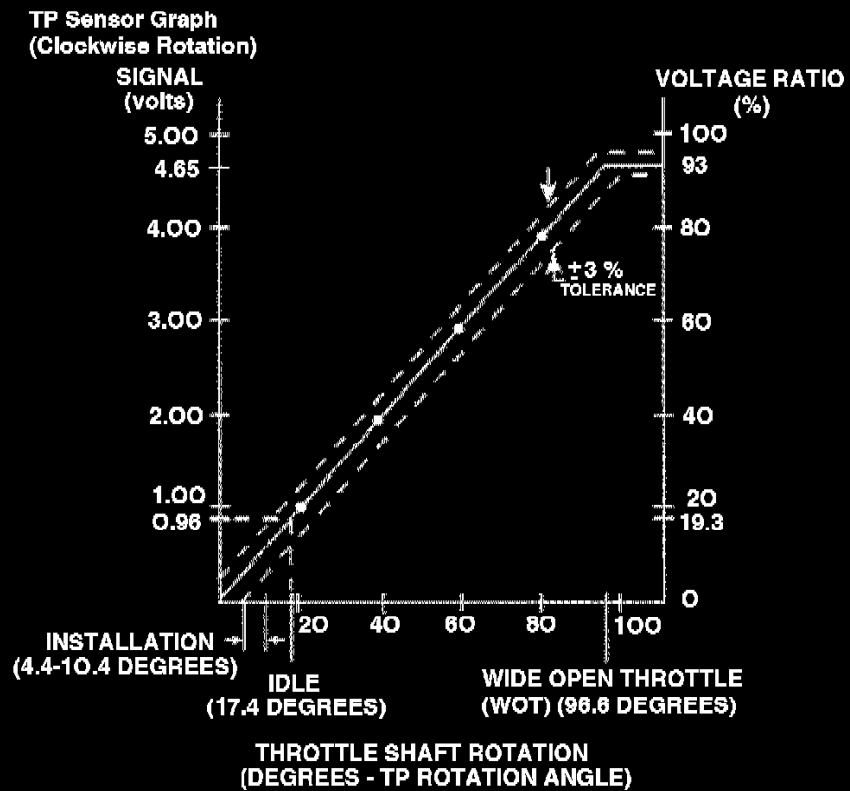
Note

This Pinpoint Test is intended to diagnose the following:

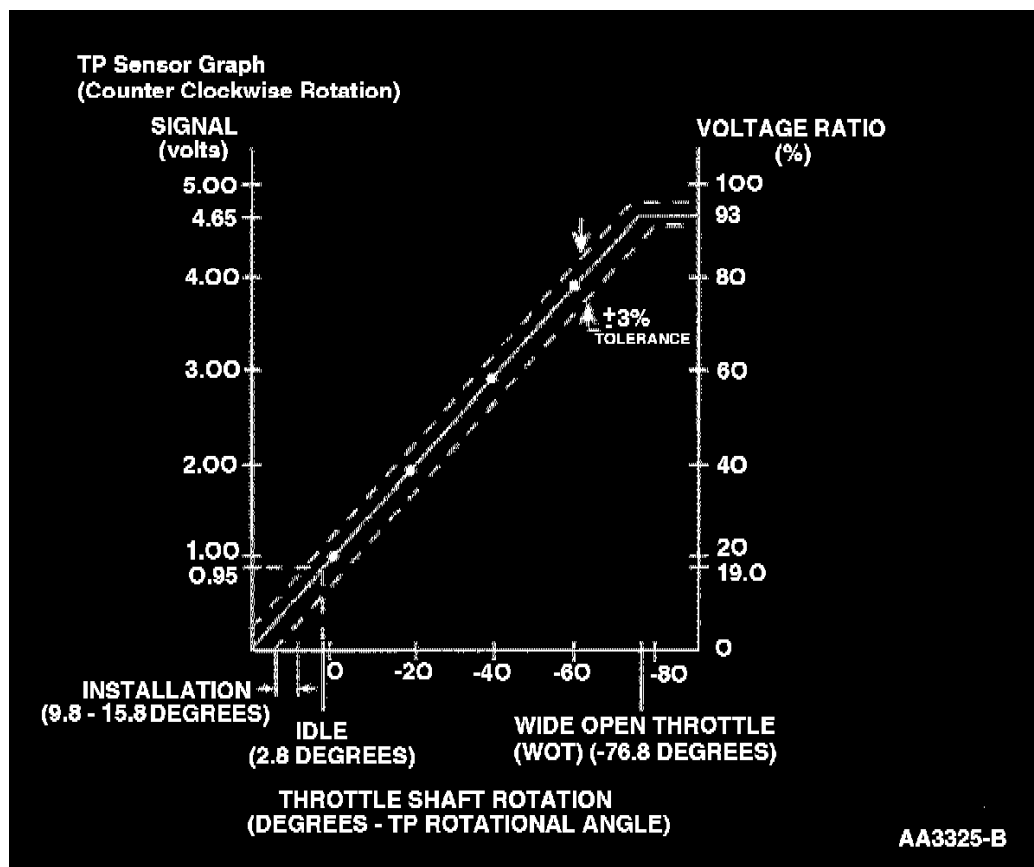
- Throttle Position (TP) Sensor (9B989)
- Binding and sticking Throttle Linkage
- Harness Circuits: TP, SIG RTN, VREF, Vehicle Power (VPWR), Power Ground (PWR GND)
- Powertrain Control Module (PCM) (12A650)

Graphs

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



AA3324-B

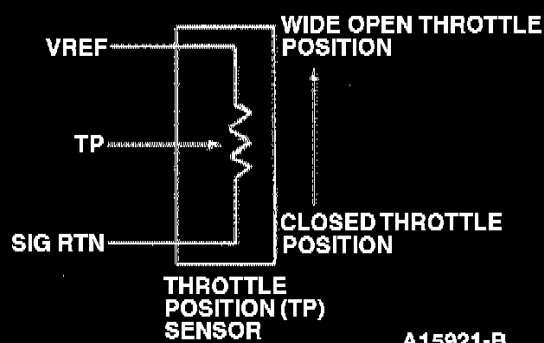


DH Introduction 3 Of 6

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware

Contacting TP Sensor



DH Introduction 4 Of 6

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

PCM PIN 91 ♂ — SIG RTN

PCM PIN 89 ♂ — TP

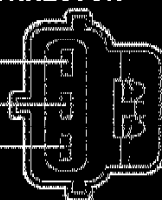
PCM PIN 90 ♂ — WREF

**AOO52901****2.0L (4V) Focus, 2.3L Ranger, 2.3L Focus****THROTTLE
POSITION (TP)
SENSOR HARNESS
CONNECTOR**

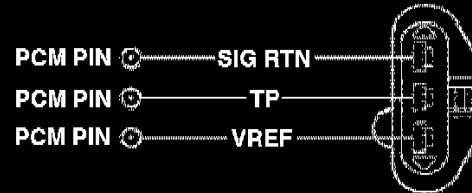
PCM PIN ♂ — SIG RTN

PCM PIN ♂ — TP

PCM PIN ♂ — VREF

**AOO61749****PCM CONNECTOR PIN NUMBERS**

PCM TYPE	VREF	TP	SIG RTN
104 PIN	90	89	91
150 PIN	E40	E19	E41

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

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

AO051372

PCM CONNECTOR PIN NUMBERS

PCM TYPE	VREF	TP	SIG RTN
104 PIN	90	89	91
122 PIN	B36	B44	B25
150 PIN	E20	E57	E17

DH: Throttle Position (TP) Sensor**DH****DH1 KOEO AND KOER DTC P1124: CHECK FOR OTHER DTCS**

- Check for DTC P1400 or P0405 in KOEO or KOER Self-Test.

Is KOEO or KOER DTC P1400 or P0405 present with KOEO DTC P1124?

Yes	No
RETURN to Section 4, Powertrain Diagnostic Trouble Code (DTC) Charts for DTC P1400 or P0405.	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.

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 .

DH1 - DH3

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 .

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 .

DH7 - DH9

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 150 PIN PCM and 122 PCM PIN, measure to both VREF pins.)

Is each resistance greater than 10,000 ohms?

Yes	No
REPLACE PCM (refer to Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	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 <u>DH12</u> .

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 .

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

DH15 DTC P1121 OR P0068: CHECK RATIONALITY OPERATION BETWEEN TP AND MAF SENSORS

- Attempt to start engine.

Does the engine run?

Yes	No
GO to <u>DH16</u> .	CHECK for major leaks, cracks, and openings between MAF sensor and throttle body. If OK, GO to <u>A1</u> .

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 <u>DH17</u> .	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 <u>HU1</u> for air restriction. If OK, REPLACE the TP sensor.	GO to <u>DH18</u> .

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	No
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.	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	No
INSPECT the TP sensor connector. If OK, REPLACE the TP sensor.	KEY OFF. GO to DH21 .

DH18 - DH20

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	No
ISOLATE and REPAIR as necessary.	Unable to duplicate or identify fault at this time. GO to <u>Z1</u>

DH22 DTC P0121: 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
INSPECT cable(s). REPAIR as necessary. RERUN Quick Test. If the DTC P0121 is still present, GO to <u>DH23</u> .	REPLACE throttle body assembly.

DH21 - DH22

DH23 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.

DH23

Test DJ: Air Conditioning Evaporator Temperature (ACET) Sensor

DJ: Air Conditioning Evaporator Temperature (ACET) Sensor
Introduction

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	3.26	37.34
10	50	3.73	58.99
0	32	4.14	95.85
-10	14	4.45	160.31
-20	-4	4.66	276.96

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

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware.

Taurus/Sable

A/C EVAPORATIVE TEMPERATURE (ACET) SENSOR HARNESS CONNECTOR



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE
AOO42254

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

All others

A/C EVAPORATIVE TEMPERATURE (ACET) SENSOR HARNESS CONNECTOR



AOO51438

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

DJ: Air Conditioning Evaporator Temperature (ACET) Sensor

DJ

DJ1 DTC P1437 OR P0538: 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/P0538 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 or P0537 received?

Yes	No
REPLACE suspect sensor.	KEY OFF. REMOVE jumper wire. GO to <u>DJ2</u> .

DJ2 CHECK ACET 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 ACET circuit between PCM harness connector and ACET sensor harness connector.
- Measure resistance of SIG RTN circuit between PCM harness connector and ACET sensor harness connector.

Are both resistances less than 5.0 ohms?

Yes	No
REPLACE PCM (refer to Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	REPAIR open circuit(s).

DJ1 - DJ2

DJ4 CHECK ACET CIRCUIT FOR SHORT TO VREF IN HARNESS

- Key off.
- Disconnect PCM.
- Measure resistance between ACET and VREF circuits at the PCM harness connector.

Is resistance greater than 10,000 ohms?

Yes	No
REPLACE PCM (refer to Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	REPAIR ACET short to VREF.

DJ5 DTC P1436 OR P0537: SIMULATE OPPOSITE SIGNAL TO PCM

- Disconnect ACET sensor.
- Rerun Self-Test where P1436/P0537 was received (Key On Engine Off or Key On Engine Running).

Is P1437 or P0538 received?

Yes	No
REPLACE sensor.	GO to <u>DJ6</u> .

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 Section 2, <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u>).	REPAIR short circuit.

DJ4 - DJ6

**DJ10 CONTINUOUS MEMORY P1436/P0537 OR P1437/P0538:
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/P0537, a sudden change could indicate a short to ground. For P1437/P0538, 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 <u>Z1</u> .

DJ10**Test DK: Electronic Throttle Accelerator Position Sensor**

DK: Electronic Throttle Control (ETC) Accelerator Pedal Position (APP) Sensor Introduction

DK

Note

This Pinpoint Test is intended to diagnose the following:

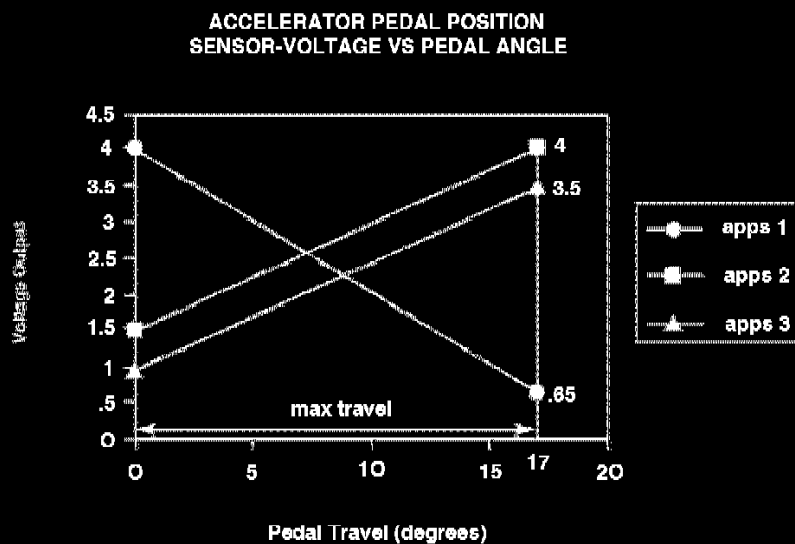
- ETC Accelerator Pedal Position (APP) Sensor (9F836) note: the APP sensor and pedal are an assembly
- Sensor harness circuits: ETCRTN, SIGRTN, ETCREF, APPS1, APPS2, APPS3
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware

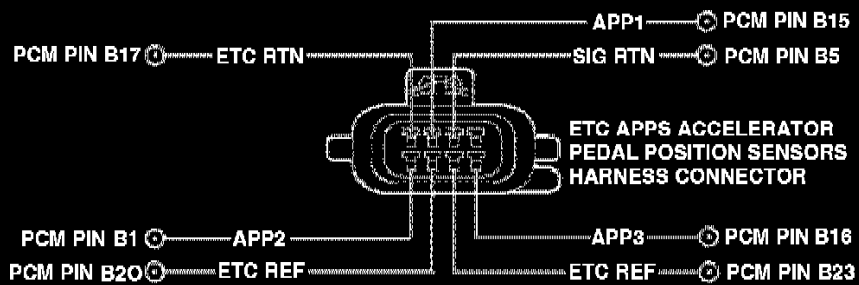
Graphs

Note: The normal range of the throttle angle measurement for the throttle position ETC (APP) sensor is 0 to 17 degrees.



A0065818

LS6/LS8, Thunderbird



A00-52665

DK Introduction 2 Of 2

DK: Electronic Throttle Control (ETC) Accelerator Pedal Position (APP)Sensor

DK

DK1 CHECK ACCELERATOR PEDAL ASSEMBLY FOR BINDING

- Note: The following steps should be taken in order due to the nature of the Electronic Throttle Control system: 1.)These DTCS effect system operation and must be repaired first: P0102, P0103, P0320, P0715, P0720, P0500, P0122, P0123, P0222, P0223, P2135, Go To Section 4. 2.)These DTCS must be repaired next due to the nature of the system: P2121, P2122, P2123, P2126, P2127, P2128, P2131, P2132, P2133, Go To DK2. 3.) If DTCS are present: P2111 or P2112, Go To DV1. 4.) DTC U300, Go To Section 4, page 16 for direction.
- Key On.
- Depress accelerator pedal slowly to the floor and release.

Does the accelerator pedal move to the floor and back without sticking?

Yes	No
KEY OFF.GO to DK2 .	KEY OFF, Isolate and repair binding, or REPLACE pedal/sensor assembly.

DK2 CHECK APPS SENSOR SIGNAL VOLTAGE RANGES

- Key on.
- Access and monitor APPS sensor 1, 2, and 3 PIDS.
- Depress accelerator pedal slowly to the floor and release.

Are the open and closed voltages within the specified table ranges?

ACCELERATOR PEDAL POSITION SENSOR SIGNAL VOLTAGES			
Pedal position	APPS1	APPS2	APPS3
CT	3.9-4.2	1.4-1.6	.8-1.1
WOT	.7-1.2	3.6-4.1	3.1-3.5

Yes	No
GO to DK9 .	For DTC group (P2121, P2122) alone, (P2126, P2127) alone, or (P2131, P2132) alone, GO to DK4 , for any combination of these DTC groups GO to DK3 .

DK1 - DK2

DK3 CHECK FOR VREF VOLTAGE AT THE APPS SENSOR HARNESS CONNECTOR

- Key Off.
- Remove APP sensor harness connector.
- Key On.
- Measure voltage between ETCREF and ETCRTN at the APPS sensor harness connector.
- Measure voltage between ETCREF and SIGTRN at the APPS sensor harness connector.
- Measure voltage between the other ETCREF and ETCRTN at the APPS sensor harness connector.
- Measure voltage between the other ETCREF and SIGRTN at the APPS sensor harness connector.

Are both voltages between 4 and 6 volts?

Yes	No
GO to <u>DK4</u>	GO to <u>C1</u> .

DK4 CHECK THE APPS SENSOR CIRCUITS FOR OPEN IN HARNESS

- For DTCS (P2121, P2122) check only APP1 circuit, for (P2126, P2127) check only APPS2 circuit, and for (P2131, P2132) check only the APPS3 circuit.
- Key Off.
- Remove PCM harness connector.
- Measure resistance of the APP1 circuit, between the APPS sensor and PCM harness connectors.
- Measure resistance of the APP2 circuit, between the APPS sensor and PCM harness connectors.
- Measure resistance for the APP3 circuit, between the APPS sensor and PCM harness connectors.

Are the resistances less than 5 ohms?

Yes	No
For any of the DTCS P2123, P2128, P2133, GO to <u>DK5</u> , for any of the DTCS P2121, P2122, P2126, P2127, P2131, P2132, GO to <u>DK7</u> .	Isolate and repair open circuit.

DK3 - DK4

DK5 CHECK APPS HARNESS FOR SIGNAL SHORT TO THE ETCREFS IN HARNESS

- Note: For DTCS (P2121, P2123) check APPS1 circuit only, for (P2126, P2128) check APPS2 circuit only, and for (P2131, P2133) check APPS3 circuit only.
- PCM and APP sensor harness connectors disconnected.
- Measure resistances between the APPS1 and the ETCREF at the APPS harness connector.
- Measure resistances between the APPS2 and the ETCREF at the APPS harness connector.
- Measure resistances between the APPS3 and the ETCREF at the APPS harness connector.
- Measure resistances between the APPS1 and the other ETCREF at the APPS harness connector.
- Measure resistances between the APPS2 and the other ETCREF at the APPS harness connector.
- Measure resistances between the APPS3 and the other ETCREF at the APPS harness connector.

Are the resistances greater than 10K?

Yes	No
GO to DK6 .	Isolate and repair short circuit.

DK6 CHECK THE APPS SENSOR CIRCUITS FOR SHORT TO PWR

- Note: For DTCS (P2121, P2123) check APPS1 circuit only, for (P2126, P2128) check APPS2 circuit only, and for (P2131, P2133) check APPS3 circuit only.
- PCM and APPS sensor harness connectors disconnected.
- Key Off.
- Measure resistance between the APPS1 and battery pwr at the APPS harness connector.
- Measure resistance between the APPS2 and battery pwr at the APPS harness connector.
- Measure resistance between the APPS3 and battery pwr at the APPS harness connector.

Are the resistances greater than 10K ohms?

Yes	No
GO to DK7	Isolate and repair short circuit.

DK5 - DK6

DK7 CHECK APPS SENSOR CIRCUITS FOR SHORT TO SIGRTN and ETCRTN

- For DTCS (P2121, P2122) check only APPS1 circuit, for (P2126, P2127) check only APPS2 circuit, and for (P2131, P2132) check only the APPS3 circuit.
- PCM and APP sensor harness connectors disconnected.
- Measure resistance between APPS1 and SIGRTN at the APPS sensor harness connector.
- Measure resistance between APPS2 and SIGRTN at the APPS sensor harness connector.
- Measure resistance between APPS3 and SIGRTN at the APPS sensor harness connector.
- Measure resistance between APPS1 and ETCRTN at the APPS sensor harness connector.
- Measure resistance between APPS2 and ETCRTN at the APPS sensor harness connector.
- Measure resistance between APPS3 and ETCRTN at the APPS sensor harness connector.

Are the resistances greater than 10K ohms?

Yes	No
For any of the DTCS P2121, P2122, P2126, P2127, P2131, P2132 GO to <u>DK8</u> . For all others GO to <u>DK8</u> .	Isolate and repair short circuit.

DK8 CHECK THE APP SENSOR CIRCUITS FOR SHORT TO GND

- For DTCS (P2121, P2122) check only APPS1 circuit, for (P2126, P2127) check only APPS2 circuit, and for (P2131, P2132) check only the APPS3 circuit.
- Key Off.
- Measure resistance between the APPS1 signal and battery gnd.
- Measure resistance between the APPS2 signal and battery gnd.
- Measure resistance between the APPS3 signal and battery gnd.

Are the resistances greater than 10K ohms?

Yes	No
GO to <u>DK9</u>	Isolate and repair short circuit.

DK7 - DK8

DK9 CHECK APPS SIGNALS FOR SHORT TO EACH OTHER IN HARNESS

- Note: For DTCS (P2104, P2121, P2126, P2131) perform only APPS1 to APPS2 check, and APPS1 to APPS3 check, and for DTCS (P2104), perform only APPS2 to APPS3 check.
- PCM and APP sensor harness connectors disconnected.
- Measure resistances between the APPS1 and APPS2 at the APPS harness connector.
- Measure resistances between the APPS1 and APPS3 at the APPS harness connector.
- Measure resistances between the APPS2 and APPS3 at the APPS harness connector.

Are the resistances greater than 10K?

Yes	No
GO to DK10 .	Isolate and repair short circuit.

DK10 CHECK APPS SENSOR FOR PROPER RESISTANCE THROUGH SENSOR

- PCM and APPS sensor harness connectors disconnected.
- Measure resistances between ETCREF and ETCRTN through the (APP) sensor, with the accelerator pedal in the "up" position..
- Measure resistances between the APPS1 and ETCRTN through the (APP) sensor.
- Measure resistances between the APPS2 and ETCRTN through the (APP) sensor.
- Measure resistances between the APPS3 and ETCRTN through the (APP) sensor.

Are the resistances within the chart ranges below?

PEDAL POSITION SENSOR CIRCUIT RESISTANCES (OHMS)				
Pedal/Throttle position	ETCREF to ETCRTN	APPS1 to ETCRTN	APPS2 to ETCRTN	APPS3 to ETCRTN
Closed Throttle	700 -1600	1600 - 3600	1600 - 3600	1300 - 3200

Yes	No
GO to DK11 .	For KOEO or KOER DTCS replace APP sensor. For Continuous DTCS, GO to DK11 .

DK11 CHECK APPS SENSOR FOR VOLTAGE SPIKES DURING OPERATION

- Connect PCM and APP sensor harness connectors.
- Key On.
- Access and monitor APPS1 PID.
- Access and monitor APPS2 PID.
- Access and monitor APPS3 PID.
- Depress accelerator pedal slowly and release.

Do the PID'S display a smooth voltage reading during the entire pedal travel?(No voltage spikes)

Yes	No
GO to <u>DK12</u> .	REPLACE APP sensor.

DK12 CHECK APP SENSOR FOR INTERMITTENT SIGNAL

- Start engine and bring to idle.
- Run throttle up to 1500 rpm for 5 seconds.
- Access APP sensor 1 PID, and monitor for a fault indication while completing the following: Lightly tap on he APP sensor, and wiggle the harness connector to simulate road shock.(repeat procedure for APP sensor 2 and 3 PIDS)

Are any of the PID voltages below the minimum (.7), or above the maximum (4.2)?

Yes	No
Inspect APP sensor harness connector, if OK, Replace APP sensor.	GO to <u>DK13</u> .

DK11 - DK12**DK13 CHECK APP SENSOR HARNESS FOR INTERMITTENT OPENS OR SHORTS**

- Key on, engine off.
- Access APP sensor 1 PID, and monitor for a fault indication while completing the following: Grasp the vehicle harness closest to the APP sensor connector. Shake and bend a small section of the harness all the way from the dash panel to the PCM.(repeat procedure for APP sensor 2 and 3 PIDS)

Are any of the PID voltages below the minimum (.7), or above the maximum (4.2)?

Yes	No
Isolate and repair as necessary.	Unable to identify a fault,GO to <u>Z1</u> . If Z1 does not identify a fault, (refer to Section 2), <u>Flash Electrically Erasable Programmable Read Only Memory (EEPROM)</u> . Replace PCM.

DK13

Test DL: Cylinder Head Temperature (CHT) Sensor

DL: Cylinder Head Temperature (CHT) Sensor Introduction

DL

Note

This Pinpoint Test is intended to diagnose the following:

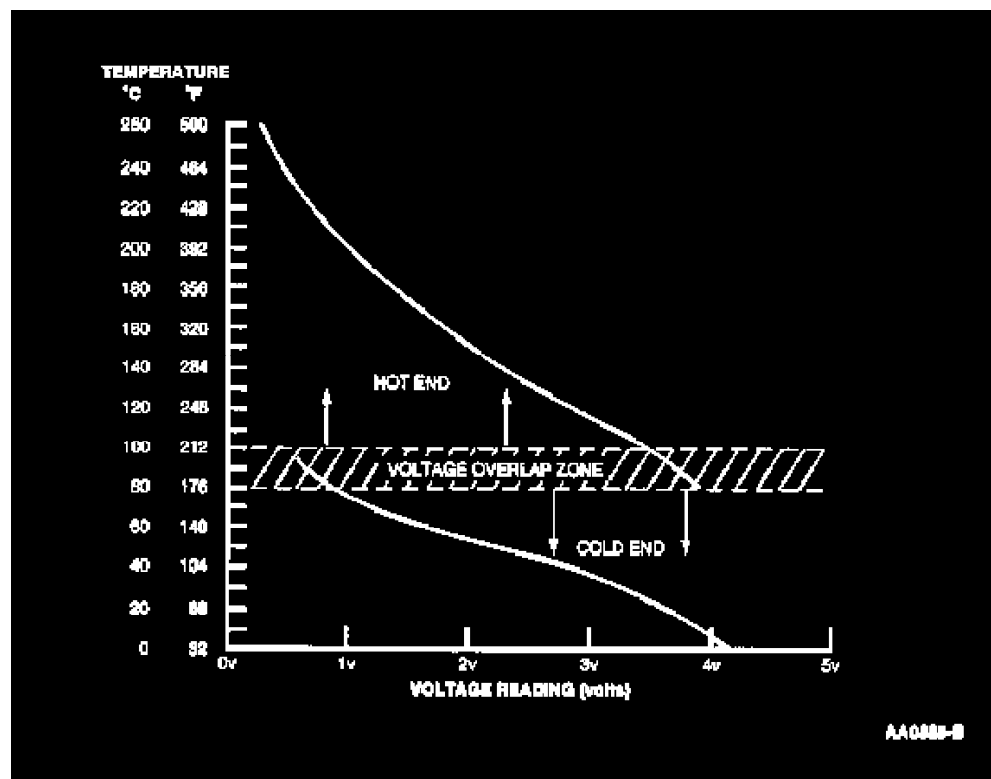
- Cylinder head temperature (CHT) sensor (6G004)
- (Marauder Only) Engine coolant temperature (ECT) sensor (12A648)
- Harness circuits: CHT, VREF, and SIG RTN
- Powertrain control module (PCM) (12A650)

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.

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

DL INTRODUCTION 1 Of 6



DL INTRODUCTION 2 Of 6

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
60	140	1.36	—	7.487

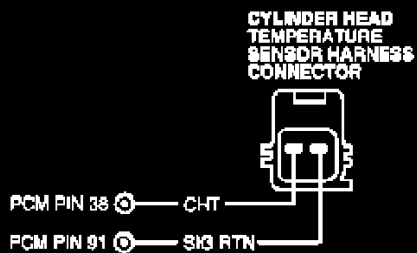
DL INTRODUCTION 3 Of 6

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

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware.

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

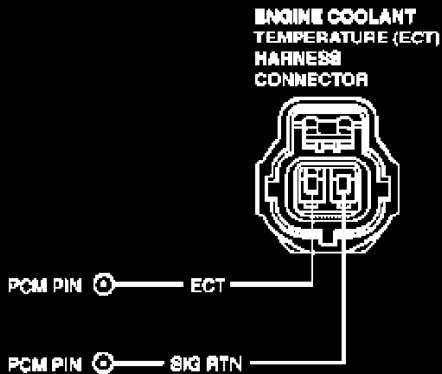


NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0027515

MARAUDER ONLY

Note: Marauder Only - An ECT (Engine Coolant Temperature) sensor is used in place of the CHT sensor. However, internal PCM logic for DTCs and PIDs still references the ECT sensor as a CHT sensor. The ECT sensor is located in the water crossover near the passenger side cylinder head. During this pinpoint please reference the ECT sensor/circuit when asked to disconnect, measure or service the CHT sensor or circuit.



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0030850

PCM CONNECTOR PIN NUMBERS

PCM TYPE	ECT	SIG RTN
104 PIN	66	91

All Others**CYLINDER HEAD
TEMPERATURE
SENSOR HARNESS
CONNECTOR**PCM PIN  — CHTPCM PIN  — SIG RTN**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE****ADD38053****PCM CONNECTOR PIN NUMBERS**

PCM TYPE	CHT	SIG RTN
104 PIN	66	91
122 PIN	E45	E25
150 PIN	E40	E17

DL INTRODUCTION 6 Of 6

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

DL**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
For LS6/LS8 and Thunderbird with Electronic Throttle Control: GO to DL3 . All Others: 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 .

DL1 - DL2

DL3 CHECK RESISTANCE OF CYLINDER HEAD TEMPERATURE SENSOR WITH ENGINE OFF

Note: IMPORTANT Marauder Only - See pinpoint introduction for ECT\CHT information.

- 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 Section 3 , Symptom Charts.	REPLACE temperature sensor.
All others, GO to DL4 .	

DL4 CHECK RESISTANCE OF CHT SENSOR WITH ENGINE RUNNING

Note: IMPORTANT Marauder Only - See pinpoint introduction for ECT\CHT information.

Note: Verify that engine is at operating temperature before taking 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPLACE temperature sensor.

DL3 - DL4

DL5 DTC P1289 OR P1290: ACCESS CHT PID AND CHECK VOLTAGE

Note: IMPORTANT Marauder Only - See pinpoint introduction for ECT\CHT information.

- 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 <u>DL7</u> .

DL6 CHECK FOR GROUNDED CIRCUIT

Note: IMPORTANT Marauder Only - See pinpoint introduction for ECT\CHT information.

- Disconnect CHT sensor.
- Key on.
- Access CHT V PID.

Is the CHT V PID more than 4.6 volts?

Yes	No
REPLACE temperature sensor.	GO to <u>DL21</u> .

DL5 - DL6

DL7 CHECK FOR OPEN HARNESS

Note: IMPORTANT Marauder Only - See pinpoint introduction for ECT\CHT information.

- 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 temperature 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuits.

**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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short to VREF.

DL11 - DL12

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.	For LS6/LS8 and Thunderbird with Electronic Throttle Control: GO to DL22 . All Others: 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 .

DL20 - DL21**DL22 CHECK CHT SIGNAL CIRCUIT FOR SHORT TO GROUND**

Note: IMPORTANT Marauder Only - See pinpoint introduction for ECT\CHT information.

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

DL22

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.



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; STEAM AND HOT LIQUID CAN COME OUT FORCEFULLY WHEN THE CAP IS LOOSENED SLIGHTLY.

Note: If electric cooling fan does not operate, return to Section 3 for electric cooling fan DTC or symptom diagnosis.

Is cooling system OK?

Yes	No
CHECK CHT sensor operation. GO to DL3	REPAIR as necessary. REFER to Engine Cooling, Section 303 in the Workshop Manual for symptom diagnosis of Engine Overheats or Loss of Coolant.

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.

Was PCM Quick Test performed prior to entering this Pinpoint Test?

Yes	No
No Diagnostic Trouble Codes (DTCs) received during PCM Quick Test. GO to DL41 .	GO to Section 3 and RERUN Quick Test. REPAIR any DTCs as necessary.

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 Workshop manual 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 Section 2, 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 Cluster, Section 413 in the Workshop Manual for further diagnosis.

**DL80 P0116: CHECK TEMPERATURE SENSOR RESISTANCE
WITH ENGINE OFF**

Note: **IMPORTANT Marauder Only - See pinpoint introduction for ECT\CHT information.**

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 Section 4 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 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 Section 2, Drive Cycles). Retest if necessary.	REPLACE suspect sensor.

DL90 DTCS P0117, P0118, P1117, P1289 OR P1290: INTERMITTENT CHECK

Note: IMPORTANT Marauder Only - See pinpoint introduction for ECT\CHT information.

- Connect scan tool.
- Key on.
- Access CHT V PID.
- While observing the PID, complete the following:
 - Tap on the sensor to simulate road shock.
 - Wiggle the sensor connector.

Is there any large changes in the voltage reading?

Yes	No
Key off. DISCONNECT and INSPECT connectors. If OK, REPLACE sensor. COMPLETE OBDII Drive Cycle to verify repair (REFER to Section 2, Drive Cycles).	GO to DL91 .

DL91 CHECK ELECTRONIC ENGINE CONTROL (EC) WIRING HARNESS

- Again access CHT V 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 changes in the voltage reading?

Yes	No
ISOLATE fault. REPAIR as necessary. COMPLETE OBDII Drive Cycle to verify repair (REFER to Section 2, Drive Cycles).	GO to DL92 .

DL92 CHECK PCM AND VEHICLE HARNESS CONNECTOR

- Disconnect PCM.
- Disconnect temperature sensor.

Are connectors and terminals OK?

Yes	No
Fault is not present at this time. COMPLETE OBDII Drive Cycle (REFER to Section 2, Drive Cycles).	REPAIR as necessary. COMPLETE OBDII Drive Cycle to verify repair (REFER to Section 2, Drive Cycles).

**DL100 DTC P1299 OR P0217 INDICATES AN ENGINE OVERHEAT
CONDITION OCCURRED**

Note: Refer to Section 4 , 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; STEAM 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	No
REFER to Engine Cooling, Section 303 in the Workshop Manual for symptom, Engine Overheats.	REFER to Engine Cooling, Section 303 in the Workshop Manual for symptom, Loss of Engine Coolant.

DL110 DTC P0125, P0128: CHECK ENGINE COOLANT LEVEL

Diagnostic Trouble Code (DTC) P0125 or P0128 indicates the engine coolant temperature has not achieved the required engine operating temperature level, since engine start-up within a specified amount of time.

Possible causes:

- Insufficient warm up time.
- Leaky or stuck open thermostat.
- Low engine coolant level.
- Malfunctioning CHT sensor.
- Malfunctioning ECT sensor (Marauder Only).



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; STEAM 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	No
GO to Engine Cooling, Section 303 in the Workshop Manual for further diagnostics.	FILL engine coolant to proper level. Complete Comprehensive Component Monitor Repair Verification Drive Cycle (Refer to Section 2 , Drive Cycles).

DL110

Test DM: MAP And Thermal MAP Sensors

DM: Manifold Absolute Pressure (MAP) Sensor and Thermal
Manifold Absolute Pressure (TMAP) Sensor
Introduction

DM

Note

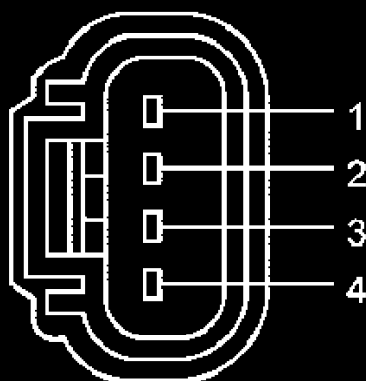
This pinpoint test is intended to diagnose the following:

- TMAP sensor (9F479)
- DPFE with integrated MAP (DPFE/MAP) sensor (9J460)
- Harness circuits: MAP, SIG RTN, and VREF
- Powertrain Control Module (PCM) (12A650)

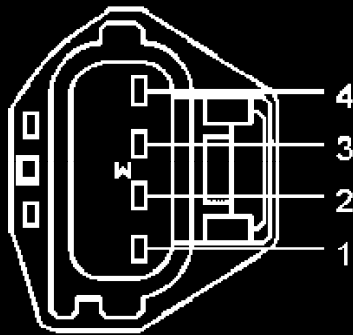
Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware.

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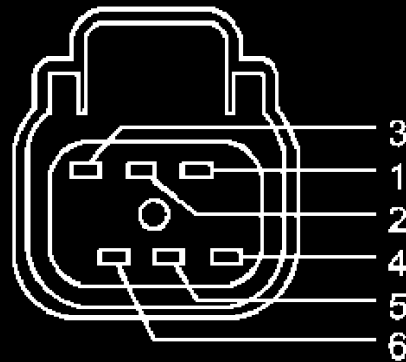


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Vehicle	Connector	Circuit	Pin
Mustang	A	MAP	1
		SIGRTN	4
		VREF	2
All other vehicles	B	MAP	4
		SIGRTN	1
		VREF	3

DM INTRODUCTION 2 OF 3

EGR System Module (ESM) Connector**A0077577**

Circuit	Pin
VPWR (Power supply)	4
MAP (Manifold absolute pressure sensor)	3
SIGRTN (Signal return)	6
VREF (Reference Voltage)	2

DM: Manifold Absolute Pressure (MAP) Sensor and Thermal Manifold Absolute Pressure (TMAP) Sensor

DM

DM1 DETERMINE COMPONENT TYPE

Is the vehicle equipped with ESM (EGR System Module) type EGR?

Yes	No
GO to DM2 .	GO to DM17 .

DM2 MONITOR MAP_V PID

- Key ON Engine RUN.
- Perform KOER Self-Test.
- Access the PCM-MAP_V PID using a scan tool.

Is the Voltage between 0.05 V - 4.95 V?

Yes	No
Verify PCM is at the latest at the latest calibration level. REPROGRAM if necessary.	KEY OFF.
Otherwise, fault is not present at this time.	GO to DM3 .

DM3 VERIFY HARNESS AND CONNECTOR INTEGRITY

- ESM connector disconnected.
- Perform a thorough visual inspection of the connector, pins and wires attaching to the pins.
- ESM connector connected.

Are there any concerns with the wiring or the ESM connection?

Yes	No
REPAIR as necessary.	GO to DM4 .

DM1 - DM3

DM4 MONITOR MAP_V PID

- Key ON Engine OFF.
- Perform KOEO Self-Test.
- Access the PCM-MAP_V PID using a scan tool.

Is the Voltage between 0.05 V - 4.95 V?

Yes	No
Fault is not present at this time	GO to DM5 .

DM5 DETERMINE PRESENT MAP_V PID VOLTAGE

- Access the PCM-MAP_V PID using a scan tool.

Is the Voltage below 0.05 V?

Yes	No
GO to DM6 .	GO to DM9 .

DM6 KOEO AND KOER DTC P0107: CHECK VOLTAGE BETWEEN VREF AND SIGRTN AT ESM SENSOR

- ESM connector disconnected.
- Key ON Engine OFF.
- Measure the Voltage between:

(+)ESM Connector, Harness Side	(-)ESM Connector, Harness Side
VREF - Pin 2	SIGRTN - Pin 6

-

Is the Voltage between 4 V - 5.5 V?

Yes	No
KEY OFF.	KEY OFF.
GO to DM7 .	GO to C1 .

DM4 - DM6

DM7 CHECK MAP CIRCUIT FOR SHORT TO SIGRTN AND GND IN HARNESS

- PCM connector disconnected.
- Measure the Resistance between:

(+)ESM Connector, Harness Side	(-)
MAP - Pin 3	Ground

-
- Measure the Resistance between:

(+)ESM Connector, Harness Side	(-)ESM Connector, Harness Side
MAP - Pin 3	SIGRTN - Pin 6

-

Is the Resistance above 10 KOhm?

Yes	No
GO to DM8 .	Repair short circuit.

DM8 INDUCE OPPOSITE MAP SENSOR VOLTAGE

- PCM connector connected.
- Add jumper wire between the points described below:

Point A ESM Connector, Harness Side	Point B ESM Connector, Harness Side
MAP - Pin 3	VREF - Pin 2

-
- Key ON Engine OFF.
- Access the PCM-MAP_V PID using a scan tool.

Is the Voltage above 4.6 V?

Yes	No
KEY OFF. Install a new ESM.	KEY OFF. Install a new PCM.

DM7 - DM8

**DM9 KOEO AND KOER DTC P0108: CHECK VOLTAGE
BETWEEN VREF AND SIGRTN AT ESM SENSOR**

- ESM connector disconnected.
- Key ON Engine OFF.
- Measure the Voltage between:

(+)ESM Connector, Harness Side	(-)ESM Connector, Harness Side
VREF - Pin 2	SIGRTN - Pin 6

•

Is the Voltage between 4 V - 5.5 V?

Yes	No
KEY OFF.	KEY OFF.
GO to DM10 .	GO to C1 .

**DM10 CHECK MAP AND SIGRTN CIRCUIT(S) FOR OPEN IN
HARNESS**

- PCM connector disconnected.
- Measure the Resistance between:

(+)PCM Connector, Harness Side	(-)ESM Connector, Harness Side
MAP	MAP - Pin 3
SIGRTN	SIGRTN - Pin 6

•

Are the resistances below 5 Ohm?

Yes	No
GO to DM11 .	Repair open circuit.

DM9 - DM10

DM11 CHECK MAP CIRCUIT FOR SHORT TO VREF IN HARNESS

- Measure the Resistance between:

(+)ESM Connector, Harness Side	(-)ESM Connector, Harness Side
MAP - Pin 3	VREF - Pin 2

•

Is the Resistance above 10 KOhm?

Yes	No
GO to DM12 .	Repair short circuit.

DM12 CHECK MAP CIRCUIT FOR SHORT TO VPWR IN HARNESS

- Measure the Resistance between:

(+)ESM Connector, Harness Side	(-)ESM Connector, Harness Side
MAP - Pin 3	VPWR - Pin 4

•

Is the Resistance above 10 KOhm?

Yes	No
GO to DM13 .	Repair short circuit.

DM11 - DM12

DM13 INDUCE OPPOSITE MAP SENSOR VOLTAGE

- PCM connector connected.
- Add jumper wire between the points described below:

Point A ESM Connector, Harness Side	Point B ESM Connector, Harness Side
MAP - Pin 3	SIGRTN - Pin 6

-
- Key ON Engine OFF.
- Access the PCM-MAP_V PID using a scan tool.

Is the Voltage below 0.23 V?

Yes	No
KEY OFF. Install a new ESM.	KEY OFF. Install a new PCM.

DM14 DTCS P0107, P0108 AND P0109: CHECK MAP CIRCUIT(S) FOR INTERMITTENT CONCERNS

- Key ON Engine OFF.
- Access the PCM-MAP_V PID using a scan tool.
- Perform a thorough wiggle test on the ESM harness.
- Lightly tap on the ESM (to simulate road shock).

Did a sudden change in voltage occur while monitoring the PID?

Yes	No
ISOLATE fault. REPAIR as necessary.	KEY OFF. Unable to duplicate or identify fault at this time. GO to Z1 .

DM15 DTC P0106: MAP RANGE/PERFORMANCE

Note: If MAP DTC(s) P0107, P0108 or P0109 are present, diagnose those DTC(s) first.

If any Mass Air Flow (MAF) sensor related DTCs are present, diagnose those DTCs prior to diagnosing MAP DTC P0106.

Disregard any DTC(s) generated as a result of this test.

- Key OFF.
- ESM connector disconnected.
- Add jumper wire between the points described below:

Point A ESM Connector, Harness Side	Point B ESM Connector, Component Side
VREF - Pin 2	VREF - Pin 2
SIGRTN - Pin 6	SIGRTN - Pin 6

-
- Key ON Engine RUN.
- Measure the Voltage between:

(+)ESM Connector, Component Side	(-)Vehicle battery
MAP - Pin 3	Negative post

-

Is the Voltage between 1 V - 2 V?

Yes	No
Note actual MAP voltage values at idle, 1000 and 2000 RPM. You will use the values for comparison in the following test step. GO to DM16 .	KEY OFF. CHECK the MAP circuit in ESM harness for open and short circuits, if OK REPLACE ESM.

DM15

DM16 COMPARE ACTUAL MAP VOLTAGE TO MAP_V PID VOLTAGE

- Access the PCM-MAP_V PID using a scan tool.
- Key ON Engine RUN.
- Note MAP_V PID voltage.
- Increase engine speed to 1000 RPM.
- Note MAP_V PID voltage.
- Increase engine speed to 2000 RPM.
- Note MAP_V PID voltage.

Does the MAP_V PID voltage stay within .5V of the actual MAP voltage?

Yes	No
Fault is not present at this time CLEAR the DTCs and REPEAT Self-Test.	Install a new ESM.

DM17 KOEO AND KOER DTCS P0107 AND P0108: CHECK VOLTAGE BETWEEN VREF AND SIGRTN AT MAP/TMAP SENSOR

- MAP/TMAP Sensor connector disconnected.
- Key ON Engine OFF.
- Measure the Voltage between:

(+)MAP/TMAP Sensor Connector, Harness Side	(-)MAP/TMAP Sensor Connector, Harness Side
VREF	SIGRTN

•

Is the Voltage between 4 V - 5.5 V?

Yes	No
KEY OFF. GO to DM18 .	KEY OFF. GO to C1 .

DM18 CHECK MAP/TMAP SENSOR OPERATION

- Add jumper wire between the points described below:

Point A MAP/TMAP Sensor Connector, Component Side	Point B MAP/TMAP Sensor Connector, Harness Side
VREF	VREF
SIGRTN	SIGRTN

-
- Key ON Engine RUN.
- Measure the Voltage between:

(+)MAP/TMAP Sensor Connector, Harness Side	(-)Vehicle battery
MAP	Negative post

-
- Briefly increase engine RPM to 3000 then return to idle.
- Monitor TMAP voltage.

Did the voltage reading rapidly increase to greater than 2.0V then rapidly decrease to less than 1.0V?

Yes	No
KEY OFF. GO to DM19 .	KEY OFF. Install a new MAP/TMAP sensor.

DM18

DM19 CHECK MAP/TMAP CIRCUIT FOR SHORT TO VREF AND SIGRTN IN HARNESS

- PCM connector disconnected.
- Measure the Resistance between:

(+)MAP/TMAP Sensor Connector, Harness Side	(-)MAP/TMAP Sensor Connector, Harness Side
MAP	VREF
MAP	SIGRTN

•

Are the resistances above 10 KOhm?

Yes	No
GO to DM20 .	Repair short circuit.

DM20 CHECK MAP/TMAP CIRCUIT FOR OPEN IN HARNESS

- Measure the Resistance between:

(+)PCM Connector, Harness Side	(-)MAP/TMAP Sensor Connector, Harness Side
MAP	MAP

•

Is the Resistance below 5 Ohm?

Yes	No
Install a new PCM.	Repair open circuit.

DM19 - DM20

DM21 DTCS P0107, P0108 AND P0109: CHECK MAP/TMAP CIRCUIT(S) FOR INTERMITTENT CONCERNS

- Key ON Engine OFF.
- Access the PCM-MAP_V PID using a scan tool.
- Perform a thorough wiggle test on the MAP/TMAP harness.
- Lightly tap on the MAP/TMAP (to simulate road shock).

Did a sudden change in voltage occur while monitoring the PID?

Yes	No
ISOLATE fault. REPAIR as necessary.	KEY OFF. Unable to duplicate or identify fault at this time. GO to Z1 .

DM21

DM22 DTC P0106: MAP/TMAP RANGE/PERFORMANCE

Note: If MAP DTC(s) P0107, P0108 or P0109 are present, diagnose those DTC(s) first.

If any Mass Air Flow (MAF) sensor related DTCs are present, diagnose those DTCs prior to diagnosing MAP DTC P0106.

Disregard any DTC(s) generated as a result of this test.

- Key OFF.
- MAP/TMAP Sensor connector disconnected.
- Add jumper wire between the points described below:

Point A MAP/TMAP Sensor Connector, Harness Side	Point B MAP/TMAP Sensor Connector, Component Side
VREF	VREF
SIGRTN	SIGRTN

-
- Key ON Engine RUN.
- Measure the Voltage between:

(+)MAP/TMAP Sensor Connector, Component Side	(-)Vehicle battery
MAP	Negative post

-

Is the Voltage between 1 V - 2 V?

Yes	No
Record actual MAP/TMAP voltage values at idle, 1000 and 2000 RPM. You will use the values for comparison in the following test step. GO to DM23 .	KEY OFF. Check MAP/TMAP harness for open and short circuits

DM22**DM23 COMPARE ACTUAL MAP/TMAP VOLTAGE TO MAP_V PID VOLTAGE**

- Access the PCM-MAP_V PID using a scan tool.
- Key ON Engine RUN.
- Note MAP_V PID voltage.
- Increase engine speed to 1000 RPM.
- Note MAP_V PID voltage.
- Increase engine speed to 2000 RPM.
- Note MAP_V PID voltage.

Does the MAP_V PID voltage stay within .5V of the actual MAP voltage?

Yes	No
Fault is not present at this time CLEAR the DTCs and REPEAT Self-Test.	Install a new MAP/TMAP sensor.

DM23

Test DP: Vehicle Speed Sensor/Transfer Case Speed Sensor

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

DP

Introduction

Note

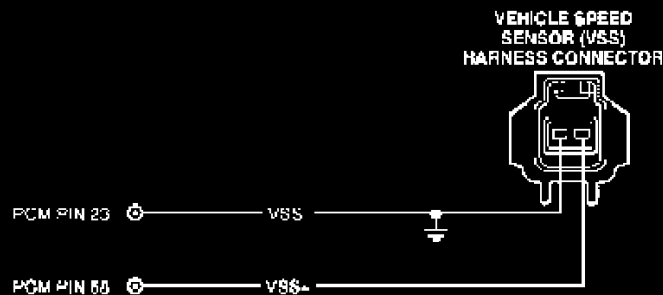
This Pinpoint Test is intended to diagnose the following:

- 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

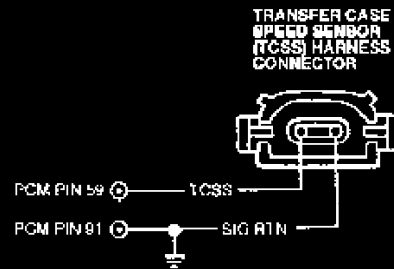
For PCM connector views, refer to Section 1, Powertrain Control Hardware .

2.0L (MTX) Escape



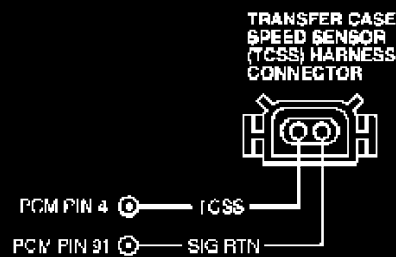
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DP INTRODUCTION 1 OF 2

4.2L F-150 4X4 Manual Shift-on-the-Fly (MSOF)

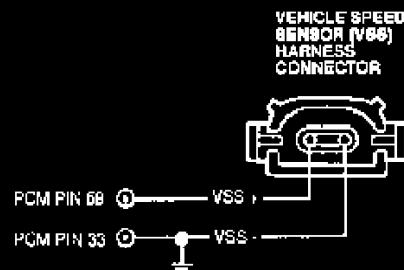
NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AA4882-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

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

DP

**DP1 DTC P0500/P0501/P1502: CHECK VSS CIRCUITS FOR OPEN
IN HARNESS**

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	No
GO to DP2 .	REPAIR open circuit. COMPLETE an OBD II Drive Cycle (REFER to Section 2, Drive Cycles).

**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 DP4 .

DP1 - DP2

DP3 CHECK VSS RESISTANCE

- Measure VSS resistance.

Is resistance between 170 and 270 ohms?

Yes	No
REPLACE the PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). COMPLETE an OBD II Drive Cycle (REFER to Section 2, Drive Cycles).	REPLACE the VSS. COMPLETE an OBD II Drive Cycle (REFER to Section 2 , Drive Cycles).

DP4 VERIFY IF VSS CIRCUIT IS SHORTED IN HARNESS OR ANOTHER MODULE

- Determine which, if any, modules are connected to the VSS circuit (Refer to Wiring Diagrams Manual). 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 Section 2, Drive Cycles).	REFER to the Workshop Manual for further diagnosis of appropriate module.

DP3 - DP4

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 Section 4, Diagnostic Trouble Code (DTC) Descriptions for a list of possible causes.)	GO to DP22 .

DP20 DTC P0503, P1500: INSPECT VSS AND CIRCUIT FOR AN INTERMITTENT

- 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 Section 2, Drive Cycles).	GO to DP21 .

DP15 - DP20

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 Section 2, Drive Cycles).	Unable to duplicate or identify a fault at this time. GO to Z1 . (REFER to Section 4, Diagnostic Trouble Code (DTC) Descriptions for a list of possible causes.)

DP30 DTC P0500, P1502 VISUAL INSPECTION

Note: The transfer case speed sensor (TCSS) provides rotational speed of output shaft of the transfer case. The PCM uses 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 .

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 Section 6 , 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.

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

DP33 - DP35

Test DQ: Barometric Pressure (BARO) Sensor

DQ: Barometric Pressure (BARO) Sensor Introduction

DQ

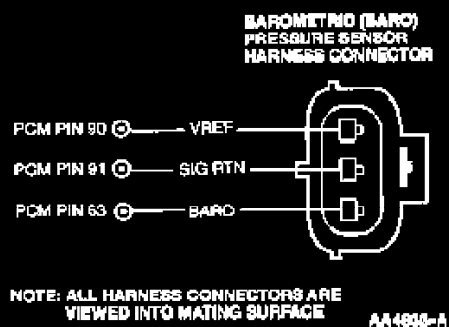
Note

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

For PCM connector views, refer to Section 1, Powertrain Control Hardware.



DQ INTRODUCTION 1 OF 2

BAROMETRIC PRESSURE REFERENCE CHART			
Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP 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

DQ INTRODUCTION 2 OF 2

DQ: Barometric Pressure (BARO) Sensor**DQ****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 [$\pm .1$ Volt Hz. (± 1 in.Hg.)].

- 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 $\pm .9$ Volt. (± 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	No
Unable to duplicate or identify fault at this time. GO to Z1 .	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	No
KEY OFF. GO to DQ5 .	KEY OFF. GO to DQ3 .

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.

DQ3 - DQ5

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 Section 2, 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).	REPAIR short circuit.

DQ6 - DQ8**Test DR: Camshaft Position (CMP) Sensor**

DR: Camshaft Position (CMP) Sensor Introduction

DR

Note

This Pinpoint Test is intended to diagnose the following:

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

Pinpoint Test Schematics and Connectors

Note: All connector views are from the harness side.

For PCM connector views, refer to Section 1, Powertrain Control Hardware.

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

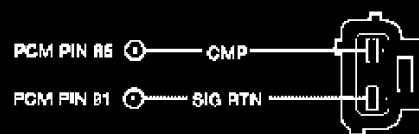
Note: CMP sensor is Variable Reluctance type.



A0082732

2.0L (4V) Escort

Note: CMP sensor is Variable Reluctance type.



A0052733

2.0L (2V) Focus

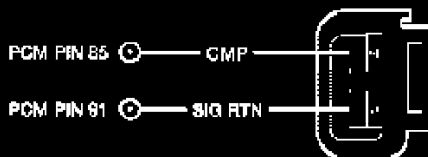
Note: CMP sensor is Variable Reluctance type.



A0052734

2.0L (4V) Focus, Escape

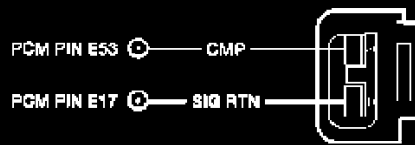
Note: CMP sensor is Variable Reluctance type.



A0052887

LS6

Note: CMP sensor is Variable Reluctance type.

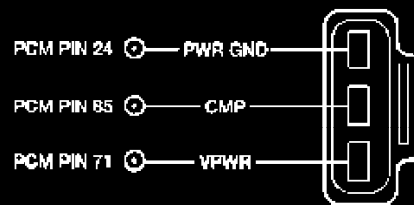
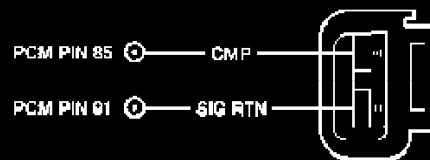
**A0053232**

Expedition/Navigator, and LS8, Thunderbird, Explorer, Mountaineer, Aviator

Note: CMP sensor is Variable Reluctance type.

**A0055681****PCM CONNECTOR PIN NUMBERS**

PCM TYPE	CMP	SIG RTN
Expedition Navigator	E31	E25
LS8 Thunderbird Explorer Mountaineer Aviator	E53	E17

4.2L F-Series, 4.2L Econoline**Note:** CMP sensor is Hall Effect type.**A0052890****All Others****Note:** CMP sensor is Variable Reluctance type.**A0052891**

DR: Camshaft Position (CMP) Sensor**DR****DR1 DTC P0340, P0345: CHECK IF ENGINE WILL START**

- Attempt to start engine.

Will the engine start?

Yes	No
GO to DR2 .	DTC P0340 or P0345 is not the cause of the No Start. GO to Section 3 to diagnose the No Start symptom.

DR2 CHECK CMP SIGNAL SENT TO PCM

- Engine running.
- Connect scan tool.
- Select CMPFM and if present CMPFM2 PID(s).

Is a fault indicated with either or both CMP sensors?

Yes	No
Individually diagnose CMP sensor(s) indicating a fault. GO to DR3 .	CMP, PCM and harness(es) working properly at this time. Concern is intermittent. GO to Z1 .

DR3 CLEAR AND ATTEMPT TO RE-GENERATE CONTINUOUS DTC P0340, P0345

- CLEAR the DTCs.
- Increase RPM to greater than 1500 for 10 seconds. Repeat twice.
- Retrieve all Continuous Memory DTCs.

Is DTC P0340 or P0345 present?

Yes	No
Key OFF. GO to DR4 .	The fault that produced DTC P0340 or P0345 is intermittent. GO to Z1 .

DR1 - DR3

DR4 DETERMINE CMP SENSOR PHYSICAL TYPE**Is the CMP sensor a drop-in (synchronizer) type?**

Yes	No
GO to DR5 .	GO to DR6 .

DR5 VERIFY CORRECT INSTALLATION OF CMP SENSOR

- A CMP sensor identifies the cylinder #1 power stroke. A sensor that is improperly installed/indexed can identify the wrong cylinder as #1, produce a tip-in hesitation and generate DTC P0340. VERIFY the correct installation by referring to Electronic Engine Controls, Section 303-14 in the Workshop Manual.

Note: If the vehicle has a miss and DTC P0340, possible ignition, alternator noise, RFI, and CKP concerns may be present.

Is the CMP sensor installed correctly?

Yes	No
GO to DR6 .	REPOSITION CMP sensor.

DR6 DETERMINE CMP SENSOR ELECTRONIC TYPE

Note: VR (Variable Reluctance) sensors have 2-wire connectors, Hall Effect sensors have 3-wire connectors.

Is the CMP sensor a VR type?

Yes	No
Key OFF. GO to DR7 .	CMP sensor is Hall Effect type. Key OFF. GO to DR13 .

DR7 CHECK CMP SENSOR RESISTANCE

- Disconnect CMP sensor.
- Measure resistance of CMP sensor between CMP and SIG RTN.

Note: CMP sensor resistance values change significantly with temperature rise.

Is resistance between 250 and 1K ohms?

Yes	No
GO to DR8 .	REPLACE CMP sensor.

DR8 CHECK CMP CIRCUIT FOR SHORT TO POWER IN HARNESS

- Disconnect PCM.
- Key ON, engine OFF.
- Measure voltage between CMP circuit (at PCM or CMP harness connector) and battery (-) terminal.

Is voltage less than 1.0V DC?

Yes	No
Key OFF. GO to DR9 .	REPAIR short circuit.

DR9 CHECK FOR OPEN IN HARNESS BETWEEN PCM AND CMP SENSOR

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

VR type sensors are susceptible to electrical interference (noise). Harness shielding, where present, should be reinstalled properly when removed for testing.

- Measure resistance of CMP circuit between PCM harness connector and CMP sensor harness connector.
- Measure resistance of SIG RTN circuit between PCM harness connector and CMP sensor harness connector.

Are resistance measurements less than 5.0 ohms for each wire?

Yes	No
GO to DR10 .	REPAIR open circuit.

DR8 - DR9

DR10 CHECK FOR SHORT IN HARNESS BETWEEN PCM AND CMP SENSOR

- Measure resistance between CMP and SIG RTN circuit (at either PCM or CMP harness connector).
- Measure resistance between CMP circuit and battery (-) terminal.
- Measure resistance between SIG RTN circuit and battery (-) terminal.

Is resistance(s) less than 10K ohms on any measurement?

Yes	No
REPAIR short circuit.	GO to DR11 .

DR11 CHECK FOR SHORTS IN PCM

- Reconnect PCM.
- Measure resistance between CMP and SIG RTN circuits at the CMP harness connector.

Is resistance(s) greater than 500 ohms?

Yes	No
GO to DR12 .	REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).

DR12 CHECK CMP SENSOR OUTPUT

- Reconnect CMP sensor.
- Digital multimeter on low voltage AC scale.
- Measure voltage between CMP and SIG RTN circuit while running engine at approximately 2500 RPM.

Is voltage greater than 0.25V AC?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).	REPLACE CMP sensor.

DR13 CHECK VPWR VOLTAGE TO CMP SENSOR

- Disconnect CMP sensor.
- Key ON, engine OFF.
- Measure VPWR circuit voltage between CMP sensor harness connector and battery (-) terminal.

Is voltage greater than 10.5V DC?

Yes	No
Key OFF. GO to DR14 .	REPAIR open circuit.

DR14 CHECK PWR GND VOLTAGE TO CMP SENSOR

- Measure PWR GND circuit voltage between CMP sensor harness connector and battery (+) terminal.

Is voltage greater than 10.5V DC?

Yes	No
GO to DR15 .	REPAIR open circuit.

DR15 CHECK CMP CIRCUIT FOR SHORT TO POWER IN HARNESS

- Disconnect PCM.
- Key ON, engine OFF.
- Measure voltage between CMP circuit (at PCM or CMP harness connector) and ground.

Is voltage less than 1.0V DC?

Yes	No
Key OFF. GO to DR16 .	REPAIR short circuit.

DR16 CHECK FOR OPEN 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.
- 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 for each wire?

Yes	No
GO to DR17 .	REPAIR open circuit.

DR17 CHECK CMP CIRCUIT FOR SHORT TO GND IN HARNESS

- Measure resistance between CMP and PWR GND circuits (at either PCM or CMP harness connector).

Is resistance(s) greater than 10K ohms?

Yes	No
GO to DR18 .	REPAIR short circuit.

DR18 CHECK FOR SHORTS IN PCM

- Measure resistance between CMP circuit and both the VPWR and PWR GND circuits at the CMP harness connector.

Is resistance(s) greater than 500 ohms?

Yes	No
GO to DR19 .	REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).

DR19 CHECK CMP SENSOR OUTPUT DURING CRANK MODE

- Reconnect CMP sensor.

Note: On vehicles equipped with 150 pin PCMs and PATS (Passive Anti-Theft System), RECONNECT the Transmission (T) and Body (B) PCM connectors ONLY if disconnected. The engine may not crank unless they are connected. Keep the Engine (E) connector disconnected.

- Digital multimeter on 12V DC scale.
- Connect digital multimeter between CMP and the PWR GND circuit at the PCM Harness Connector.
- Crank engine for at least 10 revolutions.

Does voltage reading switch between low (less than 2.0V DC) and high (greater than 8.0V DC)?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).	REPLACE CMP sensor.

DR19

Test DS: Air Conditioning Pressure (ACP) Sensor

DS: Air Conditioning Pressure (ACP) Sensor Introduction

DS

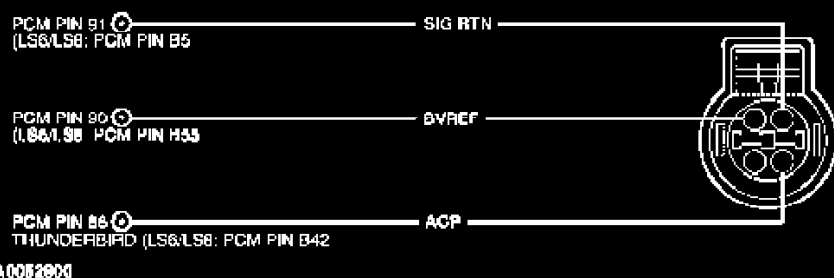
Note

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)

Schematics and Harness Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware .



ACP CONNECTOR PIN NUMBERS

PCM TYPE	ACP	BVREF	SIGRTN
104 Pin	86	90	91
150 Pin	B42	B55	B5

DS INTRODUCTION

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

DS**DS1 DTC P1461: 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 for intermittent conditions.	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 .

DS1 - DS2

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 the Climate Control System General Information, Section 412-03 (note: for Lincoln Blackwood Section 412-00) in the Workshop Manual. 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.

DS3 - DS4

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, Marauder, Thunderbird: KEY OFF. GO to DS6 . All others: REPLACE PCM (refer to Section 2, 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.

DS5 - DS6

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 the Climate Control System General Information, Section 412-00 in the Workshop Manual. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.	REPLACE PCM (refer to Section 2, 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 .

DS7 - DS10

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 the Climate Control System General Information, Section 412-03 (note: for Lincoln Blackwood Section 412-00) in the Workshop Manual. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.	GO to DS13 .

DS11 - DS12

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.

DS13 - DS14

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 Section 2, 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 the Electrical/Climate Control Systems Group in the Workshop Manual).

Does the A/C system have a refrigerant charge?

Yes	No
REPLACE PCM (refer to Section 2, 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 Climate Control System General Information, Section 412-00. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.

DS18 CHECK FOR INTERMITTENT ACP CIRCUIT FAULT

- Key on, engine off.
- Access ACP V PID.
- Observe ACP V PID for an indication of a fault while 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	No
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.	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	No
KEY OFF. GO to DS21 .	GO to Section 3 , Symptom Chart 24 (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 Section 3 , 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	No
GO to DS22 .	REFER to the Climate Control System, General Information, Section 412-00 in the Workshop Manual.

DS21**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 Section 3 . All others: REFER to the Climate Control System General Information, Section 412-00 in the Workshop Manual 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 .

DS22

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 the Climate Control System General Information, Section 412-00 in the Workshop Manual 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 .

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	No
REPLACE ACP sensor. REFER to the Climate Control System General Information, Section 412-03 (note: for Lincoln Blackwood Section 412-00) in the Workshop Manual. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.	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

DT: Power Steering Pressure (PSP) Sensor Introduction

DT

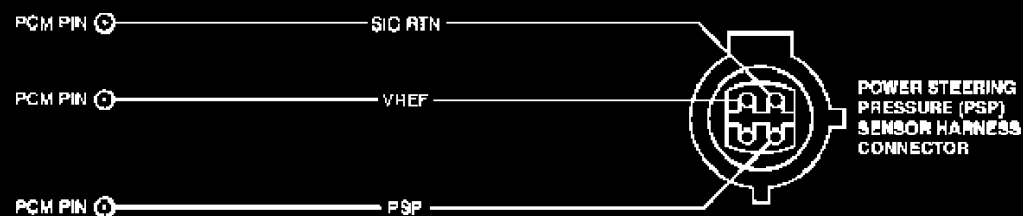
Note

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

For PCM connector views, refer to Section 1, Powertrain Control Hardware .



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

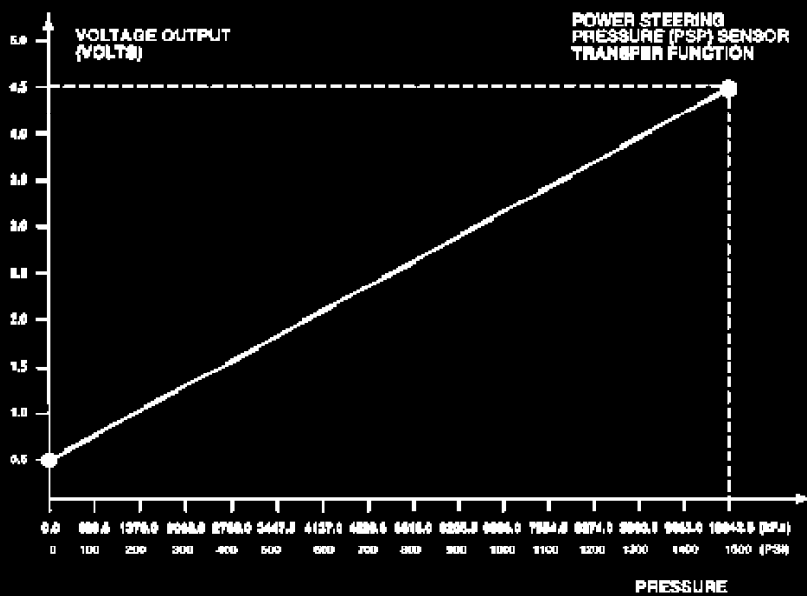
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PCM CONNECTOR PIN NUMBERS

PCM TYPE	PSP	VREF	SIG RTN
122 PIN	B18	E36	E25
150 PIN	B15	E40	T41
All Others	31	90	91

Graph

Power Steering Pressure (PSP) Sensor Transfer Function



AA0030-C

DT: Power Steering Pressure (PSP) Sensor**DT****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	No
KEY OFF. If there are any symptoms with the power steering system (for example, lack of power assist), go to Steering Systems, Section 211 in the Workshop Manual. If no symptoms are present with the power steering system, GO to DT2 .	RERUN Quick Test.

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?

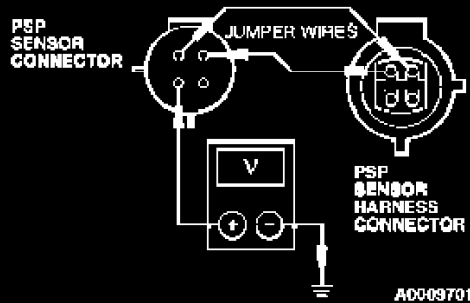
Yes	No
KEY OFF. GO to DT3 .	KEY OFF. GO to C1 .

DT1 - DT2

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.

DT4 CHECK PSP SENSOR CIRCUIT FOR OPEN IN HARNESS

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

Is resistance less than 5.0 ohms?

Yes	No
GO to DT5 .	REPAIR open circuit.

DT3 - DT4

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.

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 Section 2, 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 .

DT5 - DT10

Test DU: Intake Air Temperature 2 (IAT2)

DU: Intake Air Temperature 2 (IAT2)

Introduction

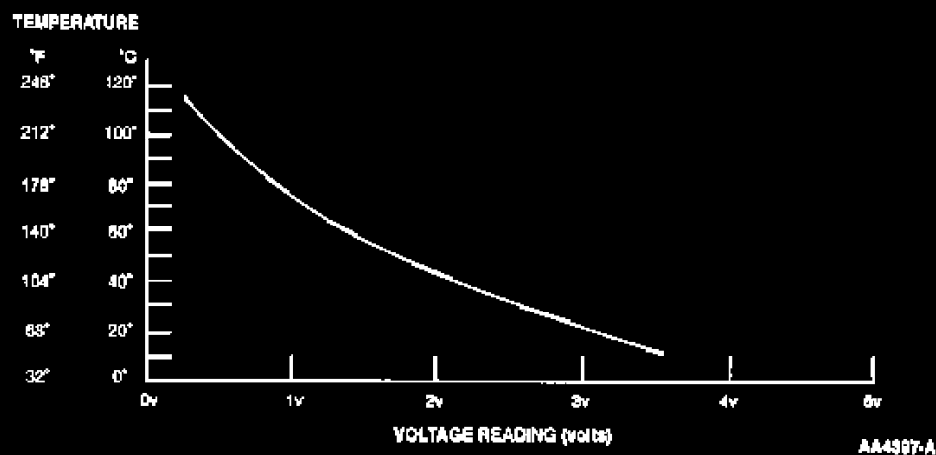
DU

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 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
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

DU INTRODUCTION 2 OF 4

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware .

THROTTLE POSITION (TP)
SENSOR HARNESS CONNECTOR

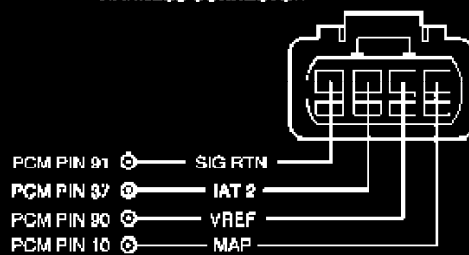


NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

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4.6L 4V SC Mustang

THERMAL MANIFOLD ABSOLUTE
PRESSURE (TMAP) SENSOR
HARNESS CONNECTOR

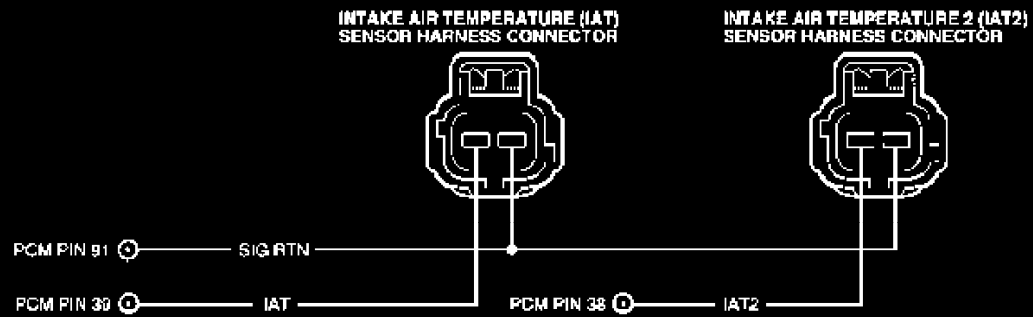


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NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

DU INTRODUCTION 3 OF 4

5.4L SC



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DU INTRODUCTION 4 OF 4

DU: Intake Air Temperature 2 (IAT2)**DU****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 on this pinpoint test cover page.

- 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuits.

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	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	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	No
REPLACE sensor.	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	No
There is sufficient VREF voltage. RECONNECT TP sensor. GO to DU22 . KEY OFF.	GO to C1 .

DU22 CHECK TEMPERATURE SIGNAL CIRCUIT FOR SHORT TO GROUND IN HARNESS

Note: Refer to the PCM connector pin numbers on this pinpoint test cover page.

- 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	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	No
GO to DU31 .	KEY OFF. GO to KP8 (Charge Air Cooler Pump).

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	No
KEY OFF. GO to DU32 .	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	No
GO to DU33 .	REPLACE PCM (refer to Section 2, 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	No
RECONNECT sensor and GO to Section 6 , Reference Values. COMPARE IAT2 PID to reference values under the given road test conditions. If sensor is not in range, REPLACE IAT2 sensor.	REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

DU32 - DU33

Test DV: Electronic Throttle Control TPS Throttle Control Motor

DV: Electronic Throttle Control (ETC) Throttle Position (TP)
Sensor, Throttle Control Motor
Introduction

DV

Note

This Pinpoint Test is intended to diagnose the following:

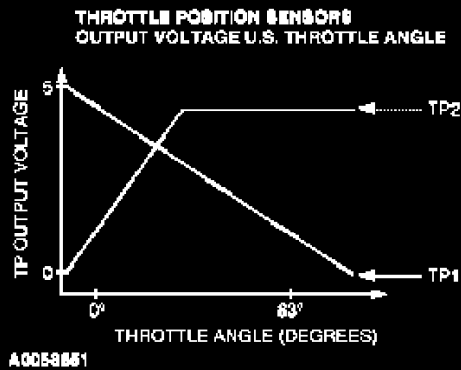
- ETC Throttle Position (TP) Sensor (9B989)
- ETC Throttle Body Control Motor
- ETC Throttle Body Assembly (9F991)
- Harness Circuits: TP1, TP2, ETCREF, ETCRTN
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware

Graphs

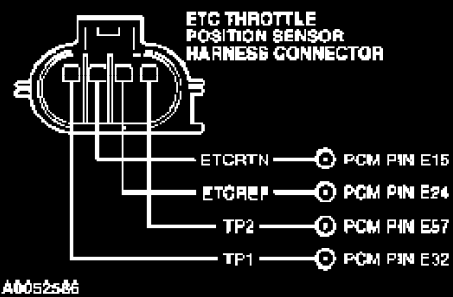
Note: The normal range of the throttle angle measurement for the throttle position ETC (TP) sensor is 0 to 83 degrees.



Pinpoint Test Schematics and Connectors

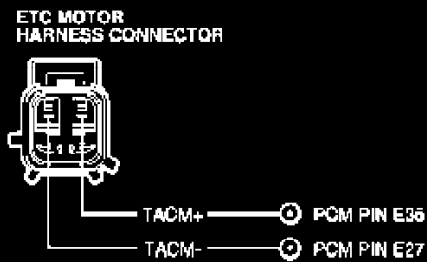
For PCM connector views, refer to Section 1, Powertrain Control Hardware

LS6, LS8, Thunderbird



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LS6, LS8, Thunderbird



A0060593

DV: Electronic Throttle Control (ETC) Throttle Position (TP) Sensor, Throttle Control Motor

DV

DV1 CHECK FOR THROTTLE PLATE OBSTRUCTION OR ETB MALFUNCTION

Note: Repair any Anti-Lock Brake System (ABS) DTCs, ABS related DTCs in other modules or vehicle communication concerns before starting this pinpoint.

- **Note:** The following steps should be taken in order due to the nature of the Electronic Throttle Control system: 1.) These DTCs effect system operation and must be repaired first: P0102, P0103, P0320, P0715, P0720, P0500, P0122, P0123, P0222, P0223, P2135, Go To Section 4. 2.) These DTCs must be repaired next due to the nature of the system: P2121, P2122, P2123, P2126, P2127, P2128, P2131, P2132, P2133, Go To DK2. 3.) If DTCs are present: P2111 or P2112, Go To DV1. 4.) DTC U0300, Go To Section 4, page 16 for direction. 5.) For DTCs P2100, P2101, or P2107 Go To DV1.
- It should also be noted, that a KOER P0121 DTC can be set by the operator resting a foot on the accelerator pedal during the test.
- Key Off.
- Visually inspect the throttle plate for binding or sticking.
- Remove air inlet from the throttle body.
- Slowly push the throttle plate open and release, then push closed completely.

Does the throttle plate move freely in both directions?

Yes	No
GO to DV2 unless P2106 is present, then see Note 17 In Section 4, return to DV2 if fault is not repaired. If DTC P2107 is present GO to DV23 , If DTC P2100 is present GO to DV22 , and for P2101, GO to DV25 .	REPAIR or REPLACE throttle body as required.

DV1

DV2 CHECK TP1 and TP2 CLOSED AND OPEN VOLTAGE RANGES

- Key On Engine Off
- Access TP 1 and TP 2 PIDS.
- Depress accelerator pedal slowly to the floor and release.

Are the TP sensor signals within the following chart ranges?

ETC TP sensor voltage ranges (closed to open throttle)

Accelerator Pedal position	TP1	TP2
CT	3.7-4.7	.3-1.9
WOT	.7-1.6	4.1-4.7

Yes	No
GO to DV9 .	For DTCS (P0121, P0122, P0221, P0222, P2106) together, GO to DV3 , for (P0121, P2106, P2135) and or (P0221, P0222, P2106, P2135), GO to DV4 , for (P0121, P0122, P2106, P2135) and or (P0221, P0223, P2106, P2135), GO to DV5 , for (P0121, P0123, P2106, P2135) or (P0221, P0223, P2106, P2135) GO to DV6 .

DV3 CHECK FOR PROPER ETCREF VOLTAGE

- Remove ETC TP harness connector.
- Key on.
- Measure voltage between ETCREF and ETCRTN pins at the ETC TP sensor harness connector.

Is the voltage between 4.0 and 6.0?

Yes	No
GO to DV4 , For P0122, GO to DV5 .	GO to C1 .

DV2 - DV3

DV4 CHECK TP SENSOR HARNESS FOR OPEN CIRCUIT

- For DTCS (P0122, P2106, P2135) check TP1 circuit only, for DTCS (P0221, P0222, P2106, P2135) check TP2 circuit only.
- Key off, remove PCM harness connector.
- Measure resistance between the PCM and TP sensor harness connectors for the TP1 circuit.
- Measure resistance between the PCM and TP sensor harness connectors for the TP2 circuit.

Are both resistances less than 5 ohms?

Yes	No
GO to DV5 .	Repair open.

DV5 CHECK TP SENSOR HARNESS FOR SHORT TO GND

- For DTCS (P0121, P0122, P2106, P2135) check TP1 circuit only, for DTCS (P0221, P0222, P2106, P2135) check TP2 circuit only.
- Measure resistance between the TP1 circuit, and battery gnd from the TP sensor harness connector.
- Measure resistance between the TP2 circuit, and battery gnd from the TP sensor harness connector.

Are both resistances greater than 10K ohms?

Yes	No
GO to DV6 .	Repair short circuit.

DV6 CHECK TP SENSOR CIRCUITS FOR SHORTS TO ETCRTN

- For DTCS (P0121, P0122, P2106, P2135) check TP1 circuit only, for DTCS (P0221, P0222, P2106, P2135) check TP2 circuit only.
- Measure resistance between the TP1 signal and ETCRTN at PCM harness connector.
- Measure resistance between the TP2 signal and ETCRTN at PCM harness connector.

Are both resistances greater than 10K ohms?

Yes	No
GO to DV7 .	Isolate and repair short

DV4 - DV6

DV7 CHECK TP SENSOR HARNESS FOR SHORT TO PWR

- For DTCS (P0121, P0123, P2106, P2135) check TP1 circuit only, for DTCS (P0221, P0223, P2106, P2135) check TP2 circuit only.
- Measure resistance between the TP1 circuit, and battery pwr from the TP sensor harness connector.
- Measure resistance between the TP2 circuit, and battery pwr from the TP sensor harness connector.

Are both resistances greater than 10K ohms?

Yes	No
GO to DV8 .	Repair short circuit.

DV8 CHECK TP SENSOR CIRCUITS FOR SHORTS TO ETCREFS

- For DTCS (P0121, P0123, P2106, P2135) check TP1 circuit only, for DTCS (P0221, P0223, P2106, P2135) check TP2 circuit only.
- Measure resistance between TP1 signal and ETCREF at PCM harness connector.
- Measure resistance between TP2 signal and ETCREF at PCM harness connector.

Are both resistances greater than 10K ohms?

Yes	No
GO to DV9 .	Isolate and repair short

DV9 CHECK TP SENSOR SIGNAL SHORTS TO EACH OTHER IN HARNESS

- Measure resistance between TP1 and TP2 circuits at the PCM harness connector.

Is the resistance greater than 10K ohms?

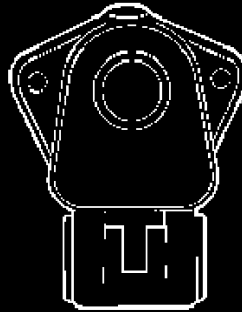
Yes	No
GO to DV10 .	Isolate and repair short

DV7 - DV9

DV10 DETERMINE THE TYPE OF ETC TP ON THE VEHICLE

Note: There are 2 types of ETC TP sensors available. Compare the sensor housing of the ETC TP on the vehicle to the illustration.

- Determine if the vehicle is equipped with a Type I ETC TP.



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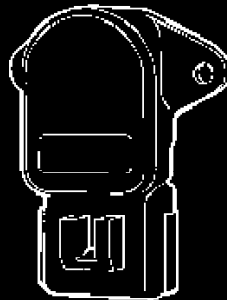
Is the vehicle equipped with a Type I ETC TP?

Yes	No
GO to DV12 .	GO to DV11 .

DV11 CHECK FOR A TYPE II ETC TP

Note: There are 2 types of ETC TP sensors available. Compare the sensor housing of the ETC TP on the vehicle to the illustration.

- Determine if the vehicle is equipped with a Type II ETC TP.



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Is the vehicle equipped with a Type II ETC TP?

Yes	No
GO to DV13 .	GO to DV10 .

DV10 - DV11

DV12 CHECK THE RESISTANCE OF THE TYPE I ETC TP

- Measure the resistance between:

Type I

(+) ETC TP Sensor Connector, Component Side	(-) ETC TP Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)
TP1	ETCREF	1,100	3,500
TP1	ETCRTN	2,500	5,900
TP2	ETCREF	1,800	4,900
TP2	ETCRTN	800	2,800
ETCREF	ETCRTN	1,800	4,900

Are all the resistances within the specifications?

Yes	No
Replace PCM for On Demand faults, Clear DTCS, Drive vehicle, and self test to verify repair. If DTCS output, or faults are only Continuous, GO to DV14 .	Replace ETC TP sensor. CLEAR the DTCs. REPEAT the self-test.

DV12

DV13 CHECK THE RESISTANCE OF THE TYPE II ETC TP

- Measure the resistance between:

Type II			
(+) ETC TP Sensor Connector, Component Side	(-) ETC TP Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)
TP1	ETCREF	700	1,800
TP1	ETCRTN	1,300	2,800
TP2	ETCREF	1,000	2,400
TP2	ETCRTN	500	1,500
ETCREF	ETCRTN	700	2,100

-

Are all the resistances within the specifications?

Yes	No
Replace PCM for On Demand faults, Clear DTCS, Drive vehicle, and self test to verify repair. If DTCS output, or faults are only Continuous, GO to DV14 .	Replace ETC TP sensor. CLEAR the DTCs. REPEAT the self-test.

DV14 CHECK TP SENSOR SIGNAL HIGH VERSUS THE ENGINE LOAD WHILE DRIVING VEHICLE

Note: Connect PCM and TP sensor connectors.

- Key on, engine running.
- Drive vehicle, exercising the throttle and TP sensor while accessing PIDS.
- Access TP2 PID and LOAD PID and record readings.

Is TP2 PID greater than 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 ETC TP sensor.	GO to DV15 .

DV15 CHECK TP SENSOR SIGNAL LOW VERSUS THE ENGINE LOAD WHILE DRIVING VEHICLE

- Drive vehicle exercising the throttle and TP sensor near higher gears (preferably overdrive) while accessing PIDS.
- Access TPPS PID and LOAD PID.

Is TP2 PID reading less than (0.64 volts) and the LOAD PID reading greater than 55%?

Yes	No
TIGHTEN TP sensor to throttle body if necessary. CLEAR Continuous Memory DTCs. DRIVE vehicle exercising the throttle. If Continuous Memory P0124 or P0224, REPLACE MAF sensor.	Unable to identify the fault at this time. GO to DV16 .

DV16 CHECK FOR INTERMITTENT TP SENSOR SIGNAL

- Start engine and bring to idle.
- Run throttle up to 1500 rpm for 5 seconds.
- Access TP1 PID for a fault indication while completing the following:
 - Lightly tap on TP sensor and wiggle harness connector to simulate road shock.
- Access TP2 PID for a fault indication while completing the following:
 - Lightly tap on TP sensor and wiggle harness connector to simulate road shock.

Are the TP1 and TP2 PIDS changing below the minimum (0.49 volt) or above the maximum (4.65 volts)?

Yes	No
INSPECT the TP sensor connector. REPAIR as necessary. If OK, REPLACE the ETC TP sensor.	GO to DV17 .

DV15 - DV16

DV17 CHECK TP SENSOR FOR INTERMITTENT SHORTS OR OPENS

- Again access the TP2 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.
 - Access the TP1 PID, and repeat the above procedure.

Are the TP2 PID and TP1 PID readings changing below the minimum 9.85% (0.49 volt) or above the maximum 93% (4.65 volts)?

Yes	No
ISOLATE and REPAIR as necessary. If DTCS P2100 and or P2101 are present, GO to DV20 , if not clear other DTCS, road test vehicle, and run self test to verify repair.	Unable to duplicate or identify fault at this time. GO to Z1 . If Z1 does not identify fault, Replace PCM

DV20 CHECK ETC MOTOR VISUALLY

- note: ensure that the TACM harness connector is properly connected.
- Key off.
- Inspect throttle body motor for damaged housing, connector, and harness.

Are there any obvious faults with the ETC motor system?

Yes	No
Repair or replace as necessary.	GO to DV21 .

DV21 CHECK ETC MOTOR FOR SHORT OR OPEN

- Remove ETC motor harness connector.
- Measure the resistance between the TACM + and TACM - pins, through the motor.

Is the resistance less than .8 ohms, or greater than 1000 ohms?

Yes	No
Replace Throttle body assembly. note: Clear DTCS and rerun self test, if DTCS (P2100, P2106, P2112), or (P2100, P2106, P2111, P2112) are output GO to DV22 , for (P2100, P2106, P2107) GO to DV23 , and for (P2100, P2106, P2107, P2111, P2112) GO to DV24 , and for DTCS (P2101, P2106, P2110, P2111, P2112) GO to DV25 .	GO to DV22 .

DV22 CHECK ETC MOTOR HARNESS FOR OPEN

- Remove PCM harness connector.
- Measure the resistance of the TACM+ circuit between the PCM and TACM harness connectors.
- Measure the resistance of the TACM- circuit between the PCM and TACM harness connectors.

Is the resistance less than 5 ohms?

Yes	No
GO to DV23 .	Repair open circuit.

DV21 - DV22

DV23 CHECK ETC MOTOR HARNESS FOR SHORT TO GND, PWR, ETCREF, AND ETCRTN

- Measure the resistance between the TACM + pin and battery gnd.
- Measure the resistance between the TACM - pin and battery gnd.
- Measure the resistance between the TACM + pin and battery pwr.
- Measure the resistance between the TACM - pin and battery pwr.
- Measure the resistance between the TACM + pin and ETCRTN.
- Measure the resistance between the TACM - pin and ETCRTN.
- Measure the resistance between the TACM + pin and ETCREF.
- Measure the resistance between the TACM - pin and ETCREF.

Are both resistances greater than 10K ohms?

Yes	No
GO to DV24 , for P2101, GO to DV25 .	Isolate and repair short circuit.

DV24 CHECK ETC MOTOR HARNESS FOR CIRCUITS SHORTED TOGETHER

- Measure the resistance between the TACM + pin and TACM- pin.

Is the resistance greater than 10K ohms?

Yes	No
GO to DV25 .	Isolate and repair short circuit.

DV25 CHECK FOR CROSSWIRED ETC MOTOR HARNESS

- Measure the resistance between the TACM + pin and TACM- pin.

Is the resistance greater than 10K ohms?

Yes	No
GO to DV26 .	Properly wire the TACM per TACM and PCM connector diagrams.

DV23 - DV25

DV26 SELF TEST VEHICLE

- Key On Engine Off.
- Clear DTCS.
- Cycle accelerator pedal to the floor and back several times.
- Self Test vehicle noting any DTCS.

Were there any DTCS related to the ETC system?

Yes	No
Intermittent fault, GO to Z1	Replace PCM.

DV26

EM: Emissions Compliance Introduction

EM

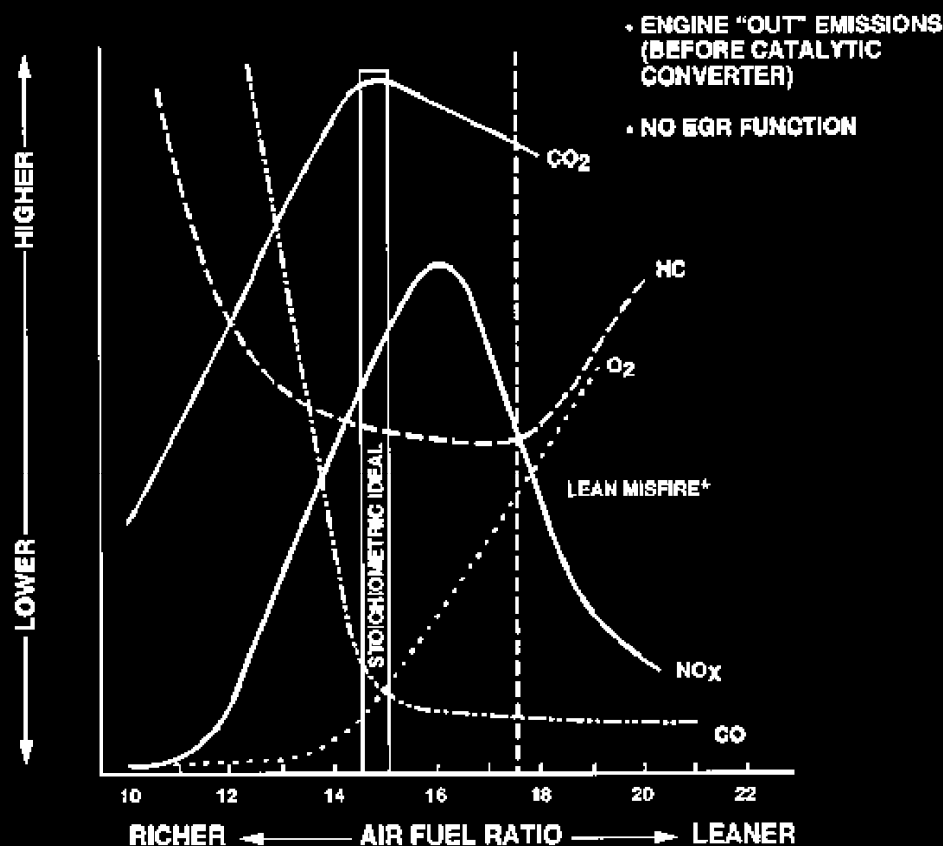
Note

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. Reset the keep alive memory (KAM). Refer to Section 2, Resetting The Keep Alive Memory (KAM).
 2. To relearn some basic Adaptive Learning (trim) values, run engine at 2500 rpm for one minute and idle engine for two minutes.

EM INTRODUCTION 1 OF 3

Exhaust Gas Analysis Chart



* EXACT AIR FUEL RATIO VARIES
DEPENDENT ON ENGINE

AA0216-A

EM INTRODUCTION 2 OF 3

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.

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.

EM: Emissions Compliance**EM****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 .

EM1 - EM2

EM3 BASELINE VEHICLE

Note: Baselining 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 baselined?

Yes	No
GO to EM4 .	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	No
GO to Section 3 (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 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	No
GO to EM6 .	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 Section 3 , Step 1: PCM Quick Test (for Test Step procedure only)).

Is a fault indicated?

Yes	No
FOLLOW Section 3 Quick Test direction. After repair, GO to EM40 to verify repair.	GO to EM7 .

EM7 CHECK CARBON MONOXIDE (CO) LEVELS

Did the vehicle have excessive CO levels?

Yes	No
Excessive CO levels indicate that the engine is running rich. GO to EM15 .	GO to EM8 .

EM8 CHECK HYDROCARBON (HC) LEVELS

Did the vehicle have excessive HC levels?

Yes	No
Excessive HC levels with low to normal CO levels indicate that the engine is running lean. GO to EM25 .	GO to EM9 .

EM9 CHECK OXIDES OF NITROGEN (NO_x) LEVELS**Did the vehicle have excessive NO_x levels?**

Yes	No
GO to EM30 .	VERIFY all previous testing.

EM15 HIGH CO LEVELS: CHECK HC LEVELS**Did the vehicle have excessive HC levels?**

Yes	No
GO to EM16 (to check for incomplete combustion/running rich).	GO to EM17 (to check for running rich).

EM16 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 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 .
- 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 EM18 .

EM18 CHECK PCV SYSTEM FOR LEAKS, STUCK VALVE, ETC.

- 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 EM19 .

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 System Section 303 in the Workshop Manual to check for proper compression, valvetrain, camshaft, etc.

Is a fault indicated?

Yes	No
REPAIR as required according to Workshop Manual direction. 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 System Section 303 in the Workshop Manual 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 according to Workshop Manual direction. After repair, GO to EM40 to verify repair.	GO to EM29 .

EM29 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.

**EM30 HIGH NO_x 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 System Section 303 in the Workshop Manual to check for base engine concerns such as excessive carbon build up in the combustion chamber.

Is a fault indicated?

Yes	No
REPAIR as required according to Workshop Manual direction. After repair, GO to EM40 to verify repair.	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	No
GO to EM45 .	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	No
GO to EM36 .	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 Section 3 , Step 1: Quick Test (for Test Step procedure only)).

Is a fault indicated?

Yes	No
FOLLOW Section 3 Quick Test direction. After repair, GO to EM38 to verify repair.	GO to EM37 .

EM37 CHECK EVAP SYSTEM

- Go to Evaporative Emissions Section 303 in the Workshop Manual to check for system leaks.

Is a fault indicated?

Yes	No
FOLLOW Pinpoint Test direction. After repair, GO to EM38 to verify repair.	VERIFY test results. If OK, GO to Z1 , or RETURN to Section 3 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 Section 3 , 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	No
Save any repair documentation that may be required by local/federal laws. RETURN vehicle to customer.	Original concern not repaired, or another concern exists. GO to EM1 and proceed as directed.

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 Section 3 , 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	No
SAVE any repair documentation that may be required by local/federal laws. RETURN vehicle to customer.	Gas level is still high, or another gas level is above the acceptable range: GO to EM1 and proceed as directed.

EM40

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	No
The catalytic converter(s) is operating correctly. RECONNECT spark plug wire(s), IAC valve and AIR system (if equipped). CLEAR the DTCs set during testing. VERIFY previous test results. If OK, GO to Z1 , or RETURN to Section 3 to repair any additional symptoms. After any repair is completed, GO to EM40 to verify repair.	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)**FB: Power Take Off (PTO)**
Introduction**FB****Note**

This Pinpoint Test is intended to diagnose the following:

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

Pinpoint Test Schematic**FB INTRODUCTION**

FB: Power Take Off (PTO)**FB****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 Section 2, 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.

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 Section 3 , 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 Section 3 , 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open PTO circuit.

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 Section 3 , 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 Section 2, Drive Cycles).
- Retrieve all Continuous Memory DTCs (refer to Section 2 , Accessing All Continuous Memory DTCs).

Are any Continuous Memory DTCs stored?

Yes	No
GO to Section 4, 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 .

FB10**Test FD: Brake Pedal Pos. (BPP) Sw./Brake Press. Applied (BPA) Sw.**

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

FD**Note**

This Pinpoint Test is intended to diagnose the following:

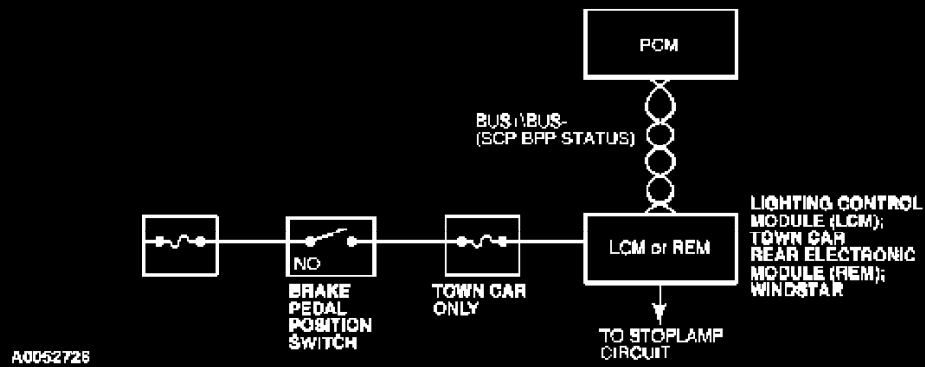
- Brake pedal position (BPP) switch
- Brake pressure applied (BPA) deactivator switch
- Harness circuits: B+, BPA, BPP, DBA, GND and stoplamp PWR
- Powertrain control module (PCM) (12A650)

Vehicles equip with stability assist will typically have the BPP switch input connected to the anti-lock brake (ABS) - traction control\stability assist module. The stability assist portion of the ABS module will interpret the BPP switch input along with other ABS inputs and generate a output called the Driver Brake Application (DBA) signal. The DBA signal is typically sent to the PCM and to other BPP signal users. Correct stop lamp operation on stability assist equip vehicles are control by the anti-lock brake (ABS) - traction control\stability assist module and \ or stop lamp relay circuitry. When diagnosing these types of system always refer to the Workshop manual for ABS description and operation information and to the vehicle wiring schematic for BPP, DBA and stop lamp circuit information.

LS6/LS8 (with stability assist)

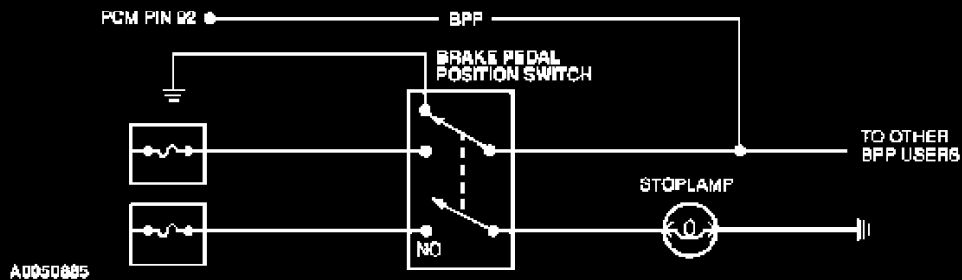
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Town Car and Windstar

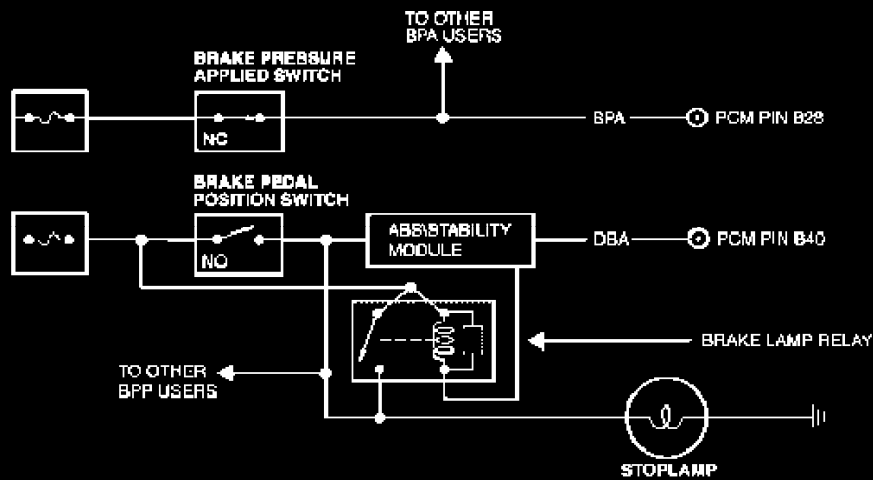


The PCM receives BPP information through the SCP link. This pinpoint test will only verify Self-Test was performed correctly. For detail wiring information, refer to the Workshop Manual or Wiring Diagrams Manual.

Explorer Sport/Sport Trac, Ranger, F-Series, Blackwood, Excursion

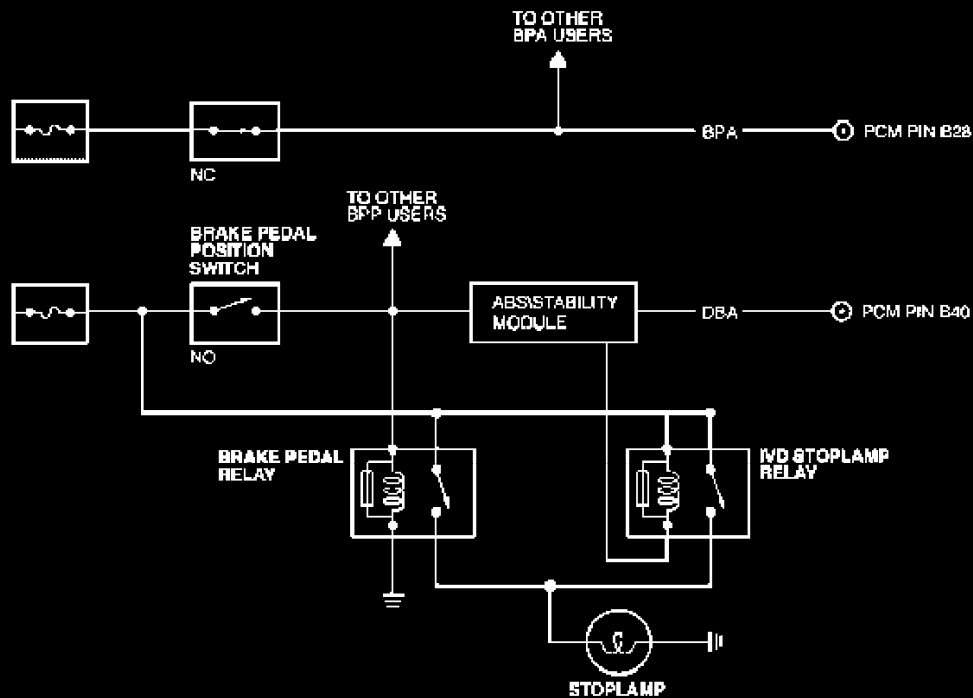


Aviator (150 pin PCM and with stability assist)



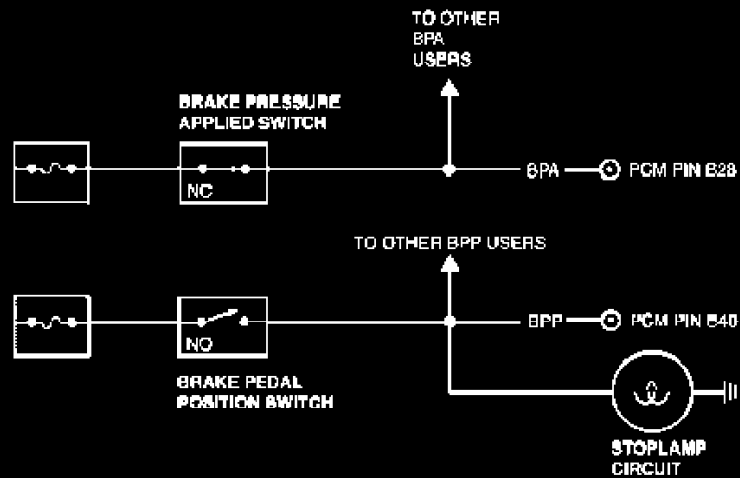
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Explorer/Mountaineer (150 pin PCM and with stability assist)



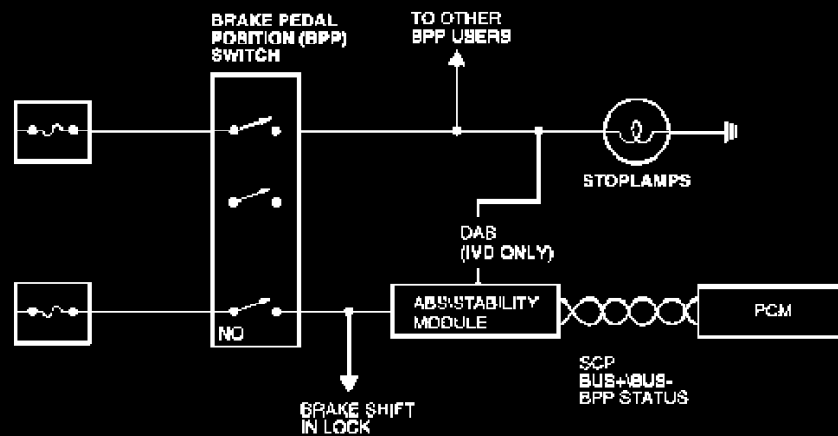
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Aviator, Explorer/Mountaineer (150 pin PCM and without stability assist)



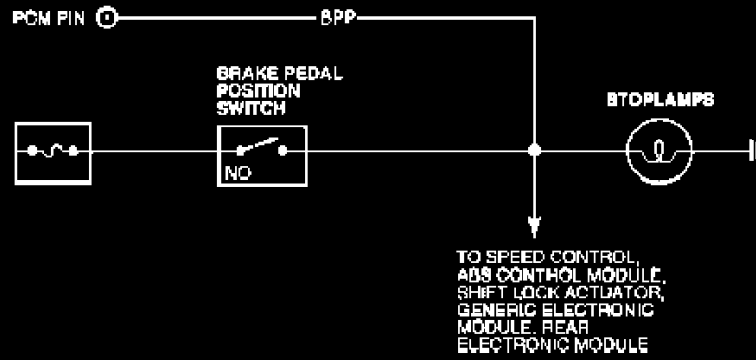
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Expedition/Navigator



A0061996

All Others



A00000000

PCM CONNECTOR PIN NUMBERS

APPLICATION	BPP
2.3L Focus	B8
All Others	92

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

**FD1 KOER DTC P0703 OR P1703: VERIFY BRAKE PEDAL WAS
APPLIED****Was the brake pedal applied and released during KOER Self-Test?**

Yes	No
For Town Car: REFER to Exterior Lighting, Section 417 in the Workshop Manual for further diagnosis of the lighting control module (LCM) system. For Windstar: REFER to Exterior Lighting, Section 417 in the Workshop Manual for further diagnosis of the Rear Electronic Module (REM). For Expedition/Navigator: REFER to Anti-Lock Brake System (ABS), Section 206 in the Workshop Manual for further diagnosis of cause of incorrect brake pedal status from ABS to PCM. All Others: KEY ON. GO to FD3 .	RERUN KOER Self-Test. APPLY and RELEASE brake pedal.

FD1

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 Town Car:
	REFER to Exterior Lighting, Section 417 in the Workshop Manual for further diagnosis of the lighting control module (LCM) system.
	For Windstar:
	REFER to Exterior Lighting, Section 417 in the Workshop manual for further diagnosis of the Rear Electronic Module (REM).
	For Expedition/Navigator:
	REFER to Anti-Lock Brake System (ABS), Section 206 in the Workshop Manual for further diagnosis of cause of incorrect brake pedal status from ABS to PCM.
	All others:
	KEY ON. GO to FD3 .

FD2

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 Focus, LS6/LS8, Thunderbird, Aviator and Explorer/Mountaineer (with stability assist): REFER to Exterior Lighting, Section 417 in the Workshop Manual for further stoplamps diagnosis. 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 .

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 Wiring 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 Section 2, 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 Wiring Diagram Manual). 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 the Workshop Manual for further diagnosis of appropriate module.	REPAIR short to power in stoplamp circuit.

FD10 CHECK FOR BPP CIRCUIT CYCLING

Note: Refer to the PCM connector pin numbers in the beginning of this Pinpoint Test.

- KEY OFF.
- Disconnect PCM.
- Measure voltage between BPP circuit at the PCM harness connector and ground while applying and releasing the brake.

Note: For LS6/LS8, Aviator and Explorer/Mountaineer (150 pin PCM) with ABS - stability assist. Measure DBA input at PCM harness connector and ground while applying and releasing the brake.

Does the voltage cycle?

Yes	No
For LS6/LS8, Thunderbird, Aviator, Explorer/Mountaineer (150 PIN PCM): GO to FD11 .	
For all others:	REPAIR open in BPP or DBA circuit to PCM.
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	

FD11 CHECK FOR BPA CIRCUIT CYCLING

Note: Refer to the PCM connector pin numbers in the beginning of this Pinpoint Test.

- Disconnect PCM.
- Measure voltage between BPA circuit at the PCM harness connector and ground while applying and releasing the brake.

Does the voltage cycle?

Yes	No
GO to FD15 .	GO to FD12 .

FD12 CHECK BPA CIRCUIT FOR OPEN IN HARNESS

- Disconnect BPA deactivator switch.
- Measure resistance of BPA circuit between PCM harness connector pin and BPA deactivator switch harness connector.

Is the resistance less than 5 ohms?

Yes	No
GO to FD13 .	REPAIR open in BPA circuit to PCM.

FD13 CHECK BPA DEACTIVATOR SWITCH

- Connect digital multimeter test probes to BPA switch terminals at the BPA switch.
- Apply brake pedal while monitoring reading.

Is the resistance less than 5 ohms with the brake pedal released and greater than 10,000 ohms with the brake pedal depressed?

Yes	No
REPAIR VPWR circuit to BPA switch.	REPLACE BPA deactivator switch.

FD14 CHECK FOR PCM BPA PID CYCLING

- Start engine.
- Access BPA PID.

Note: If BPA PID is not accessible, GO to FD11 .

- Apply and release the brake pedal several times while viewing the BPA PID.

Does the BPA PID cycle ON/OFF?

Yes	No
GO to FD15 .	GO to FD11 .

FD15 BPP AND BPA RATIONALITY CHECK

- Reconnect all disconnected components.
- Clear Continuous Memory DTCs.
- Start engine.
- Apply and release the brake pedal several times.
- Retrieve Continuous Memory DTCs.

Is P1572 present?

Yes	No
Check for misadjusted brake switch (BPP or BPA). Service as necessary.	GO to FD16 .

FD16 CHECK PCM FOR REOCCURRING BPP DTCS

- Re-run KOER Self-test.
- Retrieve Continuous Memory DTCs.

Is P0703 OR P1703 present?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	Test complete.

FD15 - FD16

Test FF: Power Steering Pressure (PSP) Switch

FF: Power Steering Pressure (PSP) Switch Introduction

FF

Note

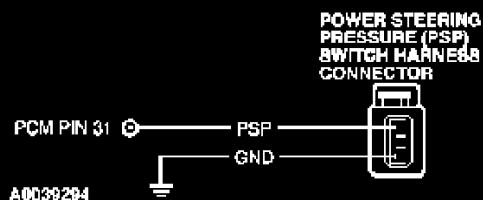
This Pinpoint Test is intended to diagnose the following:

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

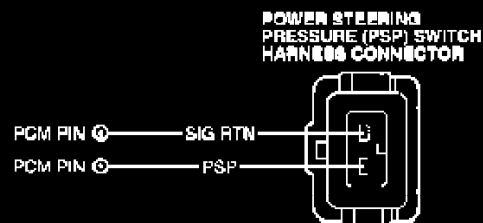
Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware .

Focus



All Others



NOTE: THE PSP AND SIG RTN CIRCUITS MAY BE REVERSED IN THE HARNESS CONNECTOR. REFER TO THE WIRING DIAGRAM MANUAL FOR MORE INFORMATION.

A0039295

PCM CONNECTOR PIN NUMBERS

PCM TYPE	PSP	SIG RTN
104 PIN	31	91
150 PIN (LS and THUNDERBIRD)	E5	E17
150 PIN	B37	B17

Shorting Bar for Harness Circuit without PSP Switch (typical)



A24585-A

FF INTRODUCTION 2 OF 2

FF: Power Steering Pressure (PSP) Switch**FF****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 .

FF1 - FF2

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.

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 Section 2, 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 .

FF10**Test H: Fuel Control**

H: Fuel Control Introduction

H

Note

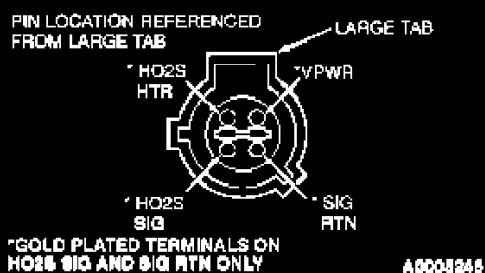
This Pinpoint Test is intended to diagnose the following:

- 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 Schematics and Connectors

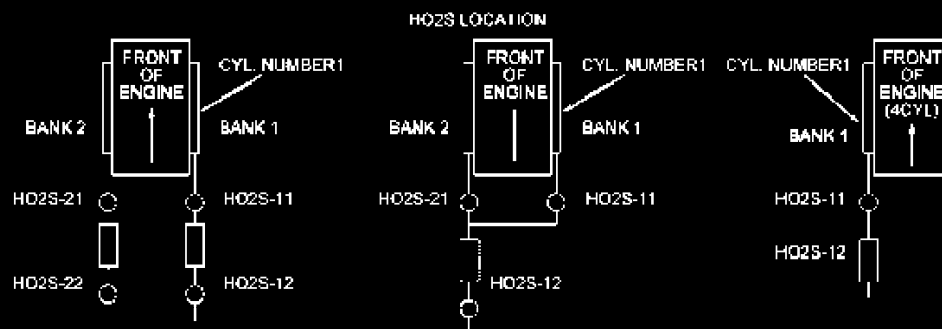
For PCM connector views, refer to Section 1, Powertrain Control Hardware

HO2S VEHICLE HARNESS CONNECTOR



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.



N0013163

HO2S PCM CONNECTOR PIN NUMBERS

PCM TYPE	HO2S-11	HTR-11	HO2S-12	HTR-12	HO2S-21	HTR-21	HO2S-22	HTR-22
104 Pin	60	93	35	95	87	94	61	96
122 Pin	B26	B21	T3	T21	B27	B20	T2	T29
150 Pin	E45	E7	T28	T15	E44	E8	T29	T16

INJECTOR VEHICLE HARNESS CONNECTOR

A24533-A

INJECTOR PCM CONNECTOR PIN NUMBERS

PCM TYPE	Inj-1	Inj-2	Inj-3	Inj-4	Inj-5	Inj-6	Inj-7	Inj-8	Inj-9	Inj-10
104 Pin	75	101	74	100	73	99	72	98	68	42
122 Pin	E14	E15	E7	E8	E3	E4	E5	E6	—	—
150 Pin	E2	E14	E24	E32	E11	E21	E29	E37	—	—

H: Fuel Control**H****H20 PERFORM KOER SELF-TEST**

- Key on, engine running and engine at operating temperature.
- Activate Key On, Engine Running (KOER) Self-Test.

Is DTC P0040, P0041, P1127, P1128, P1129 or P2278 present during KOER Self-Test?

Yes	No
GO to Section 4, Powertrain Diagnostic Trouble Code (DTC) Charts and SERVICE DTC P0040, P0041, P1127, P1128, P1129 or P2278.	GO to H21 .

**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 Section 2 Diagnostic Monitoring Test Results.)

Is the indicated value greater than the minimum threshold?

Yes	No
CLEAR the DTCs. COMPLETE HO2S Monitor Drive Cycle (REFER to Section 2, Drive Cycles). GO to H20 . If test results indicate a pass, testing is complete.	GO to H23 .

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. CLEAR the DTCs. COMPLETE HO2S Monitor Drive Cycle (REFER to Section 2, 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.

Note: If viewing the HO2S11 (O2S11) PID on the 2.3L Focus, the engine must be running.

Is the voltage greater than 1.50 volts?

Yes	No
KEY OFF. REPLACE HO2S. CHANGE oil/filter. CLEAR the DTCs. COMPLETE HO2S Monitor Drive Cycle (REFER to Section 2, Drive Cycles).	KEY OFF. REMOVE jumper wire. GO to H25 .

H25 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.

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.
- Disconnect PCM.
- 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 Section 2, 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 .

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. CLEAR the DTCs. COMPLETE HO2S Monitor Drive Cycle (REFER to Section 2, 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.

H30 DTCS P0135 AND P0155, P0141 AND P0161: HO2S HEATER CIRCUIT IS SHORTED TO GROUND, SHORTED TO VPWR OR OPEN CIRCUIT.

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
- DTC P0141 = HO2S HTR-12
- DTC P0161 = HO2S HTR-22
- DTC P0147 = HO2S HTR-13
- DTC P0167 = HO2S HTR-23

- ♦ If PCM was disconnected during a previous Pinpoint Test, reconnect PCM now.

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 H31 .

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, P0147, P0155, P0161, P0167?

Yes	No
KEY OFF. GO to H32 .	KEY OFF. GO to H33 .

H32 CHECK VPWR VOLTAGE TO HO2S HARNESS CONNECTOR

Note: If DTCs P0135 and P0155, P0141 and P0161 or P0147 and P0167 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 H33 .	CHECK fuse in circuit. If fuse is OK, REPAIR open VPWR or SIG RTN circuit. For no VPWR on LS6, LS8 and Thunderbird: GO to B5 .

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 H34 .	REPAIR shorted circuit.

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 H35 .	REPAIR open or excessive resistance in the heater circuit in harness.

H35 CHECK HO2S HTR RESISTANCE

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

Is the resistance between 3 and 30 ohms?

Yes	No
GO to H36 .	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.

Is the resistance greater than 10,000 ohms?

Yes	No
REPLACE PCM. REFER to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).	REPLACE HO2S.

H40 DTCS P0171, P0174, P1130, P1131, P1150, P1151, P2195 OR P2197: 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, P1131, and P2195
- HO2S-21 = DTCs P1150, P1151, and P2197
- 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, P1151, P2195 or P2197?

Yes	No
DISREGARD the current diagnostic trouble code (DTC) at this time. GO to Section 4, Diagnostic Trouble Code (DTC) Charts and REPAIR the other DTCs.	GO to H41 .

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 H44 .	GO to H42 .

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 H47 .	GO to H43 .

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 .

H43

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 Section 2, Resetting The Keep Alive Memory (KAM).	A vacuum leak is still present, GO to H43 .

H44

H45 DTCs P1132, P1152, P2196, AND P2198: 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 = DTCs P1132 and P2196
- HO2S-21 = DTCs P1152 and P2198
- 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 H47 .

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). REFER to Section 2, Resetting The Keep Alive Memory (KAM).	GO to H47 .

H45 - H46

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 P0040, P0041, P1127, P1128, P1129, P1131, P1132, P1151, P1162, P2196, P2196, P2197 or P2198 present?

Yes	No
KEY OFF. If DTC P0040, P0041, P1127, P1128 or P1129 is present, GO to Section 4, Powertrain Diagnostic Trouble Code (DTC) Charts and REPAIR those DTCs first.	KEY OFF. For Continuous Memory DTCs Only P0171, P0174, P0172 and P0175:
DTCs (P1131, P2195) or (P1151, P2197):	GO to H57 .
GO to H48 .	If DTC(s) P1132, P2196 and/or P1152, P2198 are no longer present, RECONNECT fuel vapor line.
DTCs (P1132, P2196) or (P1152, P2198):	Vehicles experiencing KOER DTC P1131, P1132, P1151, P1152, P2195, P2196, P2197 or P2198: REFER to Evaporative Emissions, Section 303-13 in the Workshop Manual for system leakage.
GO to H54 .	All others without recurring DTCs:
	Unable to duplicate or identify fault at this time. GO to Z1 .

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.

Note: If viewing the HO2S11 (O2S11) PID on the 2.3L Focus, the engine must be running.

Is the reading 1.30 volts or greater?

Yes	No
KEY OFF. CHECK SIG RTN circuit. GO to H49 .	KEY OFF. GO to H51 .

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
Reconnect HO2S, GO to H57 .	GO to H50 .

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).	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 H52 .	REPAIR open circuit.

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 H53 .	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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).	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).

Note: If viewing the HO2S11 (O2S11) PID on the 2.3L Focus, the engine must be running.

Is the reading 0.2 volt or less?

Yes	No
KEY OFF. GO to H56 .	KEY OFF. GO to H55 .

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).	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 H57 .	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 H58 .	KEY OFF. GO to HC1 .

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 HC1 If no external leak is detected, GO to H60 .

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 HO2S DTCs displayed with misfire DTCs: GO to H61 . All other DTCs: GO to H64 .	GO to HC6 .

H58 - H59

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 H61 .	For DTCs P0300 through P0310: GO to HD12 . For all other DTCs: GO to H64 .

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
REPLACE PCM. REFER to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). For Continuous Memory DTCs P0201 through P0210: Concern may be intermittent. Attempt to duplicate concern. If unable to duplicate concern GO to Z1	GO to H62 .

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 H63 .	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
GO to H64 .	REPAIR short circuit.

H62 - H63

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 . DTC P0172 and P0175: GO to DC25 . For DTC P1131, P1151, P2195, and P2197: GO to H65 . For DTC P1132, P1152, P2196 and P2198: GO to H69 .	REPLACE fuel injector.

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, P1151, P2196 or P2197 present?

Yes	No
GO to H66 .	Cause of DTC(s) is in the Secondary Air Injection System. GO to HM7 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 or P0174: GO to DC25 . DTCs P1131, P1151, P2195, and P2197: GO to H67 .

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. Refer to Engine, Section 303-00, 303-01 in the Workshop Manual.

Are cylinder compression readings within specification?

Yes	No
For DTCs P1131, P1151, P2195 and P2197: GO to H68 . For DTCs P1132, P1152, P2196 and P2198: GO to H69 . Misfire DTCs displayed with fuel control DTCs: GO to HD20 .	REPAIR as necessary.

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

Any vacuum or air leaks can cause DTCs P1131, P1151, P2195 and P2197.

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 H71 .	KEY OFF. REPLACE HO2S.

H69 ATTEMPT TO GENERATE DTC P1131, P1151, P2195 OR P2197

- 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, P1151, P2195 or P2197 present?

Yes	No
KEY OFF. REMOVE jumper. GO to H70 .	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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).

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 H71 .	KEY OFF. REPLACE HO2S. PERFORM KOER SELF-TEST. If DTCs P1132 or P1152 still exist, REPLACE PCM. REFER to Section 2, 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 H72 .

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 DC25 .	KEY OFF. REPLACE HO2S.

H80 DTC P0136 AND P0156 MONITOR DOWNSTREAM HO2S OUTPUT VOLTAGE FOR ACTIVITY. DTCs P1137, P1138, P1157, P1158, P2270, P2271, P2272 AND P2273 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, P1138, P2270 and P2271=HO2S-12
- DTC P0156, P1157, P1158, P2272 and P2273=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 H81 . All others: GO to H82 .

H81 CHECK FOR KOER DTCS P1137, P1157, P1138, P1158, P2270, P2271, P2272 AND P2273

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

Is DTC P1137, P1138, P1157, P1158, P2270, P2271, P2272 or P2273 present?

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

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 H83 .

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 H84 .	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.

H83 - H84

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 1.6 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).	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 P0040, P0041, P1128 AND P1129 KOER

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

- P0040 and P1128 refer to the upstream HO2S.
- P0041 and 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.
 - P0040 and P1128 = HO2S 11/21 Upstream
 - P0041 and 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.

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 H116 .	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 Z1

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).

Note: If viewing the HO2S11 (O2S11) PID on the 2.3L Focus, the engine must be running.

Is PID voltage .5 volts or greater?

Yes	No
GO to H117	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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).	Repair short to power in harness between PCM and HO2S.

H116 - H117

Test HA: Natural Gas Fuel Control

HA: Natural Gas Fuel Control Introduction

HA

Note

This Pinpoint Test is intended to diagnose the following:

- HO2S/HTR (Heater) (9F472)
- HO2S Connections
- Vacuum Systems
- Fuel Injector(s) (9F593)
- Harness Circuits: HO2S GND, HO2S, INJ 1-8, VPWR and SIG RTN
- Powertrain Control Module (PCM) (12A650)
- Natural Gas Module (NG) (9F954)

Pinpoint Test Schematic and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware

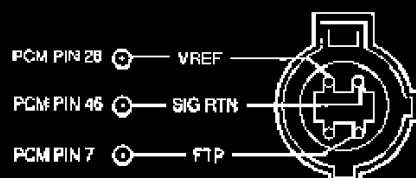
HEATED OXYGEN SENSOR
(HO2S) VEHICLE HARNESS
CONNECTOR (PIN LOCATIONS
REFERENCED FROM LARGE TAB)



*GOLD PLATED TERMINALS ON
HO2S SIGNAL AND SIGNAL RETURN
ONLY.

A0015110

FUEL TANK
PRESSURE (FTP)
HARNESS
CONNECTOR

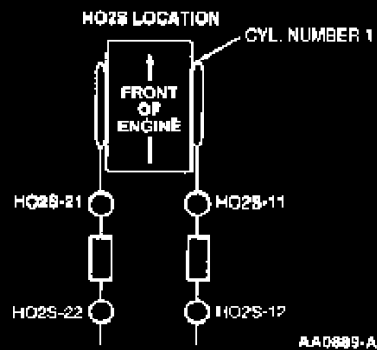


FUEL TANK PRESSURE SENSOR WIRES
TERMINATE AT THE NG MODULE

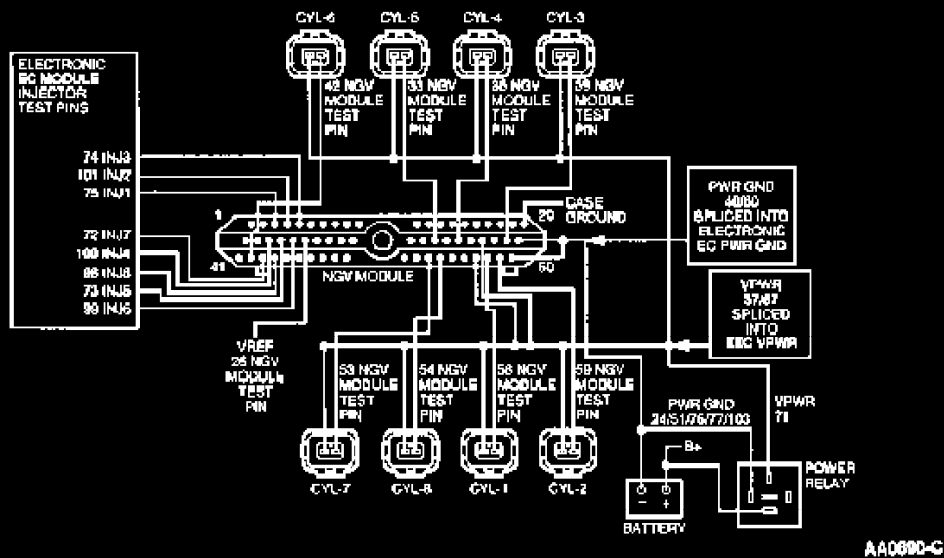
AA4388-B

HO2S CONNECTOR PIN ASSIGNMENT

Signal	Pin	HO2S HTR Ground	Pin	HTR VPWR	Pin	HO2S SIG RTN	Pin
HO2S-11	60	HO2S HTR-11 (GND)	93	VPWR	71	SIG RTN	91
HO2S-12	35	HO2S HTR-12 (GND)	95	VPWR	71	SIG RTN	91
HO2S-21	87	HO2S HTR-21 (GND)	94	VPWR	71	SIG RTN	91
HO2S-22	61	HO2S HTR-22 (GND)	96	VPWR	71	SIG RTN	91



NGV Module 60 Pin Connector



HA: Natural Gas Fuel Control**HA****HA30 DTCS P0135, P0141, P0155 AND P0161: HO2S HTR SIGNAL CIRCUIT IS OPEN, SHORTED TO GROUND, SHORTED TO VPWR OR EXCESSIVE CURRENT DRAW****DTC/HO2S Reference List**

- DTC P0135 = HO2S HTR-11
- DTC P0141 = HO2S HTR-12
- DTC P0155 = HO2S HTR-21
- 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, contamination, corrosion and proper installation.

Were any concerns found during the visual inspection?

Yes	No
REPAIR any concerns found in the visual inspection.	GO to HA31 .

HA31 PERFORM KEY ON ENGINE OFF (KOEO) SELF-TEST

- Key On.
- Engine at 2000 rpm for 1 minute.
- Key Off.
- Key On, Engine Off.
- Perform KOEO Self-Test.

Are DTCs P0135, P0141, P0155 and/or P0161 present?

Yes	No
KEY OFF. GO to HA32 .	KEY OFF. Unable to duplicate or identify fault at this time. GO to Z1 .

HA32 CHECK VPWR VOLTAGE TO HO2S HARNESS CONNECTOR

Note: If DTCs P0135 and P0155 or P0141 and P0161 are displayed, both heater circuits will require testing. DTCs displayed separately are tested individually.

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

- 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 10.6 volts?

Yes	No
KEY OFF. GO to HA34 .	KEY OFF. GO to HA33 .

HA33 CHECK VPWR CIRCUIT FOR OPEN IN HARNESS

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

Is the resistance less than 5.0 ohms?

Yes	No
GO to HA34 .	CHECK fuse in circuit. If fuse is OK, REPAIR open circuit.

HA34 CHECK HO2S HEATER RESISTANCE

- Measure the resistance of the HO2S HTR.

Is the resistance between 3 and 30 ohms?

Yes	No
GO to HA35 .	REPLACE HO2S.

HA32 - HA34

HA35 CHECK HO2S CASE FOR SHORT TO VPWR AND HTR GND

- Measure resistance between the HO2S HTR GND at the HO2S sensor connector and the HO2S sensor case.
- Measure resistance between the HO2S VPWR at the HO2S sensor connector and the HO2S sensor case.

Is the resistance greater than 10,000 ohms?

Yes	No
GO to HA36 .	REPLACE HO2S.

HA36 CHECK FOR SHORTS TO OTHER GROUNDS AND VPWR IN THE HO2S HTR GROUND HARNESS CIRCUITS

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

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

Is the resistance greater than 10,000 ohms?

Yes	No
GO to HA37 .	REPAIR shorted circuit.

HA37 CHECK HO2S HTR GROUND 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
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open or excessive resistance in the heater circuit in harness.

HA40 DTC P1131, P1151, P1132, P1152, P2195, P2196, P2197 AND P2198: UPSTREAM HO2S(S) NOT SWITCHING. DTCs P1130 AND P1150: FUEL SYSTEM NOT SWITCHING AT THE FUEL TRIM (RICH OR LEAN)**HO2S DTCs Reference list**

- HO2S-11 = DTCs P1131, P1132, P1130, P2195 and P2196
- HO2S-21 = DTCs P1151, P1152, P1150, P2197 and P2198
- Check intake air system for leaks, obstructions, damage and blockage.
- Verify integrity of the PCV system.
- Check for disconnected spark plug wires.
- Check for vacuum leaks.

Are any of the above concerns present?

Yes	No
REPAIR as necessary.	GO to DC25 .

HA41 DTCs P0171, P0172, P0174 AND P0175: FUEL SYSTEM AT THE CORRECTED FUEL TRIM**Fuel System DTC Reference list:**

- BANK 1 = DTCs P0171 (lean) and P0172 (rich)
- BANK 2 = DTCs P0174 (lean) and P0175 (rich)
- Check intake air system for leaks, obstructions and damage.
- Check air cleaner element, air cleaner housing for blockage.
- Verify fuel level.
- Verify integrity of the PCV system.
- Check for disconnected spark plug wires.
- Check for vacuum leaks.
- Verify customer did not run out of fuel.

Are any of the above concerns present?

Yes	No
REPAIR as necessary.	GO to DC25 .

HA42 PERFORM KOER SELF-TEST

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

Are HO2S DTCs P1131, P1132, P1151, P1152, P2195, P2196, P2197 or P2198 present?

Yes	No
KEY OFF. GO to HA43 .	KEY OFF. For continuous DTCs P1130, P1150 P0171, P0174, P0172 and P0175: GO to HA43 . All others: Unable to duplicate or identify fault at this time. GO to Z1 .

HA43 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 HB BEFORE SERVICING.

- Access FRP PID and monitor the fuel pressure.
- Key On, Engine Off. Record pressure readings.
- Key On, Engine Running. Record pressure readings.
- Increase engine speed to 2500 rpm and maintain for one minute. Record pressure reading.

Are the fuel pressure readings between 552 or 827 kPa (80-120 psi)?

Yes	No
KEY OFF. GO to HA44 .	KEY OFF. GO to HB1 .

HA42 - HA43

- Cycle key on and off twice.
- Leave Key On, Engine Off.
- Access FRP PID and monitor fuel pressure for two minutes.
- Verify there are no external leaks (service as necessary).

Yes	No
For DTCs P1130, P1150, P0171, P0172, P0174 and P0175: GO to HA45 .	
For No Starts: GO to HA45 .	GO to HB1 .
All other DTCs: GO to HA62 .	

- Access FRP PID and monitor fuel pressure.
- Key On, Engine Off. Monitor the fuel pressure.

Yes	No
For No Starts:	
GO to HA46 .	For DTCs P0172 and P0175:
For DTCs P1130, P1160, P0171 and P0174:	GO to HA56 .
GO to HA55 .	

HA46 CHECK FUEL INJECTOR(S) ABILITY TO DELIVER FUEL

- Access FRP PID and monitor fuel pressure.
- Cycle key twice.
- Locate and disconnect the inertia fuel shutoff (IFS) switch.
- Crank the engine for ten seconds and monitor the fuel pressure reading.

Was there a pressure drop greater than 34 kPa (10 psi)?

Yes	No
The Electronic Engine Control System is not the cause of the no start. GO to Section 3 , Symptom Chart, for further diagnosis.	GO to HA47 .

HA47 CHECK VREF VOLTAGE AT NATURAL GAS (NG) VEHICLE MODULE

- Install NG Module Breakout Box.
- NG Module connected.
- Key On, Engine Off.
- Measure the voltage between VREF and SIG RTN circuits at the NG Module Breakout Box.

Is the voltage reading between 4.0 and 6.0 volts?

Yes	No
KEY OFF. For NO START: GO to HA48 . All others: GO to HA57 .	 KEY OFF. GO to HA50 .

HA48 CHECK FOR OPEN IN POWER GROUND CIRCUITS

- NG Module disconnected.
- Measure resistance of PWR GND circuit between NG module harness connector pin and battery negative post.

Is the resistance less than 5.0 ohms?

Yes	No
GO to HA49 .	REPAIR open circuit.

HA49 CHECK FOR OPEN IN POWER GROUND CIRCUIT IN NG MODULE

- NG Module disconnected.
- Measure the resistance between PWR GND and SIG RTN circuits at the NG Module connector.

Is the resistance less than 5.0 ohms?

Yes	No
For NO START: GO to HA57 . All others: RECONNECT PCM, NG Module, and GO to A6 .	REPLACE NG Module.

HA50 IS VREF GREATER THAN 6.0 VOLTS**Is the VREF reading greater than 6.0 volts from the previous test step?**

Yes	No
GO to HA55 .	GO to HA51 .

HA51 CHECK BATTERY VOLTAGE

- Measure the voltage across the battery terminals.

Is the voltage reading greater than 10.5 volts?

Yes	No
GO to HA52 .	REFER to Section 414 in the Workshop Manual.

HA52 CHECK VPWR AT NG MODULE

- Key On, Engine Off.
- Measure the voltage between VPWR and PWR GND circuits at the NG module harness connector.

Is the voltage reading greater than 10.5 volts?

Yes	No
GO to HA54 .	GO to HA53 .

HA53 CHECK VOLTAGE BETWEEN VPWR AT THE NG MODULE AND BATTERY GROUND

- Key On, Engine Off.
- Measure the voltage between VPWR circuit at the NG module harness connector and battery ground.

Is the voltage reading greater than 10.5 volts?

Yes	No
REPAIR open ground.	REPAIR open power circuit.

HA54 CHECK VREF VOLTAGE TO THE FUEL TANK PRESSURE SENSOR

- Locate fuel tank pressure sensor at the rear of the vehicle and disconnect (On the Crown Victoria, the fuel tank pressure sensor is located under the vent box cover of the upper tank assembly).
- Key On, Engine Off.
- Measure voltage between the VREF circuit and SIG RTN circuit at the fuel tank pressure sensor harness connector (refer to schematic at the beginning of this Pinpoint Test for pin location).

Is the voltage reading between 4.0 and 6.0 volts?

Yes	No
KEY OFF. REPLACE Fuel Tank Pressure sensor. REFER to Section 310 in the Workshop Manual.	KEY OFF. GO to HA56 .

HA55 CHECK VREF CIRCUIT FOR SHORT TO POWER IN HARNESS

- Fuel tank pressure sensor disconnected.
- Disconnect NG module.
- Key On, Engine Off.
- Measure voltage between the VREF and PWR GND circuits at the NG module harness connector.

Is the voltage reading less than 1.0 volt?

Yes	No
REPLACE NG module.	REPAIR short to power.

HA56 CHECK VREF CIRCUIT FOR SHORT TO PWR GND

Note: Refer to the NG module pin numbers at the beginning of this pinpoint test.

- NG module disconnected.
- Measure resistance between VREF circuit and the SIG RTN, PWR GND and CASE GND circuits at the NG module harness connector.

Is the resistance greater than 10,000 ohms?

Yes	No
REPLACE NG module.	REPAIR short to ground.

HA55 - HA56

HA57 CHECK FUEL INJECTOR(S) AND HARNESS RESISTANCE FROM THE NATURAL GAS (NG) MODULE TO THE FUEL INJECTOR(S)

- NG module disconnected.
- Measure resistance between suspect fuel injector circuit Pin(s) and VPWR pins 37/57 at the NG module harness connector (use chart for injector pin location).

Cylinder Number	NG Module	Cylinder Number	NG Module
1	58	5	33
2	59	6	42
3	39	7	53
4	35	8	54

•

Is the resistance between 3.0 and 6.0 ohms?

Yes	No
For No Start and DTCs: GO to HA60 .	GO to HA58 .

HA58 CHECK FUEL INJECTOR(S) HARNESS RESISTANCE BETWEEN NG MODULE AND FUEL INJECTOR

- Measure resistance of injector circuits between the NG module harness connector Pins and the fuel injector(s) harness connector (use chart from Test Step HA57 for fuel injector pin location).
- Measure resistance between the NG module harness connector VPWR Pins 37/57 and VPWR circuit at the fuel injector harness connector.

Is each resistance less than 5.0 ohms?

Yes	No
GO to HA59 .	REPAIR open circuit.

HA57 - HA58

HA59 CHECK FUEL INJECTOR HARNESS CIRCUIT FOR SHORTS TO POWER AND GROUND BETWEEN THE NG MODULE AND INJECTORS

- Measure resistance between the NG module fuel injector Pin(s) and NG module Pins 37/57 and 40/60.

Cylinder Number	NG MODULE	Cylinder Number	NG Module
1	58	5	33
2	59	6	42
3	39	7	53
4	35	8	54

Is each resistance greater than 10,000 ohms?

Yes	No
For DTCs P0172 and P0175, GO to HA61	REPAIR short circuit.
All Others :	
REPLACE only damaged fuel injector(s).	

HA59

HA60 CHECK FUEL INJECTOR DRIVER SIGNAL

This test requires a standard 12 volt test lamp.

- NG module connected.

Note: A properly operating system will show a dim glow at idle on the test lamp.

- Connect test lamp between the fuel injector signal circuit pin and VPWR circuit pin at the fuel injector harness connector.
- Crank or start the engine.

Does the test lamp have a dim glow while cranking or running the engine?

Yes	No
PCM and NG circuits are OK. For runs rough condition, RETURN to Section 3 , Symptom Charts.	No light/continuous bright light, GO to HA61 .
For No Start condition, GO to A4 .	
All others: GO to HA64 .	

HA60

HA61 CHECK PCM FUEL INJECTOR HARNESS CIRCUIT RESISTANCE

Note: Refer to the PCM and NG module pin numbers at the beginning of this pinpoint test.

- PCM and NG module disconnected.
- Measure resistance of VPWR circuit between PCM harness connector pins and NG module harness connector pins.
- Measure resistance of the Fuel Injector Pin(s) between the PCM and NG module. (Refer to chart for PCM and NG module pin location.)

Cylinder Number	PCM Output to 60-Pin NG Input	
	PCM Pin	NG Module Pin
1	75	3
2	101	4
3	74	5
4	100	23
5	73	24
6	99	25
7	72	43
8	98	44

•

Is each resistance less than 5.0 ohms?

Yes	No
GO to HA62 .	REPAIR open harness circuit.

HA61

HA62 CHECK PCM FUEL INJECTOR CIRCUIT FOR SHORT TO POWER AND GROUND IN HARNESS

- Measure resistance between the Fuel Injector circuit pin(s) and VPWR and PWR GND circuits at the PCM harness connector (GO to HA61 and refer to the chart).
- Measure the resistance between the Fuel Injector circuit pin(s) and VPWR, CASE GND and PWR GND circuits at the NG module harness connector (GO to HA61 and refer to the chart).

Is each resistance greater than 10,000 ohms?

Yes	No
For DTCs P0172 and P0176: GO to HA64 . All others: GO to HA63 .	REPAIR short circuit.

HA63 CHECK FUEL INJECTOR DRIVER SIGNAL FROM PCM

This test requires a standard 12 volt test lamp.

- PCM connected, NG module disconnected.

Note: A properly operating system will show a dim glow or flicker at idle on the test lamp.

- Connect a test lamp between the VPWR circuit and each from PCM Fuel Injector Signal circuit at the NG module harness connector.
- Crank or start the engine.

Does the test lamp have a dim glow or flicker while cranking or starting the engine?

Yes	No
For no starts: REPLACE NG module. For runs rough: Return to symptom chart. For DTCs: GO to HA64 .	REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

HA64 FLOW TEST FUEL INJECTOR(S)

Use Rotunda Natural Gas (NG) Injector Tester found in the Special NG Tool Kit 113-00114 or equivalent to flow test NG fuel injectors. Follow the Rotunda Natural Gas (NG) Injector Tester test steps indicated below, or follow the specific instructions included with the injector tester you are using.

- Observe WARNING, CAUTION and NOTE.
- Key Off.
- Key On, Engine Off.
- Note initial FRP sensor pressure using the scan tool.
- Electronic fuel injector tester installed to suspect fuel injector.
- Select pulse width of 200 m sec.
- Activate the fuel injector tester.
- Note final FRP sensor pressure using scan tool.
- Subtract final pressure from initial pressure to find pressure drop.
- Repeat above test procedures for all remaining fuel injectors.

Is the leakage and flow within specification?

Yes	No
DTCs P0171, P0172, P0174 and P0175: Unable to duplicate or identify fault at this time. GO to Z1 .	
DTCs P1130 and P1150: GO to HA66 .	REPLACE fuel injector.
All others: GO to HA65 .	

HA64

HA65 CHECK CYLINDER COMPRESSION

- Check cylinder compression. Refer to Powertrain/Engine Group Base Engine/Engine—Service Section of the Workshop Manual.

Are cylinder compression readings within specification?

Yes	No
For DTCs P1131, P1130, P1151, P1150, P2196 and P2197: GO to HA66 . For DTCs P1132, P1152, P2196 and P2198: GO to HA71 .	REPAIR as necessary.

HA66 CHECK HO2S INTEGRITY

- Inspect HO2S harness for chafing, burned out wires or other damage and service.
- Inspect HO2S and connector for indications of submersions in water, oil and coolant.
Repair as necessary.
- Run engine at 2000 rpm for two minutes.
- Perform Key On Engine Running (KOER) Self-Test.
- Key off.

Are DTCs P1131, P1151, P2195 and/or P2197 present?

Yes	No
GO to HA67 .	Unable to duplicate or identify fault at this time. GO to Z1 .

HA67 CHECK HO2S's ABILITY TO GENERATE A VOLTAGE GREATER THAN 0.5 VOLT

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

Any vacuum or air leaks can cause DTCs P1131, P1151, P1130,P1150, P2195 and P2197.

- Disconnect the suspect HO2S from vehicle harness.
- Connect digital multimeter to the HO2S Signal circuit and HO2S SIG RTN circuit or HO2S GND circuit at the HO2S sensor connector.
- Run engine at 2000 rpm for two minutes.
- Rerun KOER Self-Test and monitor HO2S voltage.

Does voltage reading indicate greater than 0.5 volt during or at the end of Self-Test?

Yes	No
GO to HA68 .	REPLACE HO2S.

HA68 CHECK HO2S SIGNAL AND HO2S GROUND CIRCUITS FOR OPEN IN HARNESS

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

Is the resistance reading less than 5.0 ohms?

Yes	No
GO to HA69 .	REPAIR open circuit.

HA67 - HA68

HA69 - HA70

HA71 CHECK FOR DTCS P1132, P1152, P2196 AND P2198 WITH P1130 AND P1150

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

Are DTCS P1132, P1152, P2196 or P2198 present?

Yes	No
GO to HA72 .	Unable to duplicate or identify fault at this time. GO to Z1 .

HA72 CHECK HO2S SIGNAL FOR SHORT TO VPWR and VREF

- DTC P1130, P1132, P2196=HO2S-11
- DTC P1150, P1152, P2198=HO2S-21
- Key on, engine off.

Note: HO2S displayed as O2S on Scan Tool.

- Access the HO2S PID for the DTC generated.

Is the voltage greater than 1.0 volt and less than 4.0 volts?

Yes	No
GO to HA73 .	GO to HA75 .

HA73 CHECK HO2S CIRCUIT FOR SHORT TO VPWR

- Disconnect sensor.
- Disconnect PCM.

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

- Measure the resistance between the HO2S signal circuit pin(s) and VPWR circuit at the HO2S harness connector.

Is the resistance greater than 10,000 ohms?

Yes	No
GO to HA74 .	REPAIR short to power.

HA74 CHECK HO2S SIGNAL FOR SHORT TO HO2S HTR CIRCUIT IN THE SENSOR

- HO2S sensor disconnected.
- Key on, engine off.

Note: HO2S displayed as O2S on Scan Tool.

- Access HO2S PID for DTC(s) received.

Is the HO2S voltage less than 0.2 volt?

Yes	No
REPLACE HO2S.	REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

HA75 ATTEMPT TO GENERATE DTCS P1131, P1151, P2195 AND P2197

- Disconnect HO2S.
- Connect jumper between HO2S Signal at the HO2S harness connector and battery negative post.
- Activate Key On Engine Running (KOER) Self-Test.

Is DTC P1131, P1151, P2195 or P2197 present?

Yes	No
GO to HA76 .	DISCONNECT PCM. INSPECT both ends of connector for damaged or pushed out pins, moisture, corrosion, loose pins. REPAIR as necessary. If OK, REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

HA74 - HA75

HA76 HO2S SENSOR VOLTAGE CHECK

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

- Disconnect HO2S.
- Connect digital multimeter to HO2S SIG circuit and HO2S SIG RTN circuit 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
GO to HA77 .	REPLACE HO2S.

HA77 MONITOR HO2S PID FOR PROPER SWITCHING

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

Note: HO2S displayed as O2S on Scan Tool.

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

Did the HO2S voltage stay high (greater than 0.45 volt) or low (less than 0.45 volt)?

Yes	No
ISOLATE cause of lack of HO2S switches and repair.	GO to HA78 .

HA76 - HA77

HA78 TEST DRIVE WHILE MONITORING HO2S PID FOR PROPER SWITCHING

Note: This test step requires an observer to monitor PID for proper operation.

- Access HO2S PID.
- While observer views HO2S PID, test drive vehicle under different road conditions in an attempt to simulate the original fault.

Does HO2S appear to switch properly?

Yes	No
UNABLE to duplicate fault. Testing complete at this time.	REPLACE HO2S.

HA90 DTC P1127 KOER

Possible causes:

- Engine not operating long enough prior to performing KOER Self-Test.
- Exhaust system too cool.
- Key on, engine running.
- Access HTR11, 21 PIDs.

Do all PIDs indicate ON?

Yes	No
With engine still running, COMPLETE a KOER Self-Test to verify P1127 is no longer present.	OPERATE engine until all PIDs indicate ON. COMPLETE a KOER Self-Test.

HA100 DTC P1128 KOER

- P1128 refers to the upstream HO2S.

Possible causes:

- Crossed HO2S harness connectors.
- Crossed wiring at HO2S harness connectors.
- Crossed HO2S wiring at PCM 104-pin harness connector.
- Key off.
- Visually inspect HO2S harness connector(s) for any crossed or stretched wires or wire harnesses not mounted properly.

Are there any indications of crossed connectors or wires?

Yes	No
REPAIR as necessary.	GO to HA101 .

HA101 VERIFY PROPER HO2S SIGNAL PIN LOCATION

- Disconnect PCM.
- Disconnect both of the suspect HO2S sensors at the HO2S harness connector.
 - P1128 = HO2S 11/21 Upstream
- Measure resistance of HO2S SIG circuits between the PCM harness connector and the HO2S harness connectors.
 - HO2S-11-Test Pin 60
 - HO2S-21-Test Pin 87

Is the resistance less than 5.0 ohms?

Yes	No
HO2S SIG circuit is OK.	CONNECT HO2S connector to proper HO2S or RELOCATE HO2S signal pins in the PCM 104-pin harness connector or HO2S harness connector.

HA100 - HA101**Test HB: Natural Gas Fuel Delivery System**

HB: Natural Gas Fuel Delivery System Introduction

HB

Note

This Pinpoint Test is intended to diagnose the following:

- Fuel Pressure
- Fuel Supply Lines
- Fuel Filter (9155)
- Fuel Injectors (9F593)
- Fuel Pressure Regulator (9C968)
- Fuel Injection Supply Manifold (Fuel Rail) (9F792)
- Fuel Rail Solenoid Shut-Off Valves (9D278)

Fuel Delivery System Special Tool Kit

Tool Kit 134-00114 Contains

Filler Connector Venting Tool	Injector Flow Tester

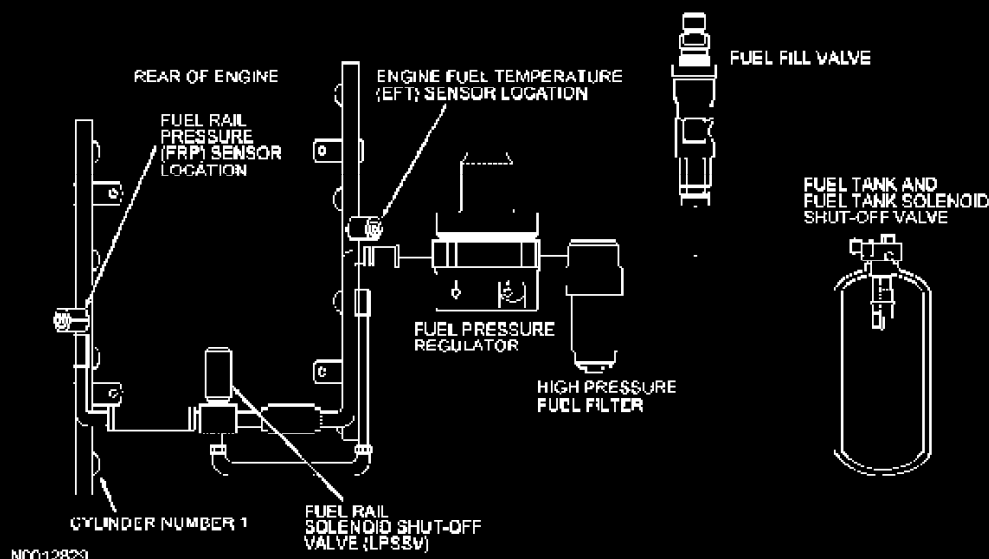
Note: For specific fuel delivery system specifications, refer to the Fuel Delivery System Test Information Chart located at the beginning of pinpoint HC.

HB INTRODUCTION 1 OF 8

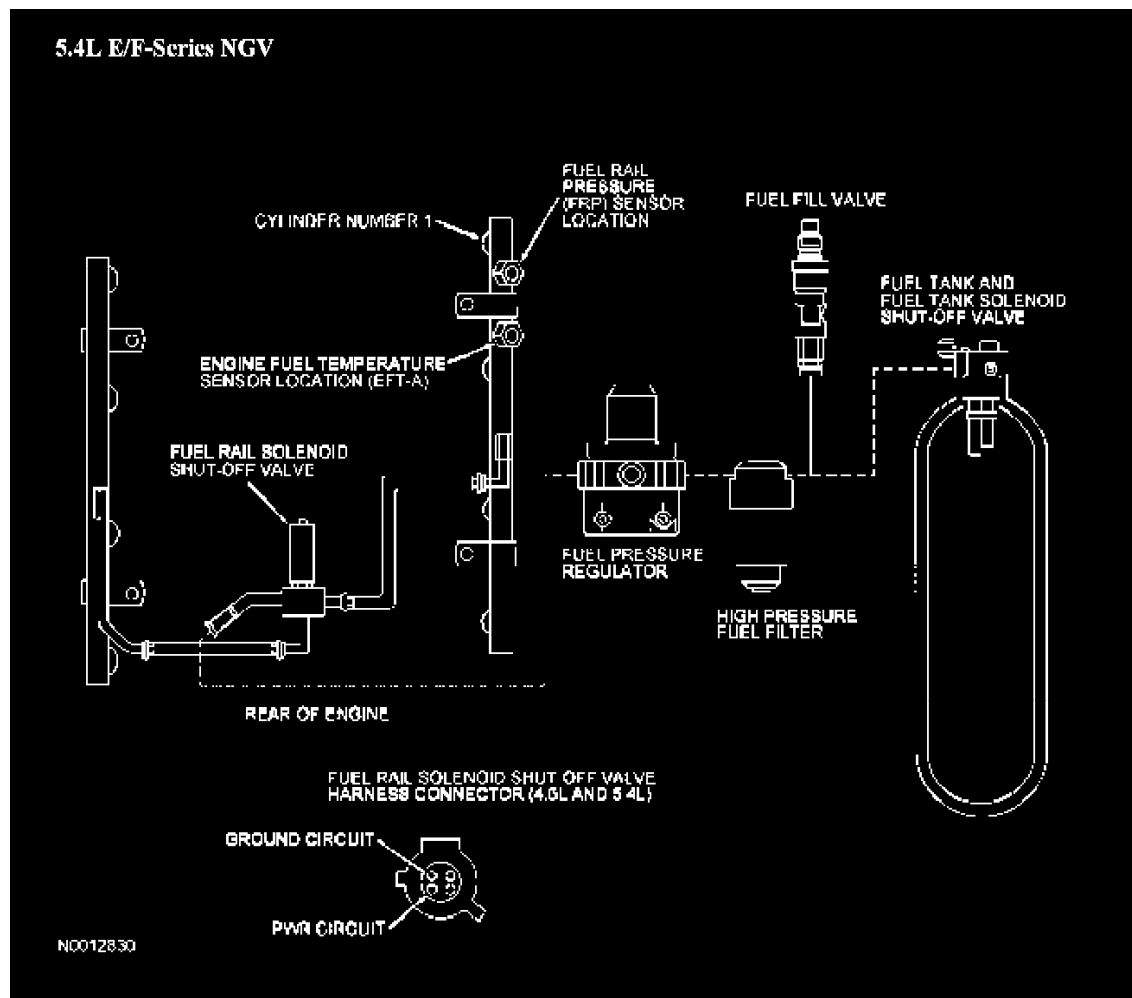
Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware

4.6L Crown Victoria NGV



HB INTRODUCTION 2 OF 8



HB INTRODUCTION 3 OF 8

WARNING

FUEL LINE VENTING IS REQUIRED PRIOR TO FUEL SYSTEM COMPONENT SERVICE.

WARNING

EYE AND EAR PROTECTION ARE REQUIRED TO BE WORN DURING VENTING OR REMOVAL AND INSTALLATION OF FUEL SYSTEM COMPONENTS.

WARNING

NATURAL GAS IN THE FUEL SYSTEM IS AT HIGH PRESSURE AT ALL TIMES. TO AVOID INJURY OR FIRE, RELEASE THE FUEL PRESSURE FROM THE FUEL SYSTEM BEFORE DISASSEMBLING ANY FUEL SYSTEM COMPONENT. TO RELEASE THE PRESSURE FROM THE SYSTEM FOLLOW THE PRESSURE RELIEF PROCEDURES OUTLINED BELOW. BECOME FAMILIAR WITH THESE PROCEDURES BEFORE PROCEEDING

Note: For vehicles with a no-start condition, the **Alternate Fuel System Pressure Relief Procedure** will need to be followed if fuel system service is required.

Fuel Line Pressure Relief Procedure

1. Key Off. Close the manual lockdown valve jackscrew on each fuel tank solenoid valve. Refer to Section 310 of the appropriate Workshop Manual to determine the location of each of the fuel tanks and jackscrews. Become familiar with the procedures in the Workshop Manual before proceeding.
2. Key On. Using a Scan Tool, access the Fuel Rail Pressure (FRP) Sensor PID. At this point, the FRP PID should indicate 80 to 120 PSI, the normal system operating pressure.

Note: If the vehicle is being diagnosed for an FRP Sensor DTC, be aware that the FRP PID reading may not indicate the actual pressure in the fuel rail.

3. Key Off. Disconnect the FRP Sensor electrical connector at the FRP Sensor. Start the engine and let idle until the engine stalls. Once the engine stalls, crank the engine for an additional 15 seconds, this will relieve most of the residual system pressure. Reconnect the FRP Sensor connector.

Note: If the engine does not stall within three minutes, start this procedure again, from the beginning (Step 1).

Note: Running the engine with the FRP Sensor disconnected will generate a DTC that will need to be cleared.

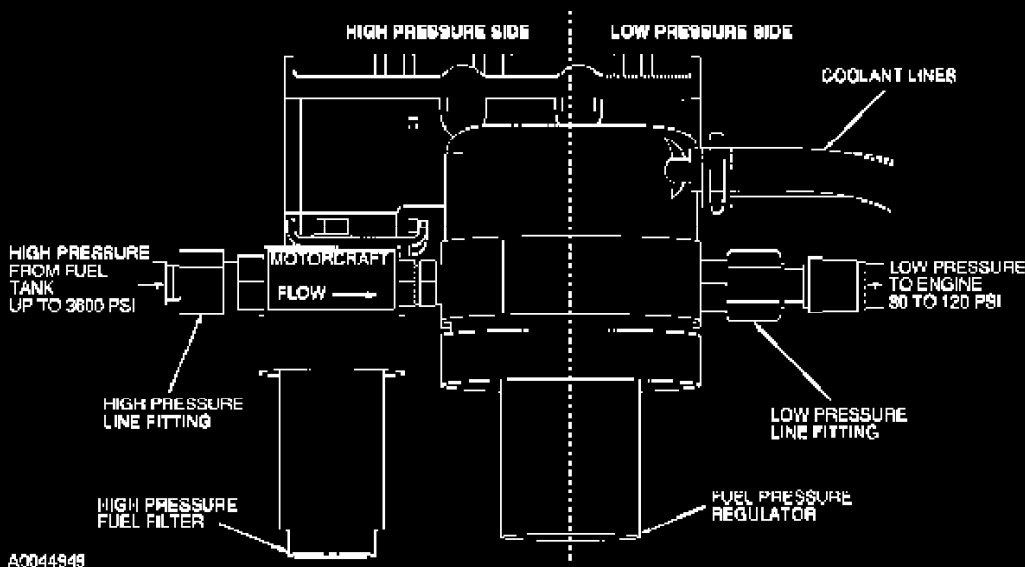


WARNING: STEP 4 IN THIS PROCEDURE WILL VENT A VERY SLIGHT AMOUNT OF RESIDUAL PRESSURE TO THE ATMOSPHERE. USE CARE TO PREVENT THE COMBUSTION OF ESCAPING FUEL. NO SMOKING, OPEN FLAMES OR ANY KIND OF ARCING.

4. Key Off. Access the fuel pressure regulator. Using the proper size wrench, slightly loosen the low pressure fuel line fitting at the fuel pressure regulator. This will release the residual pressure from the fuel system. Refer to the **Fuel Pressure Regulator** illustration below.

Note: The fuel line O-ring(s) will need to be replaced at any fuel line fitting or connection that has been loosened or disconnected. Refer to the appropriate Workshop Manual for O-ring replacement.

5. Re-secure the low pressure fuel line fitting. Key On. Again access the FRP PID. The FRP PID should indicate less than 5 PSI. If so, the fuel system may now be carefully opened and serviced.

Fuel Pressure Regulator**Alternate Fuel System Pressure Relief Procedure**

Note: This procedure should only be used if vehicle has a no-start condition.

1. Key Off. Close the manual lockdown valve jackscrew on each fuel tank solenoid valve. Refer to Section 310 of the appropriate Workshop Manual to determine the location of each of the fuel tanks and jackscrews. Become familiar with the procedures in the Workshop Manual before proceeding.
2. Access the fuel pressure regulator. Refer to Section 310 of the appropriate Workshop Manual for the location of the fuel pressure regulator.



WARNING: STEP 3 AND STEP 4 IN THIS PROCEDURE WILL VENT THE FUEL SYSTEM PRESSURE TO THE ATMOSPHERE. USE CARE TO PREVENT THE COMBUSTION OF ESCAPING FUEL. NO SMOKING, OPEN FLAMES OR ANY KIND OF ARCING.

3. Using the proper size wrench, slightly loosen the low pressure fuel line fitting at the fuel pressure regulator. The line should only be loosened far enough to generate a small leak, and a slight hissing noise will be heard. Allow the line pressure to vent to atmosphere. Refer to the **Fuel Pressure Regulator** illustration above.
4. Disconnect the FRP Sensor electrical connector. Using the proper size wrench, slightly loosen the FRP Sensor. The FRP Sensor should only be loosened far enough to generate a small leak, and a slight hissing noise will be heard. Allow the fuel rail pressure to vent to the atmosphere.

Note: The fuel line O-ring(s) will need to be replaced at any fuel line fitting or connection that has been loosened or disconnected. Refer to the appropriate Workshop Manual for O-ring replacement.

5. Re-secure the FRP Sensor. Reconnect the FRP Sensor electrical connector.

USE CARE TO PREVENT THE COMBUSTION OF ESCAPING FUEL. NO SMOKING, OPEN FLAMES OR ANY KIND OF ARCING.

SAFE FUEL HANDLING PRACTICES: NATURAL GAS—FIRE

- **REPORT ALL FIRES TO THE APPROPRIATE AUTHORITIES.**
- **FLAMES FROM NATURAL GAS HAVE A YELLOW AND/OR BLUE COLOR.**
- **KNOW THE LOCATIONS OF PORTABLE FIRE EXTINGUISHER, FIRE BLANKETS, AND FIRE ALARMS. LEARN HOW TO USE THEM.**
- **USE AN ABC RATED/CERTIFIED FIRE EXTINGUISHER OR FIRE BLANKET TO FIGHT FLAMMABLE GAS FIRES.**

FIRST AID

- **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.**
- **FOR IRRITATED EYES, FLUSH WITH LARGE AMOUNTS OF WATER FOR 15 MINUTES. REMOVE CONTACT LENSES, IF WORN. SEEK MEDICAL ATTENTION.**

HEALTH

- **NATURAL GAS (AND ALL OTHER FUEL VAPORS) CAN BE HARMFUL BY INHALATION.**
- **ALL FUELS CAN BE HARMFUL OR FATAL IF SWALLOWED.**
- **FUELS AND PRODUCTS CONTAINING METHANOL (E.G. WINDSHIELD WASHER FLUID) CAN CAUSE BLINDNESS IF SWALLOWED.**
- **ALL FUELS ARE IRRITATING TO THE EYES AND RESPIRATORY SYSTEM.**

HANDLING

- **BE AWARE OF THE MERCUROUS MERCAPTAN "ROTTEN EGG" SMELL OF NATURAL GAS.**
- **USE FLAMMABLE GAS HANDLING PRECAUTIONS.**
- **KEEP FLAMMABLE GASES IN APPROVED, LABELED CONTAINERS.**

- **USE IN WELL-VENTILATED AREAS AND CONTROL VAPORS. BE AWARE THAT NATURAL GAS IS NOT VISIBLE, IS LIGHTER THAN AIR, CAN TRAVEL ALONG THE CEILING, AND MAY COLLECT IN HIGH HOLLOWS.**
- **WHEN TRANSFERRING FLAMMABLE GASES, CONNECT THE VENT STACK TO THE SOURCE, AND GROUND THE SOURCE TO THE EARTH.**
- **DO NOT SMOKE, OR USE HEAT/SPARK PRODUCING EQUIPMENT NEAR NATURAL GAS.**
- **DO NOT EAT, DRINK OR SMOKE WHERE FUELS ARE HANDLED, PROCESSED OR STORED.**
- **WASH HANDS THOROUGHLY AFTER HANDLING ANY FUEL.**

LEAKAGE

- **NOTIFY THE PROPER AUTHORITIES IN THE EVENT OF ANY LEAKAGE YOU HAVE NOT BEEN TRAINED TO ADDRESS.**
- **STOP, AND ALLOW FUEL TO VENTILATE TO OUTSIDE ATMOSPHERE AFTER ANY FUEL ESCAPE.**

HB: Natural Gas Fuel Delivery System**HB****HB1 CHECK SYSTEM INTEGRITY**

WARNING: BEFORE SERVICING OR REPLACING ANY COMPONENTS IN THE FUEL SYSTEM, REDUCE THE POSSIBILITY OF INJURY OR FIRE BY FOLLOWING DIRECTIONS IN FUEL SYSTEM WARNING, CAUTION AND NOTE AT THE BEGINNING OF THIS PINPOINT TEST.

- Key on, engine off for 5 seconds.
- Key off.
- Visually inspect the complete fuel delivery system, including fuel lines, connections, fuel rail, pressure regulator and fuel injector areas for leaks (hissing noise), 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.
- Verify vehicle has followed maintenance schedule.
- Inspect fuel filter element for contamination and service as necessary.
- Verify Inertia Fuel Shutoff (IFS) switch is set.
- Verify vehicle battery is fully charged.
- Verify electrical/fuse integrity.

Have any concerns been identified?

Yes	No
REPAIR as necessary. VERIFY symptom no longer exists.	For symptom of poor fuel range: GO to NG fuel tank venting procedures located in Section 310 in the Workshop Manual. For symptom of fuel smell: GO to HB16 . All other symptoms: GO to HB2 .

HB2 CHECK FUEL TANK PRESSURE

- Verify there is a minimum of 1/8 tank of fuel.
- Key in ON position.
- Access and monitor the TANKPR PID from the AFCM.
- Record fuel tank pressure reading and fuel gauge reading.

Is the fuel pressure reading greater than 3,448 kPa (500 psi)?

Yes	No
KEY OFF. For no starts: GO to HB7 . All Others: GO to HB5	VERIFY fuel level. If OK, CHECK for power at tank solenoid valve. GO to HB3 .

HB3 CHECK FSV PWR AND GND CIRCUITS TO THE FUEL TANK SOLENOID SHUT-OFF VALVE

- Key on.
- Access Output Test Mode.
- Select ALL ON.

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

- Measure voltage between the FSV PWR and GND circuits at the fuel tank solenoid shut-off valve harness connector (refer to the Electrical and Vacuum Troubleshooting Manual for location).

Is the voltage reading greater than 10.5 volts?

Yes	No
GO to NG fuel tank venting procedures located in Section 310 in the Workshop Manual for fuel tank solenoid shut-off valve diagnostics.	GO to HB4 .

HB2 - HB3

HB4 CHECK FOR OPEN GND CIRCUIT TO FUEL TANK SOLENOID SHUT-OFF VALVE

- Measure resistance between the ground circuit at the fuel tank solenoid shut-off valve harness connector and battery negative post.

Is resistance less than 5 ohms?

Yes	No
REPAIR open FSV PWR circuit. VERIFY symptom no longer exists.	REPAIR open GND circuit. VERIFY symptom no longer exists.

HB5 CHECK FUEL PRESSURE

- Observe WARNING, CAUTION AND NOTE.
- Access FRP PID and monitor fuel pressure.
- Key on, engine off. Record pressure reading.

Is the fuel pressure reading between 552 to 827 kPa (80 to 120 psi)?

Yes	No
GO to DD3 .	GO to HB7

HB7 VERIFY FUEL RAIL SOLENOID SHUT-OFF VALVE OPENS

- Observe WARNING, CAUTION and NOTE.
- Key on, engine off.
- Access Output Test Mode.
- Select ALL ON and then START and STOP several times by toggling the START and STOP button on the scan tool and listening or feeling for a click at the fuel rail solenoid shut-off valve.
- Key off.

Was a click of the solenoid valve felt or heard?

Yes	No
GO to DD3	GO to HB8 .

HB4 - HB7

HB8 CHECK FSV PWR AND GND CIRCUITS TO THE FUEL RAIL SOLENOID SHUT-OFF VALVE

- Key on, engine off.
- Access Output Test Mode.
- Select ALL ON, and START.
- Measure the voltage between the FSV PWR and GND circuit at the fuel rail solenoid shut-off valve harness connector.

Note: This circuit remains on for only 7 seconds.

Is the voltage reading greater than 10.5 volts?

Yes	No
REPLACE fuel rail solenoid valve. VERIFY symptom no longer exists.	GO to HB9 .

HB9 CHECK FOR OPEN GND CIRCUIT TO FUEL RAIL SOLENOID SHUT-OFF VALVE

- Measure the resistance between the GND circuit at the fuel rail solenoid shut-off valve harness connector and battery negative post.

Is resistance less than 5 ohms?

Yes	No
REPAIR open FSV PWR circuit. VERIFY symptom no longer exists.	REPAIR open GND circuit. VERIFY symptom no longer exists.

HB10 VERIFY FUEL RAIL SOLENOID SHUT-OFF VALVE SEALS

- Observe WARNING, CAUTION and NOTE.
- Vent fuel pressure in the fuel injection supply manifold (fuel rail) and supply lines. Follow the **Fuel Line Pressure Relief Procedure** in the beginning of this pinpoint test.
- Disconnect the fuel rail solenoid shut-off valve at the fuel injection supply manifold (fuel rail) harness connector.
- Re-open the manual lockdown valve jackscrews that were required to be closed while performing the **Fuel Line Pressure Relief Procedure** .
- After two minutes, turn key on and access FRP PID and note pressure.

Is pressure at FRP sensor less than 70 kPa (10 psi)?

Yes	No
GO to HB11 .	REPLACE solenoid valve. VERIFY symptom no longer exists.

HB8 - HB10

**HB11 VERIFY FUEL RAIL SOLENOID SHUT-OFF VALVE
PARTIALLY OPENS**

- Observe WARNING, CAUTION and NOTE.
- Key off.
- Reconnect the fuel rail solenoid shut-off valve on the fuel injection supply manifold (fuel rail) at the harness connector.
- Key on, engine off.
- Access FRP PID.
- Note the FRP Sensor PID pressure.

Is the fuel pressure reading between 552 to 827 kPa (80 to 120 psi)?

Yes	No
KEY OFF. GO to HB12 .	REPLACE fuel rail solenoid shut-off valve. VERIFY symptom no longer exists.

**HB12 VERIFY FUEL RAIL SOLENOID SHUT-OFF VALVE FULLY
OPENS**

- Observe WARNING, CAUTION and NOTE.
- Vent pressure in the fuel injection supply manifold (fuel rail) and supply lines. Follow the **Fuel Line Pressure Relief Procedure** in the beginning of this pinpoint test.
- Re-open the manual lockdown valve jackscrews that were required to be closed while performing the **Fuel Line Pressure Relief Procedure** .
- Snap start the engine (Key on and immediately start the engine).
- Immediately increase the engine speed to approximately 2500 rpm while monitoring the FRP PID.
- Note the FRP pressure.

Is the fuel pressure reading between 552 to 827 kPa (80 to 120 psi)?

Yes	No
KEY OFF. GO to HB13 .	REPLACE fuel rail solenoid shut-off valve. VERIFY symptom no longer exists.

HB11 - HB12

HB13 VERIFY FUEL PRESSURE WITH ENGINE ON

- Observe WARNING, CAUTION and NOTE.
- Key on, engine running.
- Note FRP sensor pressure at idle with scan tool.
- Increase engine speed to approximately 2500 rpm.
- Note FRP sensor pressure at 2500 rpm with scan tool.

Is idle fuel pressure between 552 and 827 kPa (80 and 120 psi) and is pressure at 2500 rpm greater than 552 kPa (80 psi)?

Yes	No
KEY OFF. GO to HB14 .	VERIFY a blockage does not exist in fuel lines. REPLACE fuel pressure regulator. VERIFY symptom no longer exists.

HB14 VERIFY REGULATOR THERMOSTAT

- Observe WARNING, CAUTION and NOTE.
- Key on, engine on.
- Allow engine coolant to reach normal operating temperature.
- Measure the temperature of fuel pressure regulator coolant bowl or coolant outlet with a thermometer or temperature probe.

Is the regulator temperature within 15° to 60°C (59° to 140°F)?

Yes	No
KEY OFF. GO to HB15 .	If fuel regulator coolant bowl is less than 15°C (59°F): KEY OFF. CHECK coolant lines and coolant system for proper operation. If OK, REPLACE fuel pressure regulator. If fuel regulator coolant bowl is greater than 60°C (140°F): KEY OFF. REPLACE pressure regulator. VERIFY symptom no longer exists.

HB15 VERIFY FUEL INJECTOR FLOW

- Observe WARNING, CAUTION and NOTE.
- Key off.
- Key on, engine off.
- Note initial FRP sensor pressure using the scan tool.
- Electronic fuel injector tester installed to suspect fuel injector.
- Select pulse width of 200 m sec.
- Activate the fuel injector tester.
- Note final FRP sensor pressure using scan tool.
- Subtract final pressure from initial pressure to find pressure drop.
- Repeat above test procedures for all remaining fuel injectors.

Is the pressure drop within 241 to 345 kPa (35 to 50 psi) and all fuel injectors within 20 kPa (3 psi) of each other?

Yes	No
RETURN to Section 3 , Symptom Charts, for additional symptom diagnostics.	KEY OFF. REPLACE fuel injector(s) that does not meet pressure specification. VERIFY symptom no longer exists.

HB15

HB16 FUEL LEAK CHECK

Possible causes:

- Loose fitting connectors.
- Damaged or worn seals or fittings.
- Damaged fuel lines or fuel system components.

Note: After the vehicle has soaked for several hours (has not run), a slight natural gas smell may emanate from within the intake manifold and intake air system. This is normal, as the fuel injectors leak down from the fuel rail to the intake manifold over several hours.

- Key off.
- Access FRP PID.
- Key on, engine off (verify pressure is greater than 552 kPa (80 psi)). If the fuel system does have a fuel leak, it will be necessary to repeat this step to maintain pressure.
- Check for leaks with the natural gas sniffer provided in Rotunda tool kit 134-00114 or a soapy water solution such as Snoop. Cover the complete joint with this solution. Examine the components or joints for 60 seconds for signs of bubbles.

Are any leaks indicated?

Yes	No
VERIFY proper torque on suspect fuel system components. RECHECK for leaks. If leaks still exist, REPAIR or REPLACE as necessary.	No leaks detected. No further diagnostics are required.

HB17 DTC P1180 AND P1181; CHECK FUEL PRESSURE

- Inspect the fuel lines, regulator and fuel filter for restrictions or leaks.

Are there any concerns?

Yes	No
REPAIR as necessary.	GO to HB18 .

HB18 CHECK FUEL TANK PRESSURE

- Key on, engine running and vehicle in park.
- Scan tool connected.
- Access and monitor the TANKPR PID from the NGVM menu and record the value.
- Access and monitor the FRP PID from the PCM menu and record the value.
- Locate the approximate TANKPR value on the chart below, from this value determine the PCM inferred pressure.

Is the PCM inferred pressure ± 22 psi of the fuel rail pressure (FRP) recorded?

Fuel Tank Pressure in kPa	PCM Inferred Pressure (psi)
30000	94
28000	95.5
26000	96
24000	98
23000	96.31
22000	97.25
21000	97.5
20000	98.5
19000	99
18000	99.31
17000	99.75
16000	100.75
14000	101.75
13000	102.25
12000	102.5
11000	103
10000	103.38
9000	104.5
8000	105
7000	105.56
6000	106
5000	106.5
4000	106.88
3000	108.44
2000	109

HB18

0	0

Yes	No
ADDRESS other Continuous Memory DTCs if present.	For DTC P1180: GO to HB19 . For DTC P1181: REPLACE fuel pressure regulator.

HB19 CHECK FUEL FILTER FOR WATER OR OTHER CONTAMINATION

- Disassemble fuel filter and check for water and other contamination.

Is there any contamination present?

Yes	No
CLEAN contaminants from filter housing. REPLACE filter element.	GO to HB20 .

HB20 CHECK FUEL LINE FOR RESTRICTION

- Visually inspect all fuel lines for damage which may cause the fuel to be restricted or leaking.

Are there any restrictions?

Yes	No
REPAIR fuel line(s) as required.	GO to HB21

HB21 DETERMINE CAUSE OF NO START

- Disconnect FRP Sensor electrical connector.
- Attempt to start vehicle.

Will engine now start and run?

Yes	No
REPLACE fuel rail pressure sensor.	REPLACE fuel pressure regulator.

HB18 CONT'D - HB21

Test HC: Fuel Delivery System

HC: Fuel Delivery System Introduction

HC

Note

This Pinpoint Test is intended to diagnose the following:

- Chassis Components
- Engine Vacuum
- Fuel Pressure
- Fuel Filter (9155)
- Fuel Return
- Fuel Supply
- Fuel Injector (9F593)
- Fuel Pump Module (9H307)

Tables and Charts

Note: With the engine running, the FRP PID value may be 48-70 kPa (7-10 psi) higher than a fuel pressure reading taken with a mechanical gauge.

Fuel System Specification Chart (Key ON, Engine OFF Values)					
Application	Engine	Injector Resistance (Ohms)	Fuel System Type	Fuel Pressure kPa	Fuel Pressure PSI
CAR:					
Focus	2.0L 2V	13.8-15.2	ERFS ₃	240-485	35-70
Focus	2.0L 4V	13.8-15.2	ERFS ₃	240-485	35-70
Escort	2.0L 2V	13.8-15.2	ERFS ₃	240-485	35-70
Escort ZX2	2.0L 4V	13.8-15.2	ERFS ₃	240-485	35-70
Taurus/Sable	3.0L	11.4-12.6	ERFS ₃	240-485	35-70

	2V				
Taurus/Sable	3.0L FFV	11.4-12.6	ERFS ₃	240-485	35-70
Taurus/Sable	3.0L 4V	13.1-14.5	ERFS ₃	240-485	35-70
Lincoln LS6	3.0L	13.8-15.2	ERFS ₃	240-485	35-70
Mustang	3.8L	11.4-12.6	ERFS ₃	240-485	35-70
Lincoln LS8/ Thunderbird	3.9L	11.4-12.6	ERFS ₃	240-485	35-70
Crown Victoria Grand Marquis Town Car	4.6L	13.8-15.2	ERFS ₃	240-485	35-70
Crown Victoria	4.6L NGV	4-6	NGV ₄	276-827	80-120
Mustang GT	4.6L 2V	13.8-15.2	ERFS ₃	240-485	35-70
Mustang Cobra	4.6L 4V	13.8-15.2	ERFS ₃	240-485	35-70
Marauder	4.6L 4V	11.4-12.6	ERFS ₃	240-485	35-70
TRUCK:					
Escape	2.0L 4V	13.8-15.2	MRFS ₂	331-485	48-70
Escape	3.0L 4V	13.1-14.5	MRFS ₂	331-485	48-70
Ranger	2.3L	11.4-12.6	MRFS ₂	331-485	48-70
Ranger	3.0L	11.4-12.6	MRFS ₂	331-485	48-70
Ranger	3.0L FFV	11.4-12.6	MRFS ₂	331-485	48-70
Windstar	3.8L	11.4-12.6	RFS ₁	207-310	30-45
Explorer/Mountaineer/Ranger (all)	4.0L SOHC	11-18	MRFS ₂	331-485	48-70
E/F-Series	4.2L	11.4-12.6	RFS ₁	207-310	30-45
Aviator	4.6L 4V	13.8-15.2	ERFS ₃	240-485	35-70
Explorer/Mountaineer (all)	4.6L	11.4-12.6	MRFS ₂	331-485	48-70

E/F-Series	4.6L	13.8-15.2	RFS ₁	207-310	30-45
Expedition	4.6L	13.8-15.2	MRFS ₂	331-485	48-70
E/F-Series/Excursion	5.4L 2V	13.8-15.2	RFS ₁	207-380	30-55
Expedition	5.4L 2V	13.8-15.2	MRFS ₂	331-485	48-70
E/F-Series	5.4L NGV	4-6	NGV ₄	276-827	80-120
F-Series	5.4L 2V SC	13.8-15.2	RFS ₁	207-310	30-45
Navigator/Blackwood	5.4L 4V	13.8-15.2	MRFS ₂	331-485	48-70
E/F-Series/Excursion	6.8L	11-18	RFS ₁	207-310	30-45

1. **Return Fuel System (RFS):** This type of fuel delivery system returns excess fuel to the fuel tank by means of a fuel return line from the fuel rail. Fuel pressure is controlled by a mechanical pressure regulator located on the fuel rail. Vehicles equipped with RFS do not utilize a Fuel Rail Pressure (FRP) Sensor.
2. **Mechanical Returnless Fuel System (MRFS):** This type of fuel delivery system does not return fuel to the fuel tank by means of a return line. Fuel pressure is controlled by a mechanical pressure regulator located on the Fuel Pump Module in the fuel tank. Vehicles equipped with MRFS do not utilize an Fuel Rail Pressure (FRP) Sensor.
3. **Electronic Returnless Fuel System (ERFS):** This type of fuel delivery system does not return fuel to the fuel tank by means of a return line. This system does not incorporate a mechanical pressure regulator. Pressure is controlled by continuously varying the fuel pump speed through the Fuel Pump Driver Module (FPDM). All vehicles equipped with ERFS utilize a Fuel Rail Pressure Sensor (FRP).
4. **Natural Gas Fuel System (NGV):** This type of fuel system does not return fuel to the fuel tanks. Pressure in the fuel tanks acts as the "Fuel Pump", and line pressure is controlled by a mechanical pressure regulator located upstream of the fuel tanks. All NGV vehicles utilize a Fuel Rail Pressure Sensor (FRP). On NGV applications, the FRP Sensor is also commonly referred to as an Injection Pressure Sensor (IPS).

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.

Description

For additional information on the Fuel Delivery System, refer to Section 1 .



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 #134—R0087 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.**
- **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.
- 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 .

SPIILLS

- 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.

HC INTRODUCTION 6 OF 6**HC: Fuel Delivery System****HC****HC1 CHECK THE SYSTEM INTEGRITY**

- Visually inspect the complete fuel delivery system for damage and leakage.
- Check the following:
 - Fuel lines and connections.
 - Relays
 - Fuel tank
 - Fuel pump
 - Fuel pressure regulator
 - Fuel pulse damper
 - Fuel rail at injectors
 - Damaged connector pins
 - Electrical connectors not fully engaged
- Verify the vehicle has followed the maintenance schedule. (Fuel filter should have been replaced within the last 48,280 km (30,000 miles)).
- Verify the Inertia Fuel Shutoff (IFS) switch is set (button pushed in). Refer to the Owner Guide for location.
- Verify the fuse integrity.
- Verify the battery is fully charged.
- Verify clean sufficient fuel.

Are any of the above concerns present?

Yes	No
REPAIR as necessary.	GO to HC2 .

HC1

HC2 CHECK ALL SYSTEM RELATED DEVICES (SENSOR, DAMPER OR REGULATOR) FOR LEAKAGE

- Key in OFF position.
- FP connector connected.
- Remove the vacuum hose on each system device connected to the fuel rail.
- Inspect for the presence of fuel in the vacuum line of each device connected to the fuel rail.
- Key ON, engine running.
- Check for manifold vacuum at each system related component with a vacuum line.
- Key in OFF position.

Are all vacuum lines for system related devices indicating no fuel present?

Yes	No
GO to HC3 .	If the vacuum line connected to a component indicates that a fuel leak is present, INSTALL a new component.

HC3 CHECK THE FUEL PRESSURE



WARNING: BEFORE SERVICING OR REPLACING ANY COMPONENTS IN THE FUEL SYSTEM, REDUCE THE POSSIBILITY OF INJURY OR FIRE BY FOLLOWING THE WARNING, CAUTION, AND HANDLING DIRECTIONS AT THE BEGINNING OF THIS PINPOINT TEST.

- Key in OFF position.
- Relieve the fuel pressure. Refer to the Workshop Manual Section 310-00, Fuel System for the Fuel System Pressure Release procedure.
- Mechanical fuel pressure gauge connected.
- Key ON, engine OFF.
- Pressurize the fuel system. Refer to the Workshop Manual Section 310-00, Fuel System for the Fuel System Pressure Release procedure.
- FP connector connected.
- Cycle the key several times to charge the fuel system.
- Compare the fuel pressure reading to the Fuel System Specification Chart.

Is the fuel pressure within range?

Yes	No
GO to HC6 .	GO to HC4 .

HC4 CHECK THE VOLTAGE AT THE FUEL PUMP HARNESS CONNECTOR

- FP connector disconnected.

Note: REFER to the Wiring Diagram Manual for correct pin location.

- Measure the voltage between:

(+) Vehicle Battery (-) FP Connector, Harness Side	
Positive terminal	FPGND

•

Is the voltage greater than 10 V?

Yes	No
GO to HC5 .	Key in OFF position. REPAIR the open circuit.

HC5 CHECK THE VOLTAGE AT THE FUEL PUMP HARNESS CONNECTOR

- VERIFY the Inertia Fuel Shutoff (IFS) switch is set (button pushed in). REFER to the Owner Guide for location.
- FP connector disconnected.
- Key ON, engine OFF.
- Access the PCM and control the FP PID.
- Be aware that Output Test Mode turns off the FP after a calibrated time. If this happens, command the outputs on again to continue testing.
- Measure the voltage between:

(+) FP Connector, Harness Side	(-) Vehicle Battery
FPPWR	Negative terminal

•

Is the voltage greater than 10 V?

Yes	No
Key in OFF position. EXIT the Output State Control. GO to HC6 .	Key in OFF position. REPAIR the open circuit.

HC4 - HC5

HC6 CHECK THE FUEL PRESSURE LEAKDOWN

Note: When the fuel pump is commanded off, the fuel pressure may substantially decrease and then stabilize.

Note: During Output State Control, the fuel pump stays commanded on for only about 5 seconds.

- Mechanical fuel pressure gauge connected.
- Key ON, engine OFF.
- Access the PCM and control the FP PID.
- Run the fuel pump to obtain maximum fuel pressure.
- Command the fuel pump off.
- Allow the fuel pressure to stabilize.
- Record the stabilized reading.
- Monitor the fuel pressure for 1 minute.

Does the fuel pressure remain within 34 kPa (5 psi) of the recorded reading (RFS, MRFS) or greater than 276 kPa (40 psi) (ERFS) after 1 minute?

Yes	No
For ERFS, GO to HC13 .	Fuel rail pressure leakdown.
For MRFS, GO to HC14 .	GO to HC12 .
For RFS, GO to HC7 .	

HC6

HC7 CHECK FOR A VACUUM SOURCE

- Key ON, engine running.

Is the vacuum level at the Fuel Pressure Regulator equal to manifold vacuum?

Yes	No
GO to HC8 .	Repair as required.

HC8 CHECK THE FUEL PRESSURE REGULATOR RESPONSE



WARNING: STRICT OBSERVANCE OF POSTED SPEED LIMITS AND ATTENTION TO DRIVING CONDITIONS ARE MANDATORY WHEN CARRYING OUT THE ROAD TEST. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.

Note: Some concerns may only be present during certain fuel level conditions. Determine the fuel level at the time of the concern. Access the information from the customer information worksheet and the customer.

- Install the fuel pressure tester.
- Disconnect the vacuum hose at the pressure regulator.
- Plug the hose.
- Drive the vehicle with heavy accelerations while observing the fuel pressure gauge reading.

Does the fuel pressure reading hold steady within 21 kPa (3 psi) during the test?

Yes	No
GO to HC9 .	GO to HC14 .

HC9 CHECK THE FUEL PRESSURE REGULATOR RESPONSE TO THE DECREASE IN MANIFOLD VACUUM

- Install the fuel pressure tester.
- Key ON, engine running.
- Rapidly accelerate the engine speed to 2,500 RPM, then return to idle.

Does the fuel pressure increase during rapid acceleration?

Yes	No
GO to HC10 .	INSTALL a new fuel pressure regulator assembly.

HC10 CHECK FOR A RESTRICTED FUEL RETURN LINE

- Install the fuel pressure tester.
- REMOVE the fuel return line at the fuel rail.
- Connect the short hose from the fuel rail to a clean container of at least 1.1 liter (1.0 quart) capacity.
- Key ON, engine OFF.
- Access the PCM and control the FP PID.
- Run the fuel pump to obtain maximum fuel flow.
- Record the fuel pressure.
- Observe if fuel is being returned to the container.

Is the fuel pressure within range?

Yes	No
GO to HC11 .	INSTALL a new fuel pressure regulator assembly.

HC11 CHECK THE FUEL RETURN SYSTEM

Note: Observe the Warnings, Cautions, and Notes.

- Key in OFF position.
- Disconnect the fuel return line at the fuel rail.
- Disconnect the fuel return line at the fuel pump.
- CHECK for a restricted fuel return line.
- 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
GO to HC12 .	REPAIR the fuel return line.

HC10 - HC11

HC12 CHECK FUEL INJECTOR FLOW AND LEAKAGE

Note: Observe the Warnings, Cautions, and Notes.

- Check the fuel injectors for leakage and flow rate using the injector flow tester or other method such as inspecting the intake manifold for fuel.

Are test results satisfactory?

Yes	No
For ERFS, GO to HC13 .	INSTALL a new fuel injector as necessary.
For all others, GO to HC14 .	

HC13 COMPARE THE FRP PID TO THE MECHANICAL GAUGE

Note: Most mechanical gauges are referenced to atmospheric pressure. The FRP sensor is referenced to manifold pressure. In order to make a valid comparison, the engine must be off.

Note: The vehicle may exhibit a long crank until the fuel system is pressurized.

- Key in OFF position.
- Relieve the fuel pressure. Refer to the Workshop Manual Section 310-00, Fuel System for the Fuel System Pressure Release procedure.
- Disable the fuel pump.
- Key ON, engine OFF.
- Monitor the mechanical gauge.
- Access the PCM and monitor the FRP PID.
- Compare the FRP PID value to the mechanical gauge.
- Key in OFF position.
- Pressurize the fuel system. Refer to the Workshop Manual Section 310-00, Fuel System for the Fuel System Pressure Release procedure.
- Key ON, engine running.
- Allow the fuel pressure to stabilize.
- Key in OFF position.
- Key ON, engine OFF.
- Compare the FRP PID value to the mechanical gauge.

Are the FRP PID values within 34 kPa (5 psi) of the mechanical gauge readings?

Yes	No
GO to HC14 .	INSTALL a new FRP sensor.
	REFER to the fuel system WARNING information at the beginning of this pinpoint test.

HC14 MONITOR THE FUEL PRESSURE WHILE ROAD TESTING THE VEHICLE



WARNING: STRICT OBSERVANCE OF POSTED SPEED LIMITS AND ATTENTION TO DRIVING CONDITIONS ARE MANDATORY WHEN CARRYING OUT THE ROAD TEST. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.

Note: Some concerns may only be present during certain fuel level conditions. Determine the fuel level at the time of the concern. Access the information from the customer information worksheet and the customer.

- Key in OFF position.
- Securely route the mechanical gauge so that the gauge is viewable while road testing the vehicle.
- Key ON, engine running.
- Engine at normal operating temperature.
- Monitor the mechanical gauge.
- From a stop, accelerate to 89 km/h (55 mph) at full throttle. Repeat this 3 times.

Is the fuel pressure always greater than 240 kPa (35 psi)?

Yes	No
For symptoms without DTCs, the concern is elsewhere. RETURN to Section 3, Step 2: No DTC(s) Present Symptom Chart Index for further direction.	GO to HC15 .
For all others, unable to duplicate or identify the concern at this time.	

HC14

HC15 CHECK THE FUEL SUPPLY LINE FOR RESTRICTION

Note: Observe the Warnings, Cautions, and Notes.

- Key in OFF position.
- Disconnect the fuel supply line at the fuel rail.
- Disconnect the fuel supply line at the fuel pump.
- Check the fuel supply line for restriction.
- Apply 21 to 34 kPa (3 to 5 psi) air pressure to the fuel supply line.

Does air flow freely through the line?

Yes	No
INSTALL a new Fuel Filter assembly. GO to HC16 .	REPAIR the cause of the restriction.

HC16 VERIFY THE REPAIR

WARNING: STRICT OBSERVANCE OF POSTED SPEED LIMITS AND ATTENTION TO DRIVING CONDITIONS ARE MANDATORY WHEN CARRYING OUT THE ROAD TEST. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.

- Key ON, engine running.
- Engine at normal operating temperature.
- Monitor the mechanical gauge.
- From a stop, accelerate to 89 km/h (55 mph) at full throttle. Repeat this 3 times.

Is the fuel pressure always greater than 240 kPa (35 psi)?

Yes	No
The test is complete and no concerns are present.	INSTALL a new FP module.

HC15 - HC16

Test HD: Misfire Detection Monitor

HD: Misfire Detection Monitor Introduction

HD

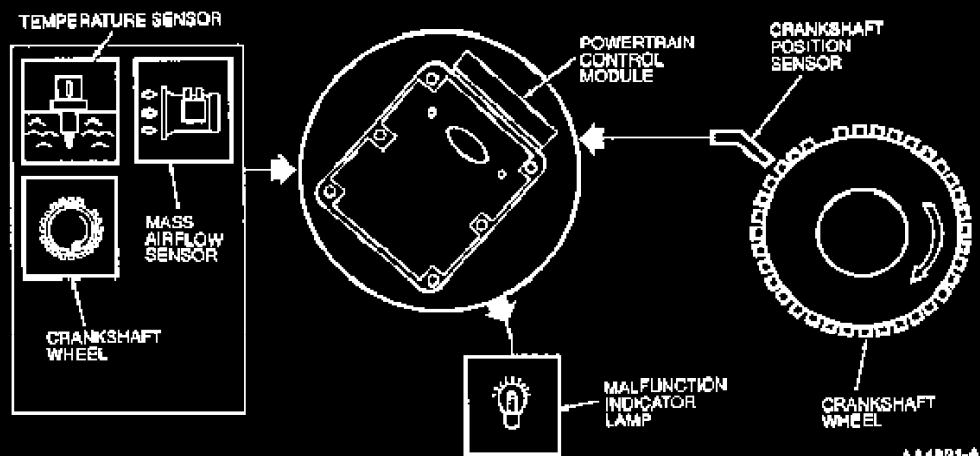
Note

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)

Pinpoint Test Schematics and Connectors

Misfire Detection Monitor



HD INTRODUCTION

HD: Misfire Detection Monitor**HD****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 Section 4 for Powertrain Diagnostic Trouble Code (DTC) Charts.	GO to HD3 .

HD1 - HD2

HD3 CHECK FOR KEY ON ENGINE OFF (KOE) DTCS

- Check for any key on, engine off DTCS which could cause the Misfire DTC.

Are any key on, engine off DTCS displayed on the Scan Tool?

Yes	No
GO to Section 4, Powertrain Diagnostic Trouble Code (DTC) Charts, and PROCEED as required.	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	No
If DTCs P1132, P1138, P1152, P1158, P1131, P1137, P1151 or P1157 are present, GO to HD8 .	If Misfire is present: Those with DPFEGR Systems, GO to HD6 . All others: GO to HD7 .
All others: GO to Section 4, Powertrain Diagnostic Trouble Code (DTC) Charts, and PROCEED as required.	If Intermittent: GO to Section 2, Diagnostic Methods for Freeze Frame Data and GO to Z1 for Intermittent Diagnosis. If OK, GO to HD7 .

HD3 - HD4

HD6 CHECK/COMPARE PID VALUES

Note: If the application does not have an EGR system, proceed to HD8.

- 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	No
KEY OFF. GO to HD7 .	KEY OFF. GO to HE100 .

HD7 EGR RESTRICTION/FLOW TEST

Note: If the application does not have an EGR system, proceed to HD8.

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	No
GO to HD8 .	REFER to Workshop Manual Section 303-00, Engine, for EGR and intake port inspection.

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	GO to H62 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 System General Information, Section 310-00 in the Workshop Manual.

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 System General Information, Section 310-00 in the Workshop Manual to determine which area within the Fuel Delivery System is at fault.

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 Section 2, 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 Section 2, 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 Section 2, 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 Section 2, 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 Section 2, Drive Cycles).

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 Section 2, 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 .

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.
- Refer to Engine System-General Information, Section 303-00 in the Workshop Manual for all of the above.

Is any service required?

Yes	No
REFER to Engine System, General Information, Section 303-00 in the Workshop Manual, Diagnosis and Testing, to make repairs.	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	No
GO to HD1 .	GO to HD31 .

HD31 CHECK FOR OTHER CONTINUOUS MEMORY DTCS**Are other Continuous Memory DTCS present?**

Yes	No
GO to Section 4 for Powertrain Diagnostic Trouble Code (DTC) Charts. PROCEED as required.	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	No
KEY OFF. Vehicles with VRS type CMP, GO to HD41 .	KEY OFF. GO to HE100 .
KEY OFF. Vehicles with hall effect type CMP, GO to HD40 .	

HD40 CHECK CMP SENSOR OUTPUT — PCM DISCONNECTED

note: A misfire may occur, and (DTC) P1309 may be output, indicating Misfire Detection Monitor was disabled. The misfire can be disabled by the lack of learning the profile correction, which can be due to CMP faults.

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	No
Note: A Hall effect type CMP sensor that is installed out of synchronization will produce a DTC. VERIFY the correct installation by referring to the Electronic Engine Controls, Section 303-14 in the Workshop Manual. If the CMP is installed properly, REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Section 2, Drive Cycles). RERUN Quick Test.	REPLACE CMP sensor. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Section 2, 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	No
VERIFY the correct installation by referring to the Electronic Engine Controls, Section 303-14 in the Workshop Manual. If CMP is installed properly, REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Section 2, Drive Cycles). RERUN Quick Test.	REPLACE CMP sensor. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Section 2, Drive Cycles).

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). Perform 3 closed throttle decelerations from 97 to 64 KPH (60 to 40 MPH), while monitoring the MP LRN PID to verify that the profile has been learned.

- 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 System, General Information Section 303-00 in the Workshop Manual, Diagnosis and Testing, to make repairs.	REPAIR as necessary. DISCONNECT the battery for 5 minutes to allow PCM to learn new data.

HD41 - HD42

Test HE: Exhaust Gas Recirculation (EGR) Systems

HE: Exhaust Gas Recirculation (EGR) Systems

Introduction

HE

Note

This Pinpoint Test is intended to diagnose the following:

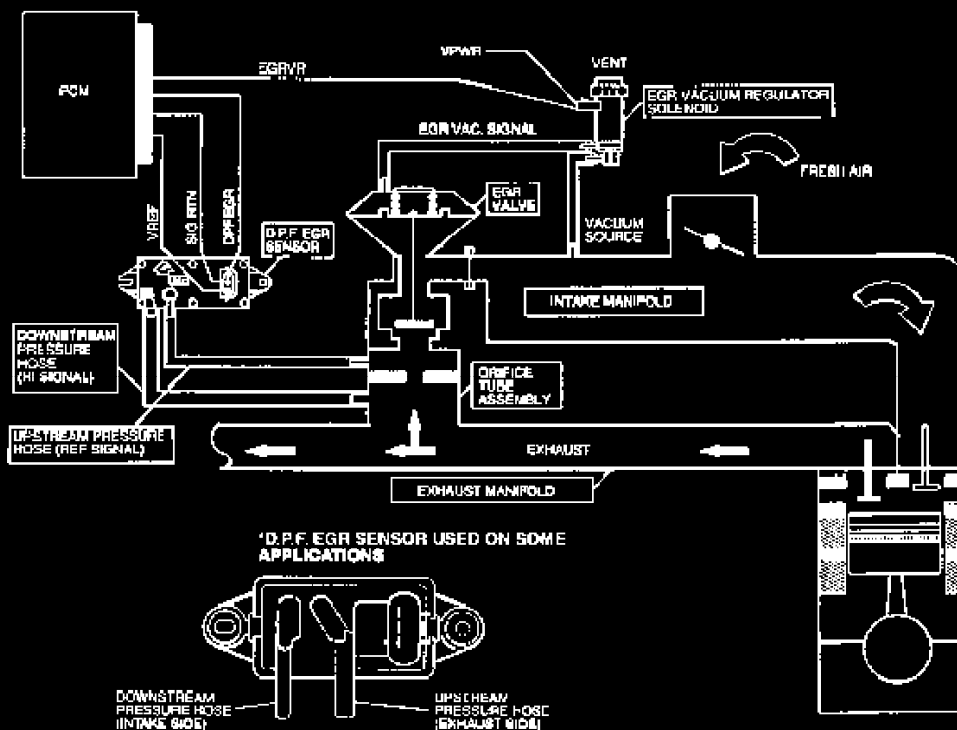
- Differential pressure feedback EGR sensor (9J460)
- Exhaust gas recirculation (EGR) valve (9D460) (9D475)
- EGR vacuum regulator solenoid (9J459)
- Orifice tube assembly (9D477)
- Differential pressure feedback EGR sensor pressure hoses
- Vacuum lines
- Harness circuits: VREF, DPFE, SIG, SIG RTN, EVR,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

HE INTRODUCTION 1 OF 4

Pinpoint Test Schematics and Connectors

Note: All connector views are from the harness side.

For PCM connector views, refer to Section 1, Powertrain Control Hardware.



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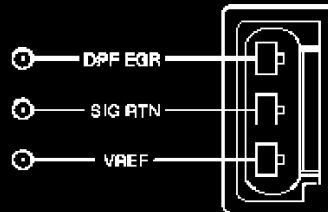
HE INTRODUCTION 2 OF 4

EXPLORER/MOUNTAINEER, LIGHTNING

A0062647

PCM CONNECTOR PIN NUMBERS

APPLICATION	DPFEGR	SIG RTN	VREF
Explorer Mountaineer	C41	C17	C20
Lightning	65	91	90

All Others

A0062648

PCM CONNECTOR PIN NUMBERS

APPLICATION	DPFEGR	SIG RTN	VREF
Expedition Navigator	E33	E25	E36
All Others	65	91	90

All EGR Vacuum Regulator (EVR) Solenoid

A0057198

PCM CONNECTOR PIN NUMBERS

APPLICATION	EVR	VPWR
Explorer Mountaineer	E16	B32/B33
Expedition Navigator	E22	B34/B46
All Others	47	71

**HE: Exhaust Gas Recirculation (EGR)
Systems**

HE**HE1 DTC P0405, P1400; DETERMINE PRESENT DPFEGR PID
VOLTAGE**

- ♦ Key ON, Engine OFF.
- ♦ Access DPFEGR PID.

Is DPFEGR PID voltage less than 0.2V DC?

Yes	No
Fault is currently present. Key OFF. GO to HE2 .	Fault is intermittent. GO to HE5 .

HE2 INDUCE OPPOSITE D.P.F. EGR SENSOR VOLTAGE

- ♦ Disconnect D.P.F. EGR sensor.
- ♦ Key ON, Engine OFF.

Is DPFEGR PID value between 4.0V and 6.0V DC?

Yes	No
REPLACE D.P.F. EGR sensor.	GO to HE3 .

**HE3 CHECK VREF AND SIG RTN CIRCUITS FOR OPEN IN
HARNESS 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 4.0V and 6.0V DC?

Yes	No
Key OFF. GO to HE4 .	GO to C1 .

HE1 - HE3

HE4 CHECK DPFEGR CIRCUIT FOR SHORT TO GROUND AND SIG RTN IN HARNESS

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

- Disconnect scan tool.
- 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 (-) terminal.

Is each resistance greater than 10K ohms?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

HE5 PERFORM 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 .

HE10 DTC P0406, P1401: DETERMINE PRESENT DPFEGR PID VOLTAGE

- Key ON, Engine OFF.
- Access DPFEGR PID.

Is DPFEGR PID voltage greater than 4.0V DC?

Yes	No
Fault is currently present. Key OFF. GO to HE11 .	Fault is intermittent. GO to HE19 .

HE11 CHECK DPFEGR CIRCUIT FOR SHORT TO PWR

- 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 battery (-) terminal.

Is voltage greater than 10.6V DC?

Yes	No
Key OFF. GO to HE12 .	GO to HE13 .

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 battery (-) terminal.

Is voltage greater than 10.5V DC?

Yes	No
REPAIR short circuit.	REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

HE13 VERIFY SCAN TOOL COMMUNICATION

- Connect jumper wire between DPFEGR and SIG RTN circuits at the D.P.F. EGR sensor harness connector.
-
- Access DPFEGR PID.

Does a scan tool communication concern appear with the jumper wire connected?

Yes	No
IMMEDIATELY REMOVE jumper wire. GO to HE19 .	GO to HE14 .

HE14 INDUCE OPPOSITE D.P.F. EGR SENSOR VOLTAGE

- Key OFF.
- Disconnect jumper wire between DPFEGR and SIG RTN circuits at the D.P.F. EGR sensor harness connector.
- Connect jumper wire between DPFEGR and VREF circuits at the D.P.F. EGR sensor harness connector.
- Key ON, Engine OFF.
- Access DPFEGR PID.

Is DPFEGR PID voltage less than 0.05V DC?

Yes	No
REMOVE jumper. GO to HE15 .	Unable to induce opposite signal. Key OFF. GO to HE17 .

HE15 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 4.0V and 6.0V DC?

Yes	No
REPLACE D.P.F. EGR sensor.	GO to C1 .

HE17 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	No
GO to HE18 .	REPAIR open circuit.

HE18 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit.

HE19 CHECK DPF EGR CIRCUIT FOR SHORT TO VREF IN HARNESS

- Disconnect PCM.
- Measure resistance between DPF EGR circuit and VREF circuit(s) at the PCM harness connector.

Is resistance greater than 10K ohms?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

HE20 PERFORM WIGGLE TEST ON D.P.F. EGR SENSOR AND CIRCUIT WHILE MONITORING DPF EGR PID FOR A SUDDEN CHANGE

- While monitoring DPF EGR PID, tap on the D.P.F. EGR sensor and wiggle the harness 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 .

HE21 CHECK FOR PRESENCE OF DTC P1405 WITH DTC P0402**Is DTC P1405 present with DTC P0402?**

Yes	No
GO to HE50 .	GO to HE22 .

HE22 DTC P0402: CHECK FOR EGR FLOW AT IDLE WITH EGR VACUUM HOSE DISCONNECTED

- Disconnect vacuum hose at EGR valve and plug hose.
- Run Key On Engine Running (KOER) Self-Test.

Did KOER DTC P0402 appear or are you unable to run KOER Self-Test due to an 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 HE23 .

HE23 CHECK FOR EGR FLOW AT IDLE WITH EGR VACUUM HOSE CONNECTED

- EGR vacuum hose connected.
- Run KOER Self-Test.

Did KOER DTC P0402 appear or are you unable to run KOER Self-Test due to an engine stall or no start?

Yes	No
Possible EGR flow at idle. GO to HE24 .	Fault is intermittent. INSPECT pressure hoses for pinching and icing. REPAIR as necessary. GO to HE31 .

HE21 - HE23

HE24 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 is routed properly.

Are vacuum hoses OK?

Yes	No
RECONNECT vacuum hoses. GO to HE25	REPAIR vacuum hoses as necessary.

HE25 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 5 seconds.
- Quickly release vacuum.
 - The DPFEGR PID voltage must be between 0.2V and 1.3V DC with the key ON and no vacuum applied.
 - The DPFEGR PID voltage must increase to greater than 4.0V DC with the vacuum applied.
 - The DPFEGR PID must drop to less than 1.5V DC 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 HE26 .

HE26 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.
- 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	No
This indicates a fault in the EGR vacuum regulator solenoid. Key OFF. GO to HE27 .	Key OFF. GO to HE28 .

HE27 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.

- Remove EGR vacuum regulator solenoid vent cap.
- Remove filter and inspect for blockage or icing in some cases.

Is the EGR vacuum regulator solenoid vent or vent filter plugged or restricted?

Yes	No
REPAIR EGR vacuum regulator solenoid as necessary. If unable to repair, REPLACE EGR vacuum regulator solenoid.	REPLACE EGR vacuum regulator solenoid.

HE28 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 HE29 .	REPLACE EGR vacuum regulator solenoid.

HE29 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 (-) terminal.

Is resistance greater than 10K ohms?

Yes	No
GO to HE30 .	REPAIR short circuit.

HE30 CHECK EGRVR CIRCUIT FOR SHORT TO VREF

- Measure resistance between EGRVR circuit and VREF circuit(s) at the PCM harness connector.

Is resistance greater than 10K ohms?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

HE29 - HE30

HE31 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 5 seconds.
- Quickly release vacuum.
 - The DPFEGR PID voltage must be between 0.2V and 1.3V DC with the key ON and no vacuum applied.
 - The DPFEGR PID voltage must increase to greater than 4.0V DC with the vacuum applied.
 - The DPFEGR PID must drop to less than 1.5V DC 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 HE32 .

HE31

HE32 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 0.2V and 1.3V DC.
- Disconnect vacuum hose at EGR valve and plug hose.
- Connect a hand vacuum pump to EGR valve.
- Start engine.
- Observe DPFEGR PID at idle and compare to the key ON engine OFF voltage. (A higher voltage at idle may 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 HE33 .

HE33 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 HE34 .

HE34 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.

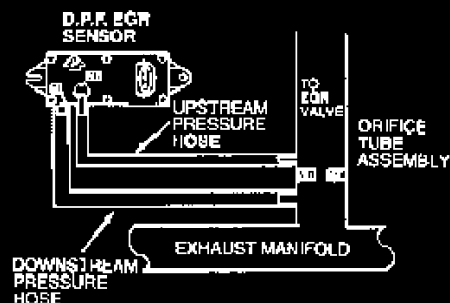
Is EGR vacuum regulator solenoid vent or filter contaminated or vacuum hose plugged?

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?



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Yes	No
REPAIR as necessary. COMPLETE EGR Monitor Repair Verification Drive Cycle (REFER to Section 2, Drive Cycles).	GO to HE51 .

HE51 INSPECT UPSTREAM PRESSURE HOSE FOR PLUGGING

Note: It is essential that ONLY the correct Ford service D.P.F. EGR sensor pressure hose be used.

- 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 Section 2, Drive Cycles).	GO to HE52 .

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	No
REPAIR or REPLACE D.P.F. EGR sensor or orifice tube assembly as necessary. COMPLETE EGR Monitor Repair Verification Drive Cycle (REFER to Section 2, Drive Cycles).	GO to HE53 .

HE51 - HE52

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 0.2V and 1.3V DC with the key ON and no vacuum applied.
 - The DPFEGR PID voltage must increase to greater than 4.0V DC with the vacuum applied.
 - The DPFEGR PID must drop to less than 1.5V DC 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. COMPLETE an EGR Monitor Repair Verification Drive Cycle (REFER to Section 2, Drive Cycles).	Unable to duplicate or identify fault at this time. GO to Z1 .

HE53

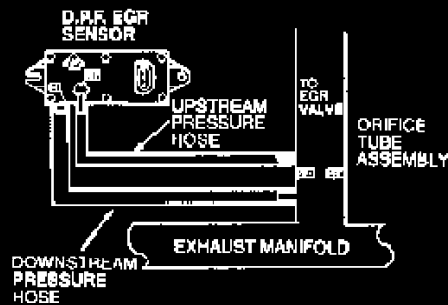
HE60 DTC P1406: INSPECT DOWNSTREAM PRESSURE HOSE CONNECTIONS

Note: If the fault is currently present, DTC P1408 will appear when running Key On Engine Running (KOER) Self-Test.

Verify EGR valve is securely attached and exhaust gasses are not leaking from the sealing surface.

- Inspect downstream hose at D.P.F. EGR sensor and orifice tube assembly for disconnect or poor connection.

Is hose OFF or poorly connected?



A0057199

Yes	No
REPAIR as necessary.	GO to HE61 .

HE61 INSPECT DOWNSTREAM PRESSURE HOSE FOR PLUGGING

Note: It is essential that ONLY the correct Ford service D.P.F. EGR sensor pressure hose be used.

- 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 .

HE60 - HE61

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 .

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 5 seconds.
- Quickly release vacuum.
 - The DPFEGR PID voltage must be between 0.2V and 1.3V DC with the key ON and no vacuum applied.
 - The DPFEGR PID voltage must increase to greater than 4.0V DC with the vacuum applied.
 - The DPFEGR PID must drop to less than 1.5V DC 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 .

HE62 - HE63

HE70 DTC P0401: RUN KOER SELF-TEST

- Run KOER Self-Test.

Did KOER DTC P1408 appear?

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 P1406 appears, note the DTC and refer to Diagnostic Trouble Code (DTC) Charts in Section 4 after completing this Pinpoint Test.

- Retrieve all Continuous Memory DTCs.

Is DTC P1406 present?

Yes	No
GO to HE60 .	GO to HE72 .

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.

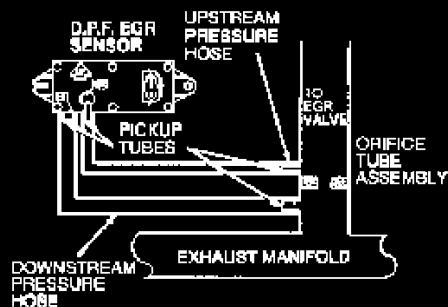
- Run Key On Engine Running (KOER) Self-Test while monitoring gauge. Approximately 30 seconds into test, EGR flow will be requested for a few seconds. The vacuum at this time should increase above 5.4 kPa (1.6 in-Hg) to open the valve.

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?

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Yes	No
REPAIR pressure hoses as necessary.	GO to HE74 .

HE73**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 5 seconds.
- Quickly release vacuum.
 - The DPFEGR PID voltage must be between 0.2V and 1.3V DC with the key ON and no vacuum applied.
 - The DPFEGR PID voltage must increase to greater than 4.0V DC with the vacuum applied.
 - The DPFEGR PID must drop to less than 1.5V DC 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 .

HE74

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.
- 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 2.5V DC 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 the EGR valve is operating as described in this test step?

Yes	No
GO to HE82 .	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.

HE80 PHYSICALLY INSPECT ALL VACUUM LINES BETWEEN EGR VALVE, EVR AND VACUUM SOURCE

- Inspect all vacuum lines for leaks, kinks, pinches, disconnects, blockage, misrouting or any physical damage.

Are any physical concerns present?

Yes	No
REPAIR as necessary.	Key OFF. GO to HE81 .

HE76 - HE80

HE81 CHECK ENGINE VACUUM

- Disconnect EVR vacuum hose at vacuum source.
- Connect vacuum gauge to vacuum source.
- Start engine.
- With engine warm and at idle, monitor vacuum gauge.

Is the vacuum gauge steadily reading a minimum of 51 kPa (15 in-Hg)?

Yes	No
Key OFF. GO to HE82 .	ISOLATE possible base engine concern and REPAIR as necessary.

HE82 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 10.5V DC?

Yes	No
Key OFF. GO to HE83 .	REPAIR open circuit.

HE83 CHECK EGR VACUUM REGULATOR SOLENOID RESISTANCE

- Measure EGR vacuum regulator solenoid resistance.

Is solenoid resistance between 26 and 40 ohms?

Yes	No
GO to HE84 .	REPLACE EGR vacuum regulator solenoid.

HE84 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 (-) terminal.

Is voltage greater than 1.0V DC?

Yes	No
REPAIR short circuit.	Key OFF. GO to HE85 .

HE85 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 HE86 .	REPAIR open in EGRVR circuit.

HE86 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. If the EGRVR does not react within 2 seconds, an EGRVR fault may be present.

Is vacuum gauge reading 13.6 kPa (4.0 in-Hg) or greater within 2 seconds?

Yes	No
REPLACE PCM (refer to section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPLACE EGR vacuum regulator solenoid.

HE90 INSPECT EGR SYSTEM FOR AN INTERMITTENT FAILURE

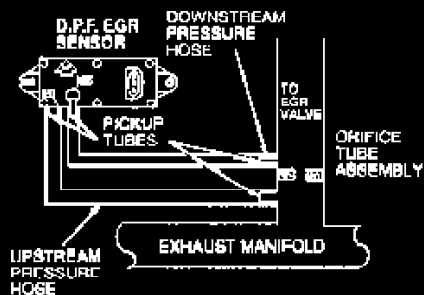
- Visually inspect the EGR system for signs of intermittent failure.

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?

A21169-B

Yes	No
REPAIR pressure hoses as necessary.	GO to HE92 .

HE90 - HE91

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 5 seconds.
- Quickly release vacuum.
 - The DPFEGR PID voltage must be between 0.2V and 1.3V DC with the key ON and no vacuum applied.
 - The DPFEGR PID voltage must increase to greater than 4.0V DC with the vacuum applied.
 - The DPFEGR PID must drop to less than 1.5V DC 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 .

HE92

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.
- 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 2.5V DC minimum with full vacuum applied.
 - DPFEGR PID voltage steady when vacuum is held. If voltage drops within 5 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.

HE93

**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 .

HE94

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 indicate possible EGR flow at idle with no EGR diagnostic trouble codes present.

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.
- 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 0.15V DC 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.

HE110 DTC P0403, 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 10.5V DC?

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 (-) terminal.

Is voltage less than 1.0V DC?

Yes	No
Key OFF. GO to HE114 .	REPAIR short circuit.

HE111 - HE113

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 10K ohms?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

HE120 CONTINUOUS MEMORY DTC P0403, P1409: WIGGLE EGR VACUUM REGULATOR SOLENOID WHILE MONITORING VPWR

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

Note: If DTC P1409 appeared after running Key On Engine Off (KOEO) or Key On Engine Running (KOER) Self-Test, GO to HE110 to diagnose present fault.

- Disconnect PCM.
- Key ON.
- Measure voltage between EGRVR and PWR GND circuits at the PCM harness connector.
- Voltage must read greater than 10.5V DC. 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?

Yes	No
ISOLATE fault and REPAIR as necessary.	Unable to duplicate or identify fault at this time. GO to Z1 .

HE114 - HE120**Test HF: Catalyst Efficiency Monitor and Exhaust Systems**

HF: Catalyst Efficiency Monitor and Exhaust Systems
Introduction

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: Interchanged or crossed catalyst monitor oxygen sensor connectors

For additional information on the Catalyst Efficiency Monitor, refer to Section 1 , On Board Diagnostic System.

For additional information on Exhaust Systems, refer to Section 1 , Catalyst and Exhaust Systems.

HF INTRODUCTION

HF: Catalyst Efficiency Monitor and Exhaust Systems

HF**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.

- 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, P0310, P0315, P0316 and P1309?

Yes	No
GO to Section 4, Powertrain Diagnostic Trouble Code (DTC) Charts, to address the Misfire Detection Monitor DTCs.	GO to HF2 .

HF1

HF2 CHECK FOR HO2S 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. Refer to Section 1 , Heated Oxygen Sensor (HO2S) Monitor for possible HO2S DTCS.

Were there any HO2S DTCS (not including the initial P0420 or P0430 DTCS)?

Yes	No
GO to, Section 4, Powertrain Diagnostic Trouble Code (DTC) Charts, to address the HO2S DTCS.	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, P0128, P1117, P1285, P1288, P1289, P1290 and P1299?

Yes	No
GO to Section 4, Powertrain Diagnostic Trouble Code (DTC) Charts, to address the ECT or CHT sensor DTCS.	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	No
GO to Section 4, Powertrain Diagnostic Trouble Code (DTC) Charts, to address the DTCS.	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	No
REPAIR any wiring or connection concerns. For PCM pin concerns, REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). COMPLETE Catalyst Monitor OBD Drive Cycle to verify repair (Refer to Section 2, Drive Cycles).	No Electronic EC root causes related to the DTCs or symptoms. GO to HF6 .

HF5

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 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 HC3 , Fuel Delivery Systems in Section 5 for diagnosis.

HF6

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 HF12 .	REPAIR the leak source(s). COMPLETE Catalyst Monitor OBD Drive Cycle to verify repair (Refer to Section 2, Drive Cycles).

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 Drive Cycle to verify repair (Refer to Section 2, 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 Drive Cycle to verify repair (Refer to Section 2, Drive Cycles). For further diagnosis of symptom (e.g. Lack of Power, Loss of Power, or No Start) REFER to Section 3 , 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 catalyst that is located between the monitored H02S Sensors, only for the bank referenced, (P0420 Bank 1), (P0430 Bank 2). Do not replace any unmonitored catalyst unless it is serviced as an assembly. COMPLETE Catalyst Monitor OBD Drive Cycle to verify repair (Refer to Section 2, Drive Cycles). For further diagnosis of symptom (e.g. Lack of Power, Loss of Power, or No Start) REFER to Section 3 , Symptom Charts.

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 catalyst that is located between the monitored H02S Sensors, only for the bank referenced, (P0420 Bank 1), (P0430 Bank 2). Do not replace any unmonitored catalyst unless it is serviced as an assembly. COMPLETE Catalyst Monitor OBD Drive Cycle to verify repair (Refer to Section 2, Drive Cycles). For further diagnosis of symptom (e.g. Lack of Power, Loss of Power, or No Start) REFER to Section 3 , Symptom Charts.

HF11

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 HF10 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	No
The exhaust system restriction is downstream of the exhaust manifold. RECONNECT exhaust system at exhaust manifold. GO to HF13 .	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 Drive Cycle to verify repair (Refer to Section 2, Drive Cycles).

HF12

HF13 CHECK MANIFOLD VACUUM WITH MUFFLER/TAILOPIPE ASSEMBLY DISCONNECTED FOR INDICATION OF A RESTRICTION

- Disconnect muffler/tailpipe assembly from the catalytic converter.
- GO to HF10 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. COMPLETE Catalyst Monitor OBD Drive Cycle to verify repair (Refer to Section 2, Drive Cycles).	There is a restriction in the catalytic converter. REPLACE the catalytic converter. NOTE: On vehicle applications where there is more than one catalyst, REPLACE only the damaged catalyst assembly. INSPECT the muffler to be certain converter debris has not entered. COMPLETE Catalyst Monitor OBD Drive Cycle to verify repair (Refer to Section 2, Drive Cycles).

HF13

Test HG: Positive Crankcase Ventilation (PCV) System

HG: Positive Crankcase Ventilation (PCV) System Introduction

HG

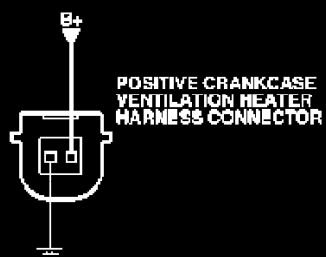
Note

This Pinpoint Test is intended to diagnose only the following:

- Heated and non-heated Positive Crankcase Ventilation (PCV) valve (6A666) and related vacuum lines.

Pinpoint Test Schematics and Connectors

4.6L Mustang, Aviator



A0002850

HG INTRODUCTION

HG: Positive Crankcase Ventilation (PCV) System

HG

HG1 CHECK POWER AND GROUND CIRCUITS AT HEATED PCV VALVE

Note: Refer to the heated PCV connector diagram in the beginning of this pinpoint test.

- Disconnect the heated PCV valve harness connector.
- Key on, engine running.
- Measure the voltage at the heated PCV valve harness connector.

Is the voltage greater than 10.5 volts?

Yes	No
GO to HG2 .	GO to HG3 .

HG2 CHECK RESISTANCE OF HEATED PCV VALVE

- Measure the resistance between both pins at the heated PCV valve.

Is the resistance reading between 28 and 35 ohms?

Yes	No
GO to HG4 .	REPLACE heated PCV valve.

HG3 CHECK B+ TO HEATED PCV VALVE CIRCUIT

- Measure B+ circuit voltage at the heated PCV valve harness connector.

Is the voltage greater than 10.5 volts?

Yes	No
CHECK the heated PCV valve ground circuit. REPAIR as necessary.	KEY OFF. B+ circuit fault. CHECK condition of related fuse(s). If OK, REPAIR open circuit. If fuse is damaged, check B+ circuit for short to ground before replacing.

HG1 - HG3

HG4 STUCK PCV VALVE CHECK

- Verify PCV valve maintenance schedule has been followed.
- Verify proper PCV valve part number.
- Verify clean PCV valve.

Does PCV valve rattle when shaken?

Yes	No
REINSTALL PCV valve. GO to HG5 .	PCV valve is sticking. REPLACE PCV valve. VERIFY a symptom no longer exists.

HG5 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	No
PCV System is OK. RETURN to Section 3 for other possible causes of vehicle symptoms.	System is leaking/plugged or Evaporative Emission System is leaking. GO to HG6 .

HG6 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 HG5 . Wait one minute.

Does vacuum now hold the paper in place?

Yes	No
PCV system is OK. REFER to Evaporative Emission Section 303 (for Aviator, REFER to Section 310) in the Workshop Manual.	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.

HG4 - HG6

Test HH: Exhaust Gas Recirculation System Module (ESM)

HH: Exhaust Gas Recirculation System Module (ESM) Introduction

HH

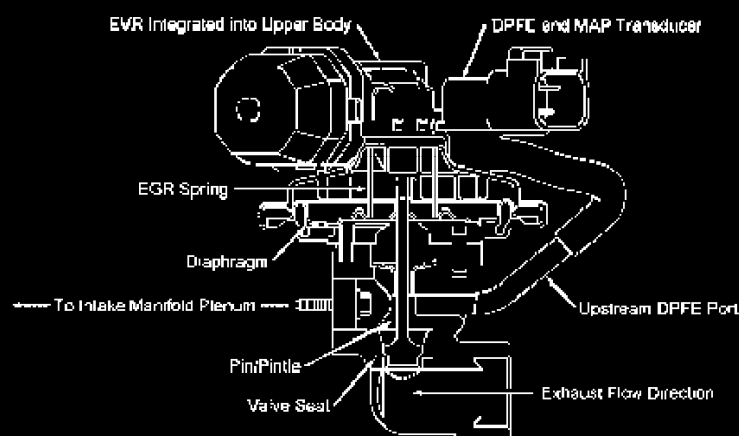
Note

This Pinpoint Test is intended to diagnose the following:

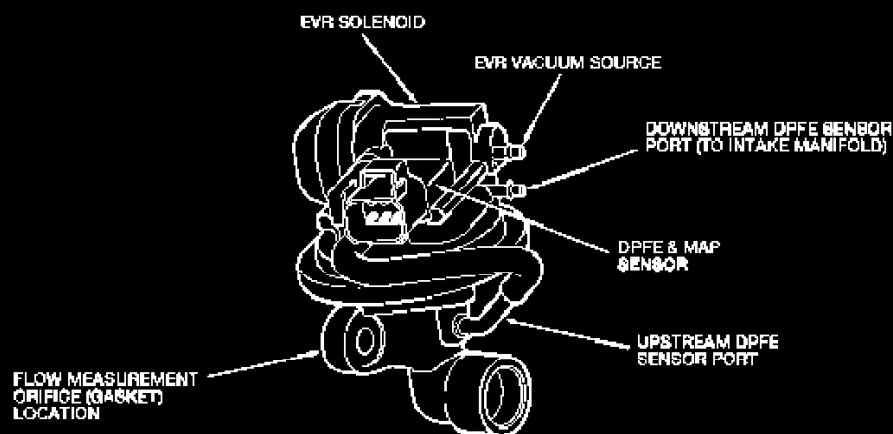
- Exhaust gas recirculation system module (ESM) (9Y456)
- Differential pressure feedback EGR sensor pressure hoses
- Vacuum lines
- Harness circuits: VREF, DPFE, SIG RTN, EVR, VPWR
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware.

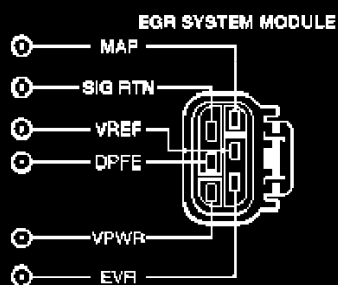


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A0003492

Aviator, Crown Victoria/Grand Marquis, LS6/LS8, Marauder, Thunderbird, Town Car



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0040138

HH INTRODUCTION 2 OF 3

PCM CONNECTOR PIN NUMBERS						
APPLICATION	MAP	VREF	EVR	SIGRTN	DPFE	VPWR
Town Car Crown Victoria Grand Marquis Marauder 104 Pin	10	90	47	91	65	71/97
Aviator 150 Pin	E59	E20	E16	E17	E41	B32
LS6/LS8 Thunderbird 150 Pin	E23	E14	E16	E17	E41	B69

HH INTRODUCTION 3 OF 3

**HH: Exhaust Gas Recirculation System
Module (ESM)**

HH**HH1 DTCS P0405 AND P1400 — DETERMINE THE PRESENT
DPFEGR PID VOLTAGE**

- Key on, engine off.
- Access the PCM-DPFEGR PID.

Is the voltage less than 0.2 volts?

Yes	No
GO to HH2 .	GO to HH10 .

HH2 INDUCE OPPOSITE DPFE SENSOR SIGNAL

- Key off.
- Disconnect the ESM.
- Key on, engine off.
- Access the PCM DPFEGR PID.

Is the voltage between 4.0 and 6.0 volts?

Yes	No
INSTALL a new ESM.	GO to HH3 .

HH1 - HH2

HH3 CHECK THE DPFEGR CIRCUIT FOR A SHORT TO SIG RTN OR GND IN HARNESS

- Key off.
- Disconnect the PCM.
- Measure the resistance between:

(+)PCM Connector, Harness Side	(-)PCM Connector, Harness Side
DPFEGR	SIGRTN

-
- Measure the resistance between:

(+)PCM Connector, Harness Side	(-)Vehicle battery
DPFEGR	Negative terminal

-

Are the resistances greater than 10,000 ohms?

Yes	No
INSTALL a new PCM.	REPAIR the short circuit in question.

HH4 DTCS P0406 AND P1401 — DETERMINE PRESENT DPFEGR PID VOLTAGE

- Key on, engine off.
- Access the PCM-DPFEGR PID.

Is the DPFEGR PID voltage greater than 4.0 volts?

Yes	No
GO to HH5 .	GO to HH10 .

HH5 CHECK THE VREF VOLTAGE TO ESM

- Key off.
- Disconnect the ESM.
- Key on, engine off.
- Measure the voltage between:

(+)ESM Connector, Harness Side	(-)Vehicle Battery
VREF - Pin 2	Negative terminal

•

Is the voltage between 4.5 and 5.5 volts?

Yes	No
GO to HH6 .	REPAIR open circuit.

HH6 CHECK THE DPFEGR CIRCUIT FOR A SHORT TO POWER

- Key off.
- Disconnect the PCM.
- Key on, engine off.
- Measure the voltage between:

(+)ESM Connector, Harness Side	(-)Vehicle battery
DPFEGR - Pin 5	Negative terminal

•

Is any voltage indicated?

Yes	No
REPAIR short circuit.	GO to HH7 .

HH5 - HH6

HH7 CHECK DPFEGR CIRCUIT FOR SHORT TO VREF

- Key off.
- Measure the resistance between:

(+)PCM Connector, Harness Side	(-)PCM Connector, Harness Side
VREF	DPFEGR

•

Is the resistance greater than 10,000 ohms?

Yes	No
GO to HH8 .	REPAIR short circuit.

HH8 CHECK THE DPFEGR AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS

- Measure the resistance between:

(+)PCM Connector, Harness Side	(-)ESM Connector, Harness Side
DPFEGR	DPFEGR - Pin 5
SIGRTN	SIGRTN - Pin 6

•

Are the resistances less than 5 ohms?

Yes	No
GO to HH9 .	REPAIR open circuit.

HH7 - HH8

HH9 INDUCE THE OPPOSITE DPFEGR SENSOR VOLTAGE

- Key off.
- Reconnect the PCM
- Connect a 5-amp fused jumper wire between the following:

ESM Connector, Harness Side	ESM Connector, Harness Side
DPFEGR - Pin 5	SIGRTN - Pin 6

-
- Key on, engine off.
- Access the PCM-DPFEGR PID.

Is the voltage less than 0.1 volt?

Yes	No
INSTALL a new ESM.	INSTALL a new PCM.

HH10 PERFORM A THOROUGH WIGGLE TEST ON THE ESM HARNESS

- Access the PCM-DPFEGR PID.
- Wiggle, shake and bend small sections of the wiring harness while working from the sensor to the PCM.

Is there any change in the PID voltage reading?

Yes	No
REPAIR as necessary.	Unable to duplicate or identify fault at this time. GO to Z1 .

HH9 - HH10

HH11 DTCS P0402 AND P1405: CHECK FOR SIMULTANEOUS PRESENCE

Note: Diagnose and repair all circuit fault DTCs before diagnosing range/performance and flow concerns. For circuit fault DTC diagnosis, refer to Section 4 Diagnostic Trouble Code (DTC) Charts.

Is DTC P0402 present with DTC P1405?

Yes	No
GO to HH29 .	GO to HH12 .

HH12 CHECK THE VREF VOLTAGE TO THE ESM

- Key off.
- Disconnect the ESM.
- Key on, engine off.
- Measure the voltage between:

(+)ESM Connector, Harness Side	(-)Vehicle Battery
VREF - Pin 2	Negative terminal

•

Is the voltage between 4.5 and 5.5 volts?

Yes	No
GO to HH13 .	REPAIR open circuit.

HH11 - HH12

HH13 SIMULATE DPFE SENSOR SIGNAL WITH A VACUUM PUMP

- Reconnect the ESM.
- Disconnect the downstream sensor port hose at the ESM.
- Verify hose is clear and free of obstructions.
- Connect a vacuum pump to the downstream sensor port.
- Key on, engine off.
- Access the PCM-DPFEGR PID.
- Apply 27-30 kPa (8-9 in Hg) vacuum to the ESM and hold for 10 seconds.
- Quickly release vacuum.
 - The DPFEGR PID voltage must be between 0.2 and 1.3 volts 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 voltage must decrease to less than 1.5 volts in less than 3 seconds when the vacuum is released.

Does the DPFEGR PID voltage indicate a fault in the DPFE sensor?

Yes	No
INSTALL a new ESM.	GO to HH14 .

HH14 INSPECT EVR SOLENOID VENT FOR BLOCKAGE

Note: When the EGR valve is closed, the EVR solenoid vacuum is vented through the solenoid vent to the atmosphere. A plugged EVR solenoid vent will not allow EGR vacuum to vent to atmosphere.

- Disconnect the EVR vacuum source hose.
- Remove the EVR solenoid vent cap (if removable).
- Remove the filter and inspect for blockage, or in some cases, icing.
- Connect a hand vacuum pump to EVR vacuum source.
- Apply 34 to 51 kPa (10 to 15 in Hg) vacuum.

Does the EVR solenoid vacuum bleed off?

Yes	No
GO to HH15 .	REPAIR the vent or if not repairable, INSTALL a new ESM.

HH15 CHECK FOR PRESENCE OF CARBON BUILDUP

- Remove the ESM.
- Visually inspect the EGR valve and valve seat for proper seating, carbon buildup or debris.

Is a concern present?

Yes	No
REPAIR as necessary.	Unable to duplicate or identify concern at this time.

HH16 DTC P0401 — PERFORM KOER SELF-TEST

Note: Diagnose and repair all circuit fault DTCs before diagnosing range/performance and flow concerns.

- Perform KOER Self-Test.

Is DTC P1408 present?

Yes	No
GO to HH17 .	GO to HH19 .

HH17 KOER DTC P1408: RETRIEVE CONTINUOUS MEMORY DTC

Note: If any DTC other than P1405 or P1406 appears, note the DTC and refer to Section 4 after completing this pinpoint test.

Note: Do not replace the ESM if DTCs P0106 and P0400 are in continuous memory. Check the vacuum hose to the MAP sensor and verify proper MAP sensor operation.

- Retrieve all Continuous Memory DTCs.

Is DTC P1405 or 1406 present?

Yes	No
For DTC P1405, GO to HH29 .	GO to HH18 .
For DTC P1406, GO to HH31 .	

HH18 CHECK THE VREF VOLTAGE TO ESM

- Key off.
- Disconnect the ESM.
- Key on, engine off.
- Measure the voltage between:

(+)ESM Connector, Harness Side	(-)Vehicle battery
VREF - Pin 2	Negative terminal

♦

Is the voltage between 4.5 and 5.5 volts?

Yes	No
GO to HH19 .	REPAIR open circuit.

HH19 CHECK EVR SOLENOID VACUUM

- Reconnect the ESM.
- Disconnect EVR vacuum source hose.
- Connect a vacuum gauge to the EVR vacuum source hose.
- Key on, engine running.
- Observe the vacuum gauge.

Is the manifold vacuum greater than 34 kPa (10 in-Hg)?

Yes	No
GO to HH20 .	REPAIR as necessary.

HH18 - HH19

HH20 SIMULATE DPFE SENSOR SIGNAL WITH A VACUUM PUMP

- Disconnect the downstream DPFE sensor port hose at the ESM.
- Verify hose is clear and free of obstructions.
- Connect a vacuum pump to the downstream DPFE sensor port.
- Key on, engine off.
- Access the PCM-DPFEGR PID.
- Apply 27-30 kPa (8-9 in Hg) vacuum to the DPFEGR sensor and hold for 10 seconds.
- Quickly release vacuum.
 - The DPFEGR PID voltage must be between 0.2 and 1.3 volts 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 voltage must decrease to less than 1.5 volts in less than 3 seconds when the vacuum is released.

Does the DPFEGR PID voltage indicate a fault in the DPFE sensor?

Yes	No
INSTALL a new ESM.	Reconnect all hoses. GO to HH21 .

HH21 CHECK THE EVR SOLENOID OPERATION

- Key on, engine running.
- Engine at operating temperature.
- Allow the engine idle to stabilize.
- Access the PCM-RPM PID.
- Access Output State Control.
- Increase the EVR duty cycle while monitoring the RPM PID.

Does the RPM decrease or the engine stall as the EVR duty cycle is increased?

Yes	No
Unable to duplicate or identify concern at this time. Check for the presence of carbon build-up in the EGR passage	GO to HH22 .

HH22 CHECK FOR THE PRESENCE OF CARBON BUILDUP IN THE EGR PASSAGE

Note: In certain vehicle applications, carbon buildup may occur downstream of the ESM. An inspection is required to make sure the passage in the upper intake manifold plenum chamber behind the ESM is open to allow exhaust gas flow.

- Key off.
- Remove the ESM. For additional information, refer to Workshop Manual Section 303.
- Disconnect the air inlet tube from the throttle body. For additional information, refer to Workshop Manual Section 303.
- Prop open the throttle body.
- Apply regulated shop air to the EGR port at the location where the ESM attaches to the upper intake manifold.

Is a restriction concern present?

Yes	No
CLEAN the EGR port as necessary and REINSTALL the ESM.	INSTALL a new ESM.

HH23 DTCS P0403 AND P1409: CHECK THE EVR SOLENOID OPERATION

- Key on, engine running.
- Engine at operating temperature.
- Allow engine idle to stabilize.
- Access the PCM-RPM PID.
- Access Output State Control.
- Increase the EVR duty cycle while monitoring the RPM PID.

Does the RPM decrease or the engine stall as the EVR duty cycle is increased?

Yes	No
Concern is intermittent. GO to Pinpoint Test Z1 .	GO to HH24 .

HH24 CHECK THE EVR SOLENOID FOR VOLTAGE

- Key off.
- Disconnect the ESM
- Key on, engine off.
- Measure the voltage between:

(+)ESM Connector, Harness Side	(-)Vehicle battery
VPWR - Pin 4	Negative terminal

•

Is the voltage greater than 10.5 V?

Yes	No
GO to HH25 .	REPAIR open circuit.

HH25 CHECK THE EVR SOLENOID COIL RESISTANCE

- Key off.
- Measure the resistance between:

(+)ESM Connector, Component Side	(-)ESM Connector, Component Side
EVR - Pin 1	VPWR - Pin 4

•

Is the resistance between 26 and 40 ohms?

Yes	No
GO to HH26 .	INSTALL a new ESM.

HH24 - HH25

HH26 CHECK THE EVR CIRCUIT FOR AN OPEN IN THE HARNESS

- Disconnect the PCM.
- Measure the resistance between:

(+)ESM Connector, Harness Side	(-)PCM Connector, Harness Side
EVR - Pin 1	EVR

•

Is the resistance less than 5 ohms?

Yes	No
GO to HH27 .	REPAIR open circuit.

HH27 CHECK THE EVR CIRCUIT FOR SHORT TO POWER IN HARNESS

- Key on, engine off.
- Measure the voltage between:

(+)PCM Connector, Harness Side	(-)Vehicle battery
EVR	Negative terminal

•

Is the voltage less than 1 volt?

Yes	No
GO to HH28 .	REPAIR short circuit.

HH26 - HH27

HH28 CHECK THE EVR CIRCUIT FOR A SHORT TO GND IN THE HARNESS

- Key off.
- Measure the resistance between:

(+)PCM Connector, Harness Side	(-)
EVR	Ground

•

Is the resistance greater than 10,000 ohms?

Yes	No
INSTALL a new PCM.	REPAIR short circuit.

HH29 DTC P1405 — INSPECT UPSTREAM PRESSURE HOSE CONNECTION AND ESM ATTACHMENT

- Verify EGR valve is securely attached and that exhaust gases are not leaking from the sealing surface.
- Visually inspect the upstream DPFE sensor hose for a disconnect or poor connection.

Is the DPFE sensor hose and ESM securely attached?

Yes	No
GO to HH30 .	REPAIR as necessary.

HH30 INSPECT UPSTREAM HOSE FOR RESTRICTION

Note: It is essential that ONLY the correct Ford service pressure hose be used. The length of hose must also remain the same for proper system operation.

- Visually inspect the upstream DPFE sensor hose routing. Hose must not be pinched or have dips in it where water could settle or freeze.
- Remove the upstream DPFE sensor hose at the ESM and carefully inspect for restrictions, water or leaks.

Is a concern present?

Yes	No
REPAIR or REPLACE hose as necessary.	GO to HH33 .

HH31 DTC P1406 — INSPECT DOWNSTREAM HOSE CONNECTION AND ESM ATTACHMENT

- Verify EGR valve is securely attached and that exhaust gases are not leaking from the sealing surface.
- Inspect the downstream DPFE sensor hose at the ESM for a disconnect or poor connection.

Is the DPFE sensor hose and ESM securely attached?

Yes	No
GO to HH32 .	REPAIR as necessary.

HH32 INSPECT DOWNSTREAM HOSE FOR RESTRICTION

Note: It is essential that ONLY the correct Ford service pressure hose be used. The length of hose must also remain the same for proper system operation.

- Visually inspect the downstream pressure hose routing.
- Remove the downstream pressure hose and carefully inspect for restrictions, water or leaks.

Is a concern present?

Yes	No
REPAIR or REPLACE hose as necessary.	GO to HH33 .

HH31 - HH32

HH33 SIMULATE DPFE SENSOR SIGNAL WITH A VACUUM PUMP

- Disconnect the downstream DPFE sensor port hose at the ESM
- Connect a vacuum pump to the downstream DPFE sensor port.
- Key on, engine off.
- Access the PCM-DPFEGR PID using a scan tool.
- Apply 27-30 kPa (8-9 in Hg) vacuum to the DPFE sensor and hold for 10 seconds.
- Quickly release vacuum.
 - The DPFEGR PID voltage must be between 0.2 and 1.3 volts 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 voltage must decrease to less than 1.5 volts in less than 3 seconds when the vacuum is released.

Does the DPFEGR PID voltage indicate a fault in the DPFE sensor?

Yes	No
INSTALL a new ESM.	Concern is intermittent. GO to Pinpoint Test Z1 .

HH33

HH34 EGR DIAGNOSIS BY SYMPTOM: CHECK FOR EGR FLOW WITH EVR VACUUM HOSE DISCONNECTED

Note: Perform KOER Self-Test.

REPAIR any other DTCs.

- Possible causes for EGR flow at idle with no related DTCs:
 - EGR valve not fully seating.
 - EVR solenoid vent restricted.
 - damaged EVR solenoid.
- Disconnect and plug the EVR vacuum source hose.
- Key on, engine off.
- Access the PCM-DPFEGR PID.
- Record the PID voltage.
- Key on, engine running.
- Allow engine idle to stabilize.
- Monitor and record the DPFEGR PID voltage at idle.
- Compare the recorded DPFEGR PID voltages.
- An increase in DPFEGR PID voltage indicates EGR flow.

Is the idle DPFEGR PID voltage greater than 0.15 volts when compared to the KOEO DPFEGR PID voltage?

Yes	No
REMOVE and the INSPECT ESM for signs of contamination, unusual wear, carbon deposits, binding or other damage. REPAIR as necessary. If no concerns are present, install a new ESM.	Inspect the EVR solenoid vent for blockage. To continue symptom diagnosis, refer to Section 3 .

HH34

Test HK: Variable Cam Timing (VCT)

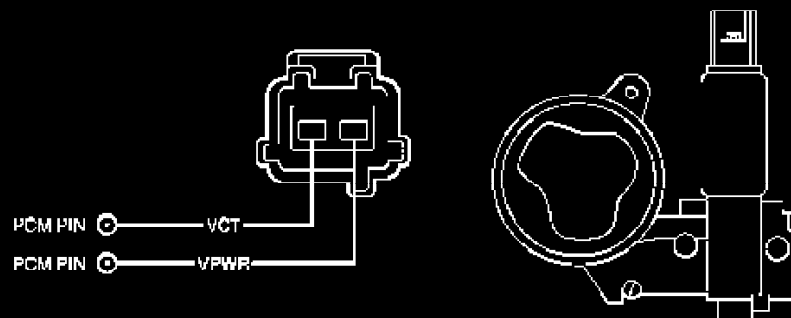
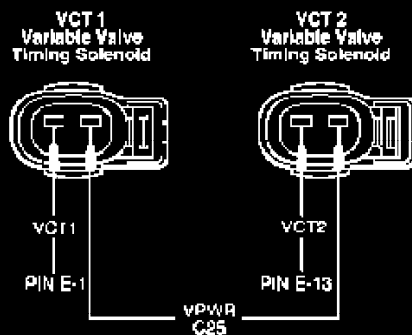
HK: Variable Cam Timing (VCT)**Introduction****HK****Note**

This Pinpoint Test is intended to diagnose the following:

- Powertrain Control Module (PCM) (12A650)
- Harness circuits: VCT and VPWR
- VCT Solenoid (6L713), or (6B297)
- Spider Assembly (6C260) Right Bank, or (6C261) Left Bank

Schematics and Harness Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware

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PCM CONNECTOR PIN NUMBERS				
Application	VCT	VCT1	VCT2	VPWR
104 PIN	45	N/A	N/A	71
150 PIN	N/A	E1	E13	B25

HK INTRODUCTION 2 OF 2

HK: Variable Cam Timing (VCT)**HK****HK1 DTC P0010, P0020, P1380 AND P1385: CHECK FOR KOER DTCs**

DTC/Variable Cam Timing (VCT) Reference List:

- DTC P0010, P1380= Actuator - Bank 1
- DTC P0020, P1385= Actuator - Bank 2
- Start engine and bring up to operating temperature.
- Check for DTC P0010, P0020, P1380 or P1385 during KOER Self-Test.

Is DTC P0010, P0020, P1380 or P1385 present during KOER Self-Test?

Yes	No
Key OFF. GO to HK2 .	Unable to duplicate or identify fault at this time. GO to Z1 .

HK2 CHECK VPWR VOLTAGE AT VCT SOLENOID VALVE HARNESS CONNECTOR

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

- Disconnect the VCT solenoid valve harness connector.
- Key ON.
- Measure VPWR at the VCT harness connector.

Is the voltage reading greater than 10.5 volts?

Yes	No
KEY OFF. GO to HK3 .	KEY OFF. REPAIR VPWR circuit.

HK1 - HK2

HK3 CHECK VCT CIRCUIT FOR OPEN IN HARNESS

- 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 ohms?

Yes	No
GO to HK4 .	REPAIR open circuit.

HK4 CHECK VCT CIRCUIT FOR SHORT TO GROUND OR PWR IN HARNESS

- Measure resistance between VCT PCM pin and PCM PWR and PWR GND pins.

Is each resistance greater than 10K 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 within the specifications listed below?

Vehicle	Engine	VCT Type ¹	Res. MIN	Res. MAX
Escort	2.0L	EPS	3	6
Focus SVT	2.0L	IPS	9	15
Lincoln LS	3.0L	IPS	6	11
	3.9L			
T-Bird	3.9L	IPS	6	11

¹ EPS = Exhaust Phase Shifting

IPS = Intake Phase Shifting

Yes	No
GO to HK6 .	REPLACE VCT solenoid valve assembly.

HK6 CHECK VCT SOLENOID VALVE FOR SHORT TO CASE

- Measure resistance between either terminal of the VCT solenoid valve and the solenoid body.

Is resistance greater than 10K ohms?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPLACE VCT solenoid valve.

HK11 DTCs P0011, P0012, P0021, P0022, P1381, P1383, P1386 or P1388: CHECK VCT FOR PROPER OPERATION**DTC/Variable Cam Timing (VCT) Reference List:**

- DTC P0011, P1381= Over Advanced - Bank 1
- DTC P0021, P1386= Over Advanced - Bank 2
- DTC P0012, P1383= Over Retarded - Bank 1
- DTC P0022, P1388= Over Retarded - Bank 2
- Key ON.
- Check for DTCs P0011, P0012, P0021, P0022, P1381, P1383, P1386 or P1388 in KOER Self-Test.

Are any of the above DTCs present during KOER Self-Test?

Yes	No
KEY OFF.GO to HK12 .	KEY OFF. Unable to duplicate or identify fault at this time. GO to Z1 .

HK6 - HK11**HK12 CHECK CAMSHAFT TIMING**

Note: Check the operation of the VCT solenoid and check for a stuck or sticking solenoid valve caused by contamination. If the valve is stuck, check spider bracket for contamination prior to solenoid replacement.

- Verify camshaft timing. Refer to Engine, Section 303-01 in the Workshop Manual.

Is the camshaft timing within specification?

Yes	No
Camshaft positioning incorrect. REPLACE camshaft mechanism. REFER to Engine, Section 303-01B in the Workshop Manual for proper repair direction. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.	REFER to Powertrain/Engine, Section 303-01 in the Workshop Manual for proper direction in setting cam timing. RERUN Quick Test.

HK12

HM: Secondary Air Injection (AIR) System Introduction

HM

Note

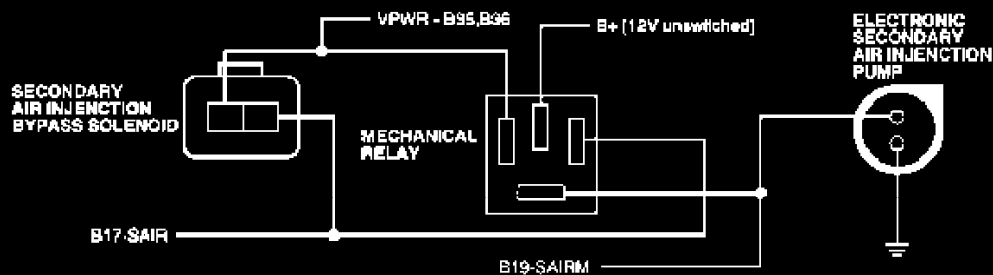
This Pinpoint Test is intended to diagnose the following:

- Harness circuits: B+, EAIR, EAIR Monitor, Ground, AIRB
- (AIR) relay
- Electric secondary air injection (AIR) pump (9A486)
- Secondary air injection (AIR) bypass solenoid (9H465)
- Powertrain control module (PCM) (12A650)
- Secondary air injection (AIR) diverter valve (9F491)
- Vacuum supply
- Air silencer (9H467)
- Secondary air injection (AIR) check valve (12A197)
- Hoses (9B460)
- Partial restricted exhaust

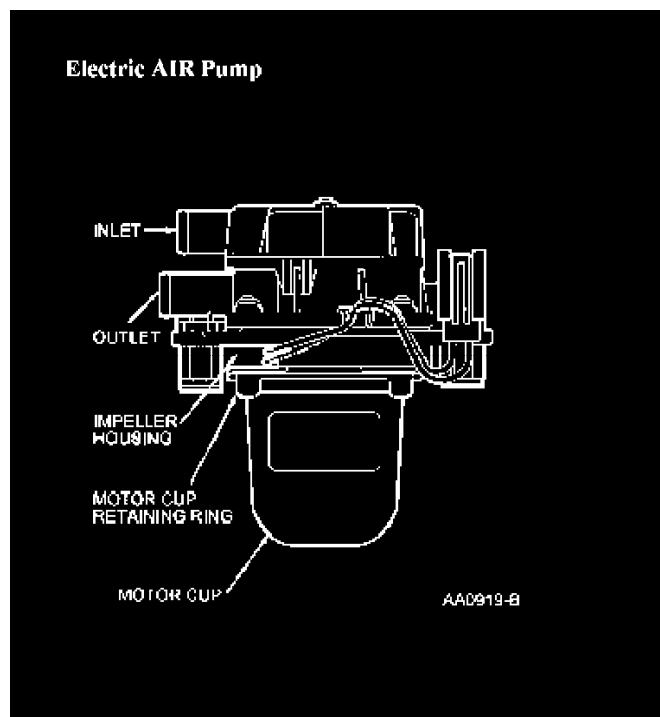
Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware

Secondary Air Injection System Connectors



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**HM INTRODUCTION 2 OF 2****HM: Secondary Air Injection (AIR) System****HM****HM1 DTC P0412: CHECK B+ VOLTAGE TO (AIR) RELAY**

- Disconnect (AIR) relay.
- Key on, engine off.
- Measure voltage of B+ circuit between (AIR) relay harness connector and battery negative post.

Is voltage greater than 10.6 volts?

Yes	No
Supplied voltage is OK, GO to HM2 .	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 (AIR) relay harness connector and AIR bypass harness connector.

Is resistance less than 5.0 ohms?

Yes	No
GO to HM3 .	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	No
The EAIR harness is OK. GO to HM4 .	REPAIR short circuit.

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 (AIR) RELAY RECONNECTED

- AIR bypass solenoid disconnected.
- Reconnect (AIR) 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 (AIR) relay.

HM3 - HM5

HM6 CHECK B+ CIRCUIT FOR OPEN IN HARNESS

- Measure resistance of B+ circuit between (AIR) 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 (AIR) relay.	REPAIR open circuit. RECONNECT (AIR) 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
- Command the Secondary Air Injection Pump ON then OFF.

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.

HM9 CHECK FOR VACUUM AT AIR DIVERTER VALVES

- 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)?

Yes	No
GO to HM10 .	GO to HM32 .

HM10 CHECK AIR DIVERTER VALVE(S) INTEGRITY**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)?

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).

HM11 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.
- 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?

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.

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 .

HM13 - HM15

HM16 CHECK (AIR) 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 (AIR) relay.	Possible intermittent concern. GO to Z2 . If no problem is found, REPLACE PCM (REFER to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

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 P2257: CHECK B+ CIRCUIT VOLTAGE TO (AIR) RELAY

- Disconnect (AIR) relay.
- Key on.
- Measure voltage of B+ circuit between (AIR) 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 (AIR) RELAY

- Key on, engine off.
- Measure VPWR circuit voltage at the (AIR) 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 (AIR) relay and Electronic Engine Control power relay.

HM21 CHECK VOLTAGE ON EAIR MONITOR CIRCUIT

- Reconnect (AIR) relay.
- Disconnect electric AIR pump.
- Key on, engine off.
- Enter output test mode.
- Access AIRM PID.

Is PID on?

Yes	No
REMAIN in output test mode.GO to HM25	If DTC P0411 is present, REPLACE electric AIR pump. REMAIN in output test mode.GO to HM22 .

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	KEY OFF. GO to HM23 .

HM23 CHECK EAIR DRIVER AND EAIR MONITOR CIRCUITS FOR OPEN IN HARNESS

- Disconnect (AIR) relay.
- Measure resistance of EAIR driver circuit between PCM harness connector and (AIR) relay harness connector.
- Measure resistance of EAIR monitor circuit between PCM harness connector and (AIR) relay harness connector.
- Measure resistance of EAIR monitor circuit between the (AIR) 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 (AIR) 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 Section 2, 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 (AIR) relay harness connector and dedicated fuse B+ circuit.

Is resistance less than 5 ohms?

Yes	No
REPLACE (AIR) relay dedicated fuse.	REPAIR open circuit.

HM27 DTC P2258: CHECK EAIR MONITOR CIRCUIT FOR OPEN IN HARNESS

- Disconnect (AIR) 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.

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 10.6 volts?

Yes	No
REPAIR short circuit.	EAIR Monitor circuit is OK. GO to HM30 .

HM30 CHECK (AIR) 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 (AIR) relay.	REPLACE PCM (refer to Section 2, 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.

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 (AIR) relay.
- Disconnect PCM.
- Measure resistance of EAIR circuit between PCM harness connector and the AIR bypass solenoid harness connector and at the (AIR) 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short to power.

HM39

Test HU: Intake Air Systems

HU: Intake Air Systems Introduction

HU

Note

This Pinpoint Test is intended to diagnose the following:

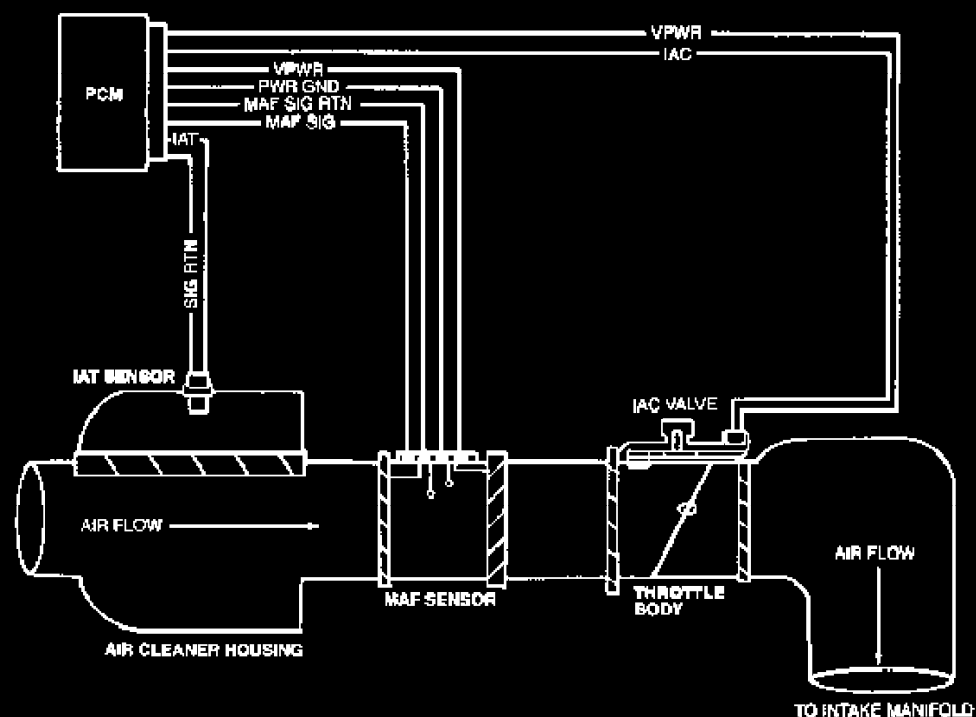
- Throttle body assembly (9E926)
- Speed control cable (9A825)
- Accelerator cable linkage to throttle body (9C799)
- Air cleaner assembly (including air cleaner element)
- Air inlet tube
- Clean air tube hose and resonator (9R504)(9F593)
- Intake manifold runner control housing assembly (IMRC) (9U531)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

HU INTRODUCTION 1 OF 5

Pinpoint Test Schematics and Connectors

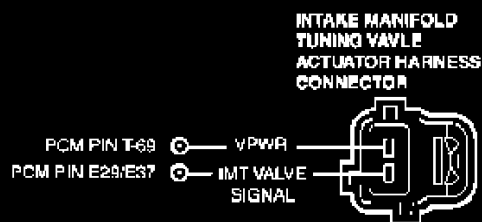
For PCM connector views, refer to Section 1 Powertrain Control Hardware

Intake Air System

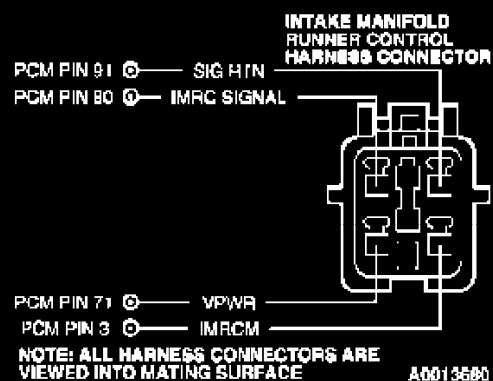
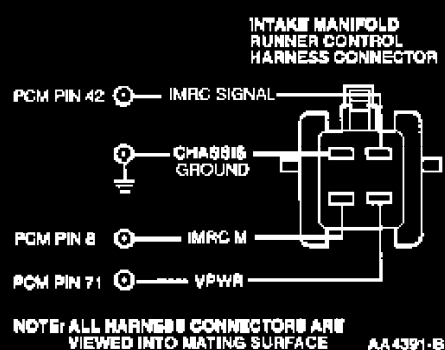
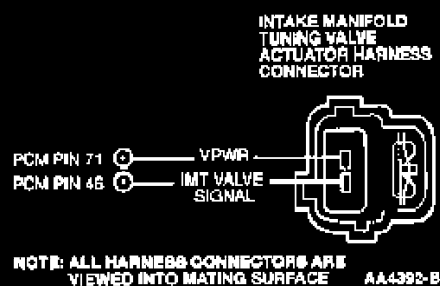


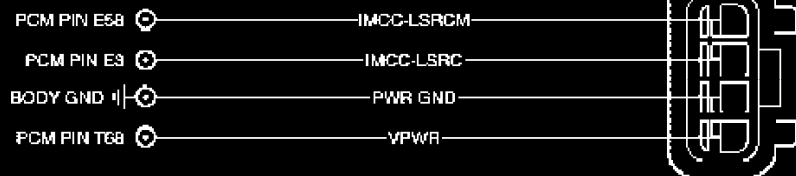
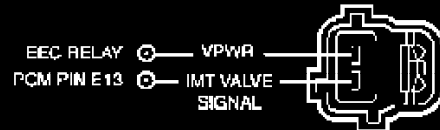
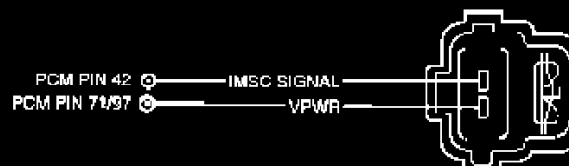
AA0844-A

3.0L LS6



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
A0032730

2.0L 2V Focus/Escort**3.8L Mustang/Windstar, 4.2L E/F-Series****4.6L E/F-Series, 5.4L Blackwood**

4.6L 4V Aviator**IMCC-LSRC**
Intake Manifold Communication Control
Long Short Runner Control and Monitor**A0035767****5.4L 4V Expedition/Navigator, 4.6L 2V Expedition****INTAKE MANIFOLD**
TUNING VALVE
ACTUATOR HARNESS
CONNECTOR**NOTE: ALL HARNESS CONNECTORS ARE**
VIEWED INTO MATING SURFACE
A0052731**HU INTRODUCTION 4 OF 5****2.3L 4V Ranger****INTAKE MANIFOLD**
SWIRL CONTROL
ACTUATOR HARNESS
CONNECTOR**NOTE: ALL HARNESS CONNECTORS ARE**
VIEWED INTO MATING SURFACE**A0028390****HU INTRODUCTION 5 OF 5**

HU: Intake Air Systems

HU**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 .

- Key on, engine running.
- Determine if idle speed is incorrect. Refer to the Typical Reference Value Charts in Section 6 , 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?

Yes	No
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 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	No
GO to HU3 .	GO to HU4 .

HU1 - HU2

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	No
REPAIR cable(s) causing the concern.	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	No
KEY OFF. GO to HU5 .	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	No
REPLACE air cleaner element or clear any restrictions.	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	No
REPLACE PCV valve or REPAIR leak or crack.	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	No
GO to HU8 .	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.

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 (refer to Section 303-04 of the Workshop Manual).
- 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.

HU15 DTCS P1516, P1517, P1518, P1519, P1520, P1537, P1538, P2004, P2005, P2006, P2007, P2008, P2014 AND P2019 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 Section 1 , 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 and 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. REFER to Section 303-01 of the Workshop Manual. GO to HU38 .	REPLACE IMRC/IMSC actuator. GO to HU38 .

HU17 PERFORM IMRC/IMSC FUNCTIONAL TEST

- Connect scan tool to data link connector (DLC).
- Key on, engine off.

Note: All except Escape, 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 Escape, 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 Section 2).



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 Section 2).
- 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 .

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 Section 2, 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 .

HU22 - HU23

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 Section 2, 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 2.6 volts?

Yes	No
GO to HU26 .	GO to HU30 .

HU26 CHECK IMRC/IMSC MONITOR PID TO DETERMINE A SHORT TO VPWR

- With the scan tool, monitor the IMRC/IMSCM PID or voltage while in Output Test Mode.
- Turn all output on.

Is the IMRC/IMSCM PID displaying less than 1 volt with all outputs on?

Yes	No
GO to HU27 .	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	No
KEY OFF. GO to HU28 .	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	No
KEY OFF. REPAIR short circuit. GO to HU38 .	KEY OFF. REPLACE PCM (refer to Section 2, 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	No
Possible intermittent concern. GO to Z1 . REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)) after determining fault is not intermittent. GO to HU38 .	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	No
KEY OFF. REPLACE IMRC/IMSC actuator. GO to HU38 .	KEY OFF. GO to HU31 .

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 Section 2, 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)) after determining concern is not intermittent. GO to HU38 .	REPAIR open circuit. GO to HU38 .

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 Section 2, 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 Section 4, Powertrain Diagnostic Trouble Code (DTC) Charts).

Are any DTCs received?

Yes	No
GO to Section 4, Powertrain Diagnostic Trouble Code (DTC) Charts.	PASSED IMRC/IMSC Drive cycle. No IMRC/IMSC concern is present at this time.

HU65 DTC P0660, P1549, P2070, P2071, P2075: 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. REFER to Section 303-14 of the Workshop Manual for component removal procedure. VERIFY a symptom no longer exists.	Passed visual inspection. GO to HU66 .

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 if available or check voltage between IMTV pin and PWR GND.
- Increase engine speed slowly to about 4000 rpm while observing IMTV PID/voltage.

Does PID/voltage read 100% or greater than 4 volts then drop to 50% or less than 1 volt while rpm was above 3500?

Yes	No
KEY OFF. Passed test. GO to HU67 .	REPLACE PCM (refer to Section 2, 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 10.6 volts?

Yes	No
KEY OFF. Passed check. GO to HU69 .	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 IMTV PCM pin and actuator harness connector.

Is the resistance less than 5.0 ohms?

Yes	No
Passed test. GO to HU70 .	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 IMTV PCM pin and PWRGND.

Is resistance greater than 10,000 ohms?

Yes	No
Passed check. GO to HU71 .	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 IMTV PCM pin and PWRGND.

Is the voltage less than 1 volt?

Yes	No
KEY OFF. Passeded check. GO to HU72 .	REPAIR IMT Valve actuator signal circuit for short to VPWR. VERIFY a symptom no longer exists.

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	No
KEY OFF. Passeded test. GO to HU73 .	REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). VERIFY a symptom no longer exists.

HU73 CHECK IMT VALVE SHUTTER FOR DAMAGE

- Remove IMT Valve (Refer to Section 303-14 of the Workshop Manual).
- Visually inspect IMT valve shutter for damage.
- Rotate shutter by hand.

Does the shutter bind or appear damaged?

Yes	No
Damaged shutter. REPLACE IMT valve. VERIFY a symptom no longer exists.	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	No
Passed check. Fault is intermittent. GO to Z1 .	REPLACE IMT valve actuator. VERIFY a symptom no longer exists.

HU74**Test HX: Evaporative Emission (EVAP) Monitor and System****HX: Evaporative Emission (EVAP) Monitor and System
Introduction****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:

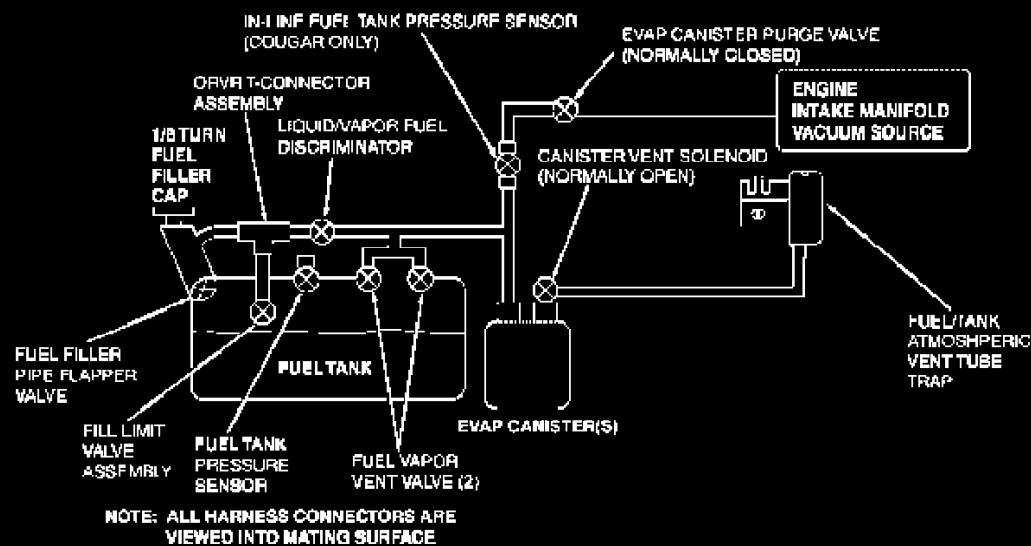
- Canister vent (CV) solenoid (9F945)
- Fuel filler cap (9030)
- Fuel tank pressure (FTP) sensor (9C052)
- In-line fuel tank pressure (FTP) sensor (9C052)
- EVAP canister purge valve (9C915)
- Harness circuits: CV, FCIL, FLI, FTP, EVAP Canister Purge Valve, SIG RTN, vehicle power (VPWR), reference voltage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

HX INTRODUCTION 1 OF 10

Pinpoint Test Schematics and Connectors

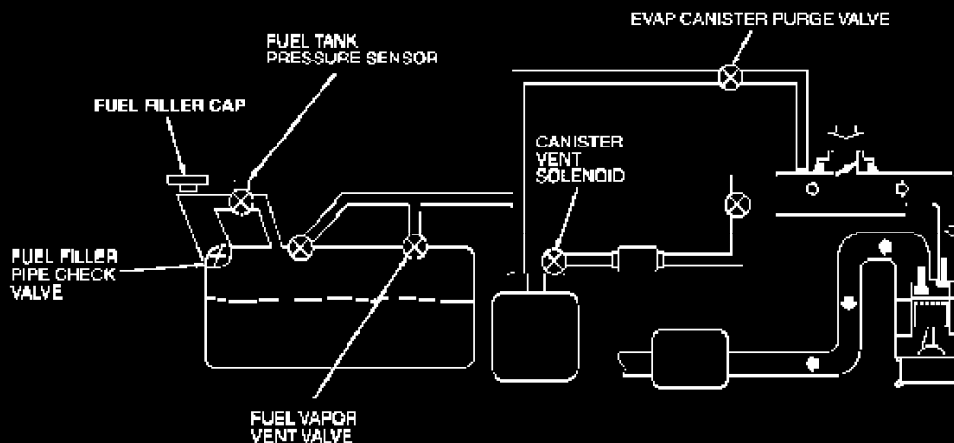
For PCM connector views, refer to Section 1, Powertrain Control Hardware

Focus, Escort

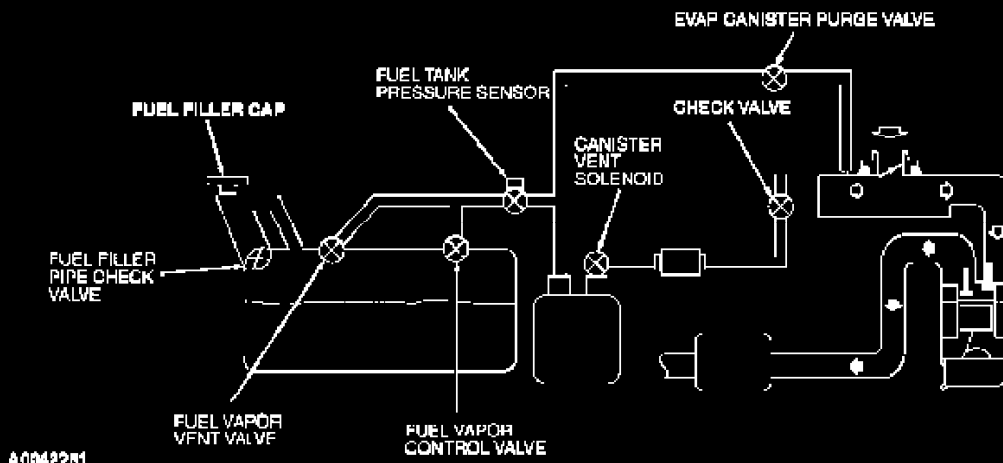
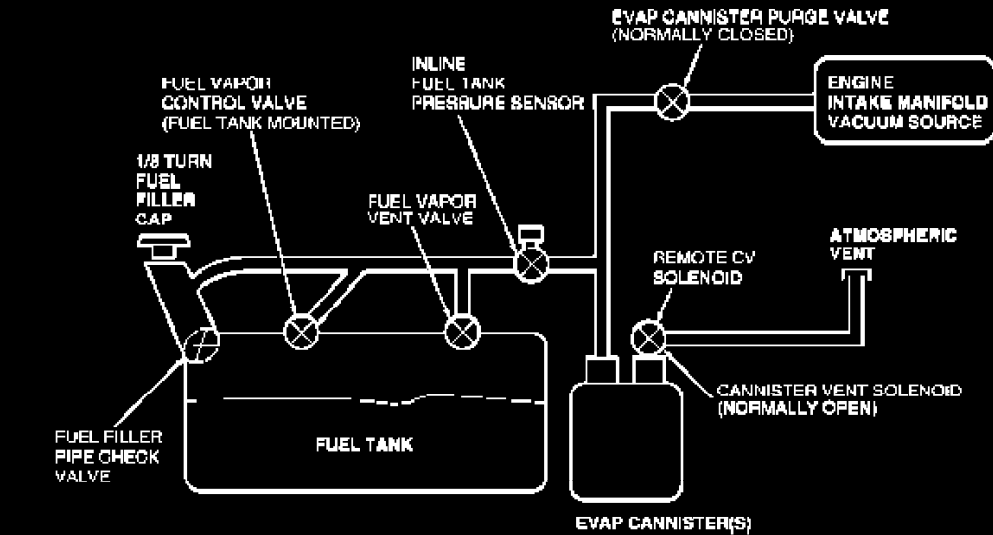


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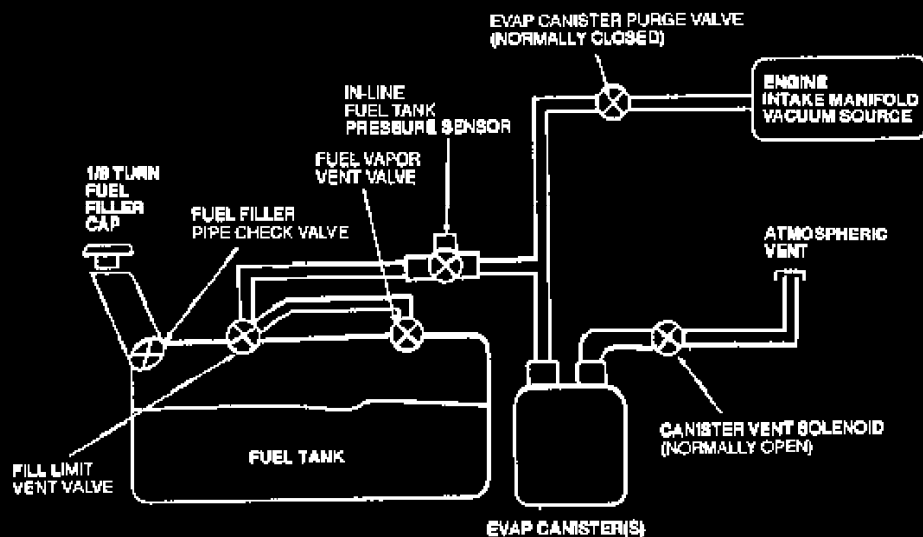
2.0L Escape



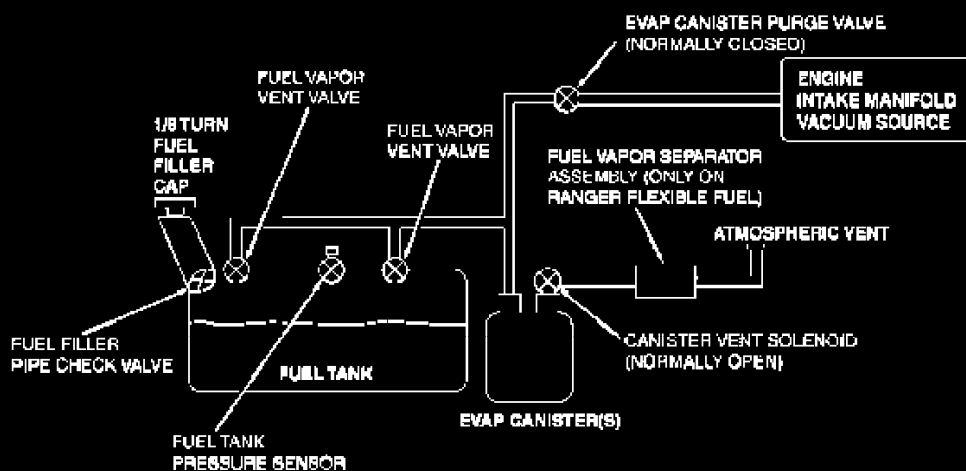
A0042253

3.0L Escape**Mustang, Taurus/Sable, Crown Victoria/Grand Marquis, Town Car**

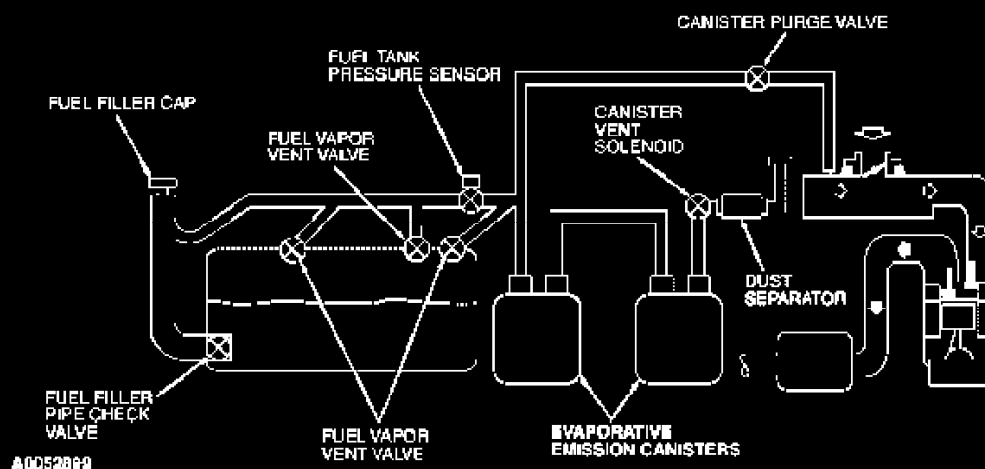
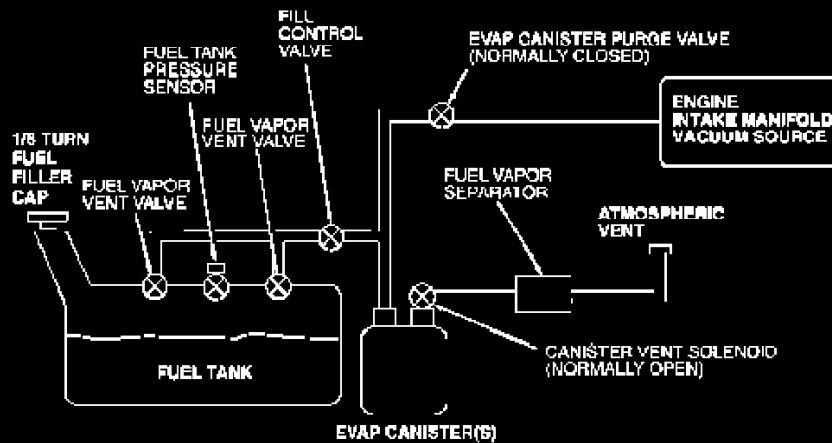
LS6/LS8, Thunderbird

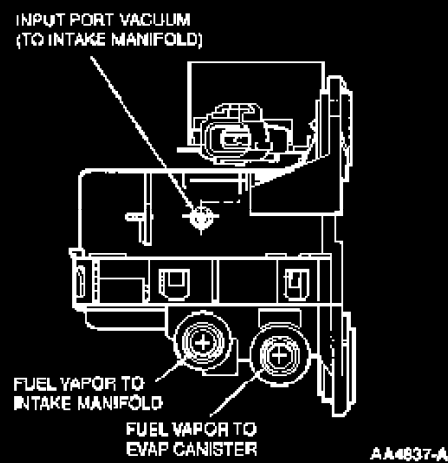
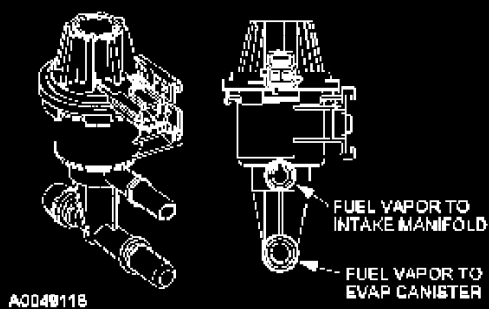
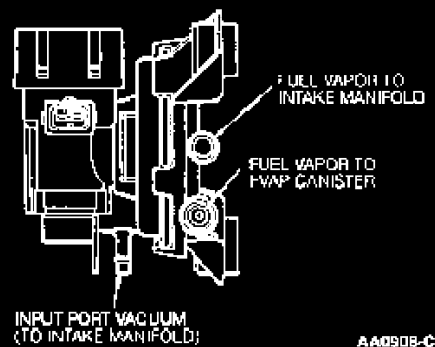


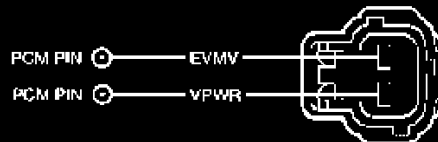
Ranger, Explorer Sport/Sport Trac, F-Series, E-Series/Club Wagon, Expedition/Navigator/Blackwood, Excursion



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

Explorer/Mountaineer, Aviator**Windstar**

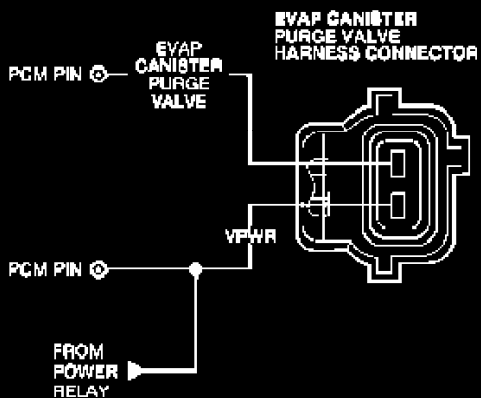
Focus, 2.0L (4V) Escort, Taurus/Sable, Mustang**LS6/LS8, Thunderbird, 2.3L Focus****All Others**

**ELECTRONIC VAPOR
MANAGEMENT VALVE
HARNESS CONNECTOR**

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0052592

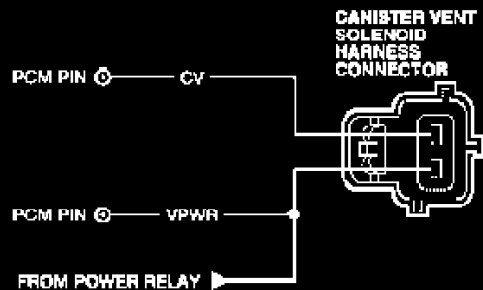
PCM TYPE	EVMV	VPWR
150 PIN	B12	B32/B33
150 PIN 2.3L Focus	B34	B35/B36



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0051431

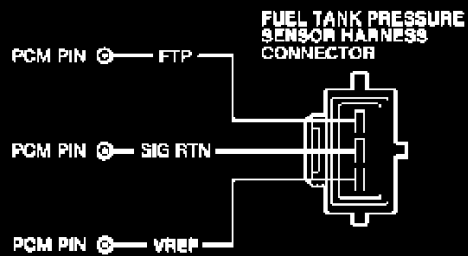
PCM TYPE	CANP	VPWR
104 PIN	56	71
122 PIN	B38	B34/B46
150 PIN	B12	B32/B33



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

A0001402

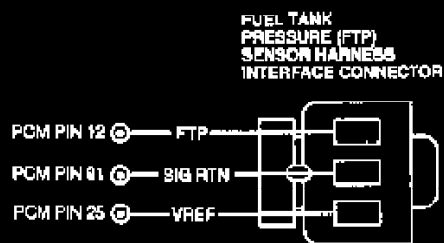
PCM TYPE	CV	VPWR
104 PIN	67	71
122 PIN	B36	B34/B46
150 PIN	B6	B32/B33
150 PIN 2.3L Focus	B13	B35/B36



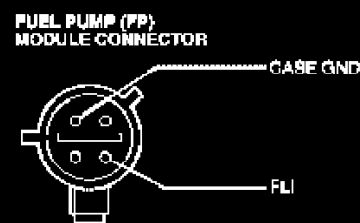
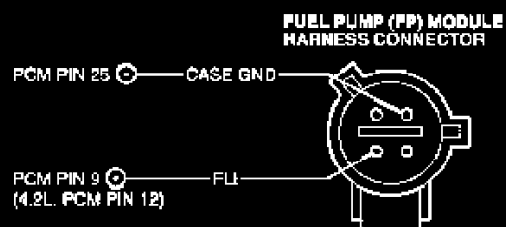
**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

A0051430

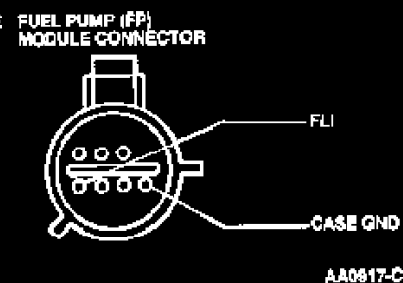
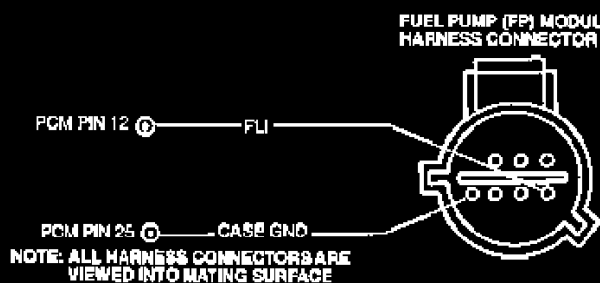
PCM TYPE	FTP	VREF	SIG RTN
104 PIN	62	90	91
122 PIN	B8	B45	B33
150 PIN	B52	B20	B17 (B5 for LS6/LS8/ Thunderbird)
150 PIN 2.3L Focus	B9	B40	B41

Escort

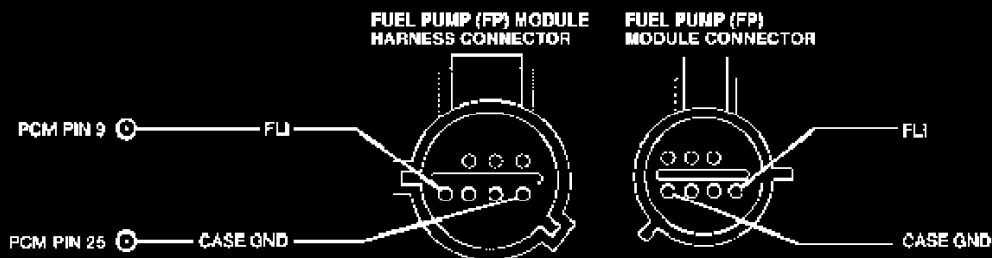
NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE AA4891-A

E-Series

NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE
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3.0L Ranger FFV

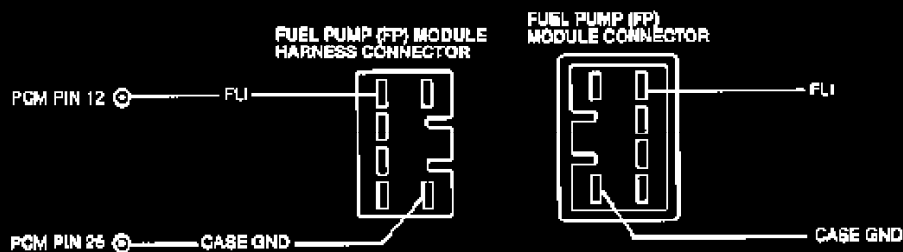
Taurus/Sable, Crown Victoria/Grand Marquis, Explorer Sport/Sport Trac, Ranger



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0051433

Escort



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AA4840-A

Charts and Tables

Fuel Cap Off Indicator Lamp PCM Pin Number Table	
Applications	PCM Pin
Focus	46 (except 2.3L)
Escort	79
Taurus/Sable, Explorer Sport/Sport Trac, Ranger	82
Crown Victoria/Grand Marquis	20
F150 (except Lightning)	70

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

HX**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
An intermittent circuit fault may cause a Continuous Memory DTC P0443. GO to HX2 .	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
For LS6/LS8/Thunderbird/2.3L Focus: KEY OFF. GO to HX3 . For All others: KEY OFF. GO to HX4	REPAIR open circuit.

HX1 - HX2

**HX3 CHECK EVAP CANISTER PURGE VALVE RESISTANCE FOR
LS6/LS8/THUNDERBIRD/2.3L FOCUS**

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 2.5 and 6.0 ohms?

Yes	No
GO to HX5 .	REPLACE damaged EVAP canister purge valve. COMPLETE an Evaporative Emission Leak Check Monitor Repair Verification Drive Cycle (REFER to Section 2, Drive Cycles).

HX4 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 HX5 .	REPLACE damaged EVAP canister purge valve. COMPLETE an Evaporative Emission Leak Check Monitor Repair Verification Drive Cycle (REFER to Section 2, Drive Cycles).

HX5 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 HX6 .	REPAIR open circuit.

HX6 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 HX7 .	REPAIR short circuit.

HX7 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.	The fault that produced Continuous Memory DTC P0443 can be intermittent. GO to Z1 . If OK REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

HX18 DTC P1450: 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, Section 303 in the Workshop Manual for removal instructions. For Aviator application, REFER to Section 310 in the Workshop Manual 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. 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 Drive Cycles). RETRIEVE Continuous Memory DTCs. If DTC 1450 is still present, GO to HX19.	GO to HX19 .

HX18

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	No
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, Section 303 (for Aviator, REFER to Section 310), Diagnostic Trouble Code/Symptom Chart in the Workshop Manual for a blocked (plugged) EVAP system condition.	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	No
REFER to Evaporative Emissions, Section 303 (for Aviator, REFER to Section 310), in the Workshop Manual for a blocked (plugged) EVAP system condition.	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	No
RETURN to Diagnostic Subroutines, Section 4 , for direction in addressing the other DTCs.	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	No
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 Section 2, Drive Cycles). RETRIEVE Continuous Memory DTCs. If DTC P1450 is still present, REFER to Evaporative Emissions, Section 303 (for Aviator, REFER to Section 310), Diagnostic Trouble Code/Symptom Chart, in the Workshop Manual.	KEY OFF. GO to HX23 .

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 Section 2, 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 .

HX28 CHECK OPPOSITE INDUCED HIGH FTP SIGNAL

- ◆ Disconnect FTP sensor.
- ◆ Connect a jumper wire between VREF circuit and FTP circuits at the FTP sensor harness connector.
- ◆ Key on, engine off.
- ◆ Measure voltage between FTP circuit at the FTP sensor harness connector and chassis ground.

Is measured voltage reading between 4.0 and 6.0 volts?

Yes	No
REPLACE FTP sensor. REFER to Evaporative Emissions, Section 303 (for Aviator, REFER to Section 310) in the Workshop Manual for component removal and installation. 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 Section 2, Drive Cycles).	REMOVE jumper. GO to HX29 .

HX29 CHECK VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS AT FTP SENSOR

- ◆ Key on, engine off.
- ◆ Measure voltage between VREF and SIG RTN circuits at the FTP sensor harness connector.

Is voltage between 4.0 and 6.0 volts?

Yes	No
KEY OFF. GO to HX30 .	VREF voltage is out of range. GO to C1 .

HX30 CHECK FTP CIRCUIT FOR SHORT TO SIG RTN 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.
- Measure resistance between FTP and SIG RTN circuits at the PCM harness connector.
- Measure resistance between FTP circuit at the PCM harness connector and battery negative post.

Is each resistance greater than 10,000 ohms?

Yes	No
REPLACE PCM (REFER to Section 2, Drive Cycles).	REPAIR short circuit.

HX33 DTC P0453: CHECK FOR HIGH FTP SENSOR VOLTAGE

Note: FTP sensor input with no pressure/vacuum on the fuel tank (fuel filler cap open or not open to atmosphere) is 2.37 to 2.97 volts.

- 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 greater than 4.50 volts?

Yes	No
KEY OFF. GO to HX34 .	The fault that produced DTC P0453 is Intermittent. GO to Z1 .

HX34 CHECK FTP CIRCUIT FOR SHORT TO POWER

- 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?

Yes	No
KEY OFF. The FTP is indicating a short to VPWR. GO to HX35 .	KEY OFF. GO to HX36 .

HX35 CHECK FTP 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 the voltage between FTP circuit at the PCM harness connector and battery negative post.

Is voltage greater than 10.5 volts?

Yes	No
REPAIR short circuit.	REPLACE PCM. (REFER to Section 2 , Flash EEPROM.)

HX36 CHECK OPPOSITE INDUCED LOW FTP SIGNAL

- Connect a jumper wire between SIG RTN and FTP circuits at the FTP sensor harness connector.
- Key on, engine off.
- If a scan tool communication concern exists, turn the key off, remove jumper immediately and GO 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?

Yes	No
REMOVE jumper. GO to HX37 .	Unable to induce opposite signal. KEY OFF. GO to HX39 .

HX37 CHECK FOR IN RANGE VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS AT FTP SENSOR

- Key on, engine off.
- Measure voltage between VREF and SIG RTN circuits at the FTP sensor vehicle harness connector.

Is voltage between 4.0 and 6.0 volts?

Yes	No
KEY OFF. GO to HX38 .	VREF voltage is out of range. GO to C1 .

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 150 PIN PCM, measure to both VREF pins.)

Is the resistance greater than 10,000 ohms?

Yes	No
REPLACE FTP sensor. REFER to Evaporative Emissions, Section 303 (for Aviator, REFER to Section 310), in the Workshop Manual for component removal and installation. 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 Section 2, 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 ohms?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

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	No
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 Section 2, Resetting The Keep Alive Memory (KAM). COMPLETE an Evaporative Emission Leak Check Monitor Repair Verification Drive Cycle (REFER to Section 2, Drive Cycles). RERUN Quick Test. If DTC P0455 is present, REFER to Evaporative Emissions, Section 303 (for Aviator, REFER to Section 310), Diagnostic Trouble Code/Symptom Chart in the Workshop Manual.	COMPLETE PCM KAM Reset to clear DTCs and adaptive memory. REFER to Section 2, Resetting The Keep Alive Memory (KAM). COMPLETE an Evaporative Emission Leak Check Monitor Repair Verification Drive Cycle (REFER to Section 2, Drive Cycles). RERUN Quick Test. If DTC P0455 is present, REFER to Evaporative Emissions, Section 303 (for Aviator, REFER to Section 310), Diagnostic Trouble Code/Symptom Chart in the Workshop Manual. Otherwise, INFORM the vehicle owner that it is important and necessary to immediately install the fuel filler cap after every refueling event.

HX65 DTC P1451 OR P0446: 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 Section 2, 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.

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 Section 2, 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	KEY OFF. REPAIR short circuit to VPWR, VREF or chassis ground.

HX76 DTC P0460, P0462 OR P0463: CHECK FUEL TANK LEVEL VOLTAGE RANGE

Note: For Focus, Escape, Mustang, LS6/LS8, Thunderbird, Town Car, Windstar, Explorer/Mountaineer, Aviator, 4.6L/5.4L E-Series, F-Series, Expedition/Navigator/Blackwood and Excursion applications, do not continue with step HX76. Instead, go to Instrument Cluster Section 413, fuel level indicator or Rear Electronic Module (REM) diagnosis in the Workshop Manual.

- Key on, engine running.
- Access fuel level input voltage (FLI) PID.

Is the fuel level input voltage (FLI) PID reading between .25 and 4.5 volts?

Yes	No
GO to HX77 .	GO to HX80 .

HX77 CHECK FOR FUEL TANK FLOAT LEVEL RESPONSE

- Key on, engine off.
- Observe the FLI PID.
- If fuel level is under one quarter (25% on FLI PID), add fuel (7.57 to 11.36 liters [2 to 3 gallons]) to the fuel tank.
- If fuel level is greater than three quarters (75% on FLI PID), drain (7.57 to 11.36 liters [2 to 3 gallons]) fuel from the fuel tank.

Did the FLI PID indicate a movement upward or downward as fuel is either added or drained?

Yes	No
No concern found at this time. GO to Z1 for possible intermittent condition. (Frequent filling of the fuel tank without allowing fuel level to drop below the full mark may contribute to a P0460 DTC.)	KEY OFF. REFER to Instrument Cluster Section 413 in the Workshop Manual for inoperative fuel level sender.

HX80 CHECK FLI CIRCUIT VOLTAGE AT FP MODULE

- Disconnect the instrument cluster connector to the fuel gauge. (Refer to Instrument Cluster Section 413 in the Workshop Manual or Wiring Diagram manual 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

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
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.

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
GO to HX86 .	REPAIR open circuit.

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	No
REFER to Instrument Cluster Section 413 in the Workshop Manual (reference: Wiring Diagram manual) for fuel gauge diagnosis. REPLACE fuel gauge or REPAIR as necessary. Then RERUN Quick Test. If DTC P0460, P0462 or P0463 are still present, REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit.

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	No
KEY OFF. REPLACE PCM (REFER to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	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. REFER to Instrument Cluster Section 413 in the Workshop Manual.

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	No
REFER to Instrument Cluster Section 413 in the Workshop Manual to diagnose instrument cluster and Check Fuel Cap Bulb. If OK, REPLACE PCM (REFER to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). VERIFY repair by turning key to ON position (lamp will turn OFF in 3 seconds).	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

HY: Generator/Regulator System Introduction

HY

Note

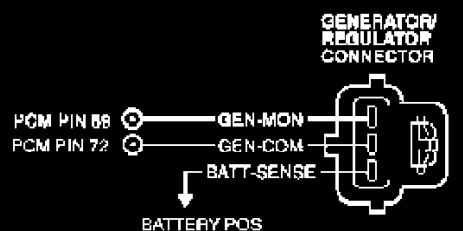
This Pinpoint Test is intended to diagnose the following:

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

Schematics and Harness Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware.

Focus, 2.0L Escape



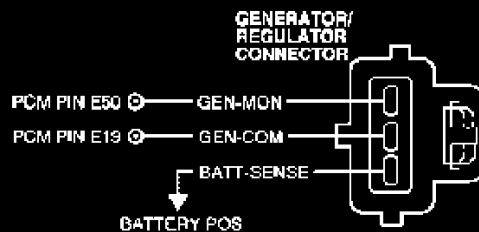
NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

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GENERATOR/REGULATOR CONNECTOR PIN NUMBERS (GENCOM and ALF, GENMON and I-Line, are located in the same connector pins. Expedition/Navigator use the ALF and I-Line names.)

VEHICLE TYPE	GENCOM	GENMON
Escort/Focus	72	59
2.0L Escape	7	45
Expedition/Navigator	B7(ALF)	B14(ILine)

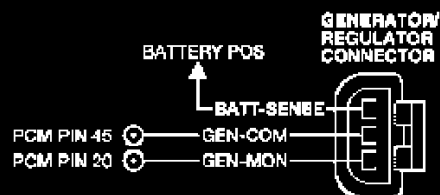
LS6/LS8, Thunderbird



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

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Taurus/Sable, Windstar, Marauder



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

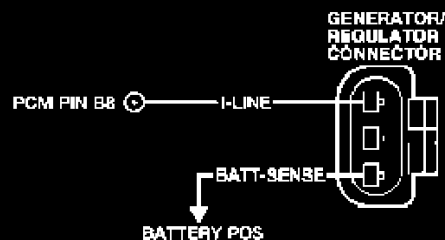
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GENERATOR/REGULATOR CONNECTOR PIN NUMBERS

VEHICLE TYPE	GENCOM	GENMON
Taurus/Sable	20	45
Windstar	45	20
Marauder	45	7

HY INTRODUCTION 2 OF 3

Explorer/Mountaineer, Aviator



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

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HY INTRODUCTION 3 OF 3

HY: Generator/Regulator System**HY****HY1 DTC P0620, P1244 or P0626, P1245 or P0625, P1246 or P0622:
VERIFY GENERATOR DRIVE FUNCTION**

Note: The DTCS in the title are the old and new names for the same DTC, some applications have the old name and some have the new.

- 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 Section 414 in the Workshop Manual.

**HY2 CHECK BATTERY POWER WIRE CIRCUIT FROM
BATTERY TO ALTERNATOR**

- Measure voltage at the large battery power wire connected to the alternator, at the alternator.

Is the voltage within plus or minus 0.5 volt of battery voltage?

Yes	No
For Explorer/Mountaineer and Expedition/Navigator GO to HY4 For all others GO to HY3 .	REPAIR battery-sense circuit. It may be necessary to clean or tighten the connector nut to enable proper charging.

HY1 - HY2

HY3 VERIFY CHARGING SYSTEM IS EEC CONTROLLED

- Key off.
- Disconnect battery terminals at battery, and the battery lead at the alternator.
- Disconnect generator harness connector and measure resistance between battery-sense and gen-com pin at the generator. (For LS6,LS8, Thunderbird measure the resistance between the ALTMON and ground.)

Is resistance within the table ranges?

Resistance Values for Alternator Circuits(Ohms)

VEHICLE TYPE	LOW RANGE	HIGH RANGE
LS6, LS8, Thunderbird	53	203
All Others	750	1050

Yes	No
GO to HY4 .	REPLACE generator/regulator assembly.

HY4 CHECK BATTERY-SENSE CIRCUIT VOLTAGE AT THE ALTERNATOR

Note: Battery sense voltage pin is located in the generator/regulator harness connector.

- Reconnect generator.
- Reconnect battery.
- Measure battery sense voltage from the battery sense pin to ground at the generator harness connector.

Is the voltage within plus or minus 0.5 volt of battery voltage?

Yes	No
For Explorer/Mountaineer and Expedition/Navigator, GO to HY5 . For all others GO to HY6 .	REPAIR battery-sense circuit.

HY3 - HY4

HY5 CHECK EEC CONTROL CIRCUIT IN PCM

- Key off.
- Remove generator and PCM harness connectors.
- Measure resistance between the I-Line and VPWR through the PCM where applicable for Expedition/Navigator.
- Measure resistance between the I-Line and ground through the PCM where applicable for Explorer/Mountaineer.

Are the resistances within the ranges in the table?

Resistance Values for PCM Circuits(Ohms)		
VEHICLE TYPE	LOW RANGE	HIGH RANGE
Expedition/ Navigator	1550	1650
Explorer/ Mountaineer	100	150

Yes	No
GO to HY6 .	REPLACE PCM (refer to Section 2), Flash Electrically Erasable Programmable Read Only Memory (EEPROM).

HY6 CHECK GEN-MON AND GEN-COM CIRCUIT FOR SHORT TO POWER

Note: Explorer/Mountaineer have only I-Line circuits, and LS6/LS8/Thunderbird have only Gen Mon and I-Line circuits.

- 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.
- Measure voltage between I-LINE signal pin at the PCM harness connector and chassis ground where applicable.

Is each voltage greater than 0.5 volt?

Yes	No
KEY OFF. REPAIR short circuit.	GO to HY7 .

HY7 CHECK GEN-MON AND GEN-COM CIRCUIT FOR SHORT TO GROUND

- Key off.

Note: Explorer/Mountaineer have only I-Line circuits, and LS6/LS8/Thunderbird have only Gen Mon and I-Line circuits.

- 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.
- Measure resistance between the I-LINE signal pin at the PCM harness connector and chassis ground where applicable.

Is resistance greater than 10,000 ohms?

Yes	No
GO to HY8 .	REPAIR short circuit.

HY8 CHECK GEN-MON AND GEN-COM CIRCUIT FOR OPEN

Note: Explorer/Mountaineer have only I-Line circuits, and LS6/LS8/Thunderbird have only Gen Mon and I-Line circuits.

- 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 harness connector and the PCM harness connector.
- Measure resistance of the I-LINE circuit between the generator/regulator harness connector and the PCM harness connector where applicable.

Is each resistance less than 5.0 ohms?

Yes	No
For Explorer/Mountaineer, GO to HY10 . For all others GO to HY9 .	REPAIR open circuit.

HY7 - HY8

HY9 CHECK GENERATOR MONITOR SIGNAL

- Engine idling.
- Access GFS PID.

Is duty cycle between 3 - 95% for LS6/LS8/Thunderbird, and 6 - 98% for all others?

Yes	No
For LS8/LS8/Thunderbird GO to HY11 . For all others GO to HY10 .	REPLACE generator/regulator assembly.

HY10 CHECK GENERATOR COMMUNICATOR SIGNAL

- Access GENFDC PID. (or ARC PID for Expedition/Navigator.)
- Engine idling.
- Toggle load on and off (headlights and wipers).

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

HY11 CHECK GENERATOR CHARGING VOLTAGE

Note: Explorer/Mountaineer do not have diagnostic PIDS, and LS6/LS8/Thunderbird does not have a GENFDC PID.

- Engine idling.
- Measure battery voltage.

Is the battery voltage between 12.2 and 14.7?

Yes	No
GO to Z1 .	REPLACE generator/regulator assembly.

HY9 - HY11

Test JB: Secondary Ignition

JB: Secondary Ignition
Introduction

JB**Note**

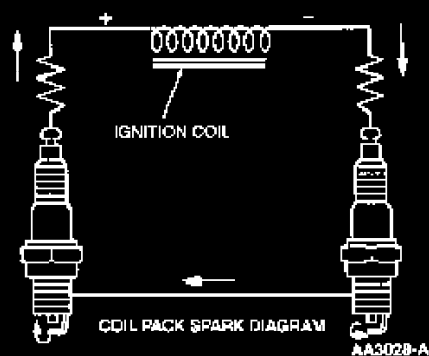
This Pinpoint Test is intended to diagnose the following:

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

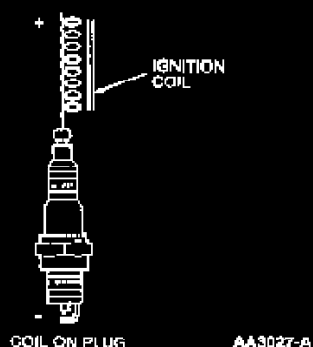
Caution

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, Taurus/Sable, 3.8L Mustang, Ranger, Windstar, 4.0L Explorer/Mountaineer, 4.2L E/F-Series



3.0L Escape, 4.6L Mustang, Crown Victoria/Grand Marquis, Thunderbird, LS6/LS8, Town Car,
4.6L Explorer/Mountaineer, Expedition, Navigator/Blackwood, Aviator, 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

JB: Secondary Ignition

JB

JB1 VISUAL INSPECTION OF IGNITION SYSTEM

- Visually inspect the engine compartment to make sure all coils and spark plug wires are properly and securely connected.
- Examine all wiring harnesses and connectors for damaged, burned or overheated insulation and loose or broken conditions.
- Be certain the battery is fully charged.
- All accessories must be off during diagnosis.

Is a problem indicated?

Yes	No
REPAIR as necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Section 2, Drive Cycles).	For coil pack application using engine analyzer: GO to JB2 .
	For coil pack applications not using engine analyzer: GO to JB20 .
	For coil on plug applications: GO to JB15 .

JB1

JB2 CONNECT ENGINE ANALYZER

Obtain an Engine Analyzer to diagnose concerns in the secondary side of the ignition system.

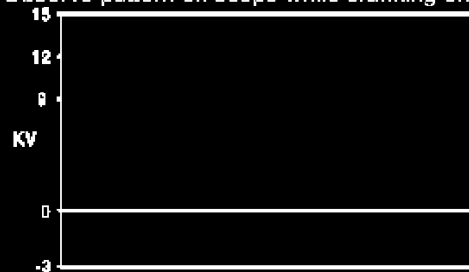
Note: In order for the diagnostic procedures to provide accurate results, it is essential that the calibration of the engine analyzer be maintained. Refer to the equipment manual for the procedure to calibrate the engine analyzer. If the equipment manual is not available, an estimate of the calibration can be made by connecting the Spark Tester D81P-6666-A or equivalent to a properly operating ignition system and measuring the firing voltage of the spark tester only. The spark tester firing voltage should be approximately 12KV.

Is the engine analyzer connected?

Yes	No
GO to JB3 .	GO to JB2 .

JB3 CHECK FOR IGNITION PATTERN

- Observe pattern on scope while cranking engine.



A0027507

Is the pattern flat which indicates no spark on all cylinders?

Yes	No
KEY OFF. L96, L98, Thunderbird: GO to B5 . All others : IGN START/RUN circuit concern. 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 Section 2, Drive Cycles).	GO to JB4 .

JB5 CHECK FOR TWO MISSING SPARK PATTERNS ON THE SAME COIL

- Observe pattern on scope.



Is the spark pattern missing from two cylinders on the same coil?

Yes	No
INSPECT spark plug wires and spark plugs for missing cylinders. 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. If spark plug wires and spark plugs are OK, GO to JE1 .	GO to JB6 .

JB5

JB6 CHECK FOR ONE MISSING SPARK PATTERN

- Observe pattern on scope.



Is spark pattern missing from one cylinder?

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 Section 2, Drive Cycles).	GO to JB7 .

JB6

JB7 CHECK FOR HIGH SPARK PLUG FIRING VOLTAGE

- Check the spark plug firing voltage average pattern.



Is the average value of spark plug firing voltage greater than 15KV?

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 Section 2, Drive Cycles).	GO to JB8.

JB7**JB8 CHECK FOR LOW SPARK PLUG FIRING VOLTAGE**

- Check the spark plug firing voltage average pattern.



Is there consistently low spark plug firing voltage or sloping spark line on one or more cylinders?

Yes	No
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 Section 2, Drive Cycles).	GO to JB9 .

JB8

JB9 CHECK FOR EVENNESS BETWEEN CYLINDERS

- Check the spark plug firing voltage average pattern.



Is the evenness of spark plug firing voltage greater than 6KV?

Yes	No
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 Section 2, Drive Cycles).	GO to Z1 .

JB15 DTC P0301 THROUGH P0310: MISFIRE ON CYLINDERS 1 THROUGH 10

Are any of the above listed DTCs present?

Yes	No
GO to JB16 .	GO to JB17 .

JB9 - JB15

JB16 CHECK FOR SPARK AT CYLINDER(S) INDICATED BY DTC(S)

- 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?

Yes	No
KEY OFF. GO to JB18 .	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

- 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?

Yes	No
KEY OFF. GO to JB18 .	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

- Remove and check plugs for damage, wear, carbon deposits and proper plug gap.

Are plugs OK?

Yes	No
GO to JB19 .	REPAIR plugs. ADJUST gap or REPLACE as necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle (REFER to Section 2, Drive Cycles).

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 Section 3 , RETURN to Section 3 . 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 Section 2, 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 Section 2, 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 Section 2, Drive Cycles). If spark plug wires are OK, GO to JE1 .

JB21 -JB22

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 Section 2, 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 Section 3 , RETURN to Section 3 . 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 Section 2, Drive Cycles).

JB23

Test JD: Crankshaft Position (CKP) Sensor

JD: Crankshaft Position (CKP) Sensor Introduction

JD

Note

This pinpoint test is intended to diagnose the following:

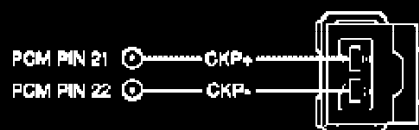
- Crankshaft position (CKP) sensor (6C315)
- Harness Circuits: CKP(+) and CKP(-)
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematics and Connectors

Note: All connector views are from the harness side.

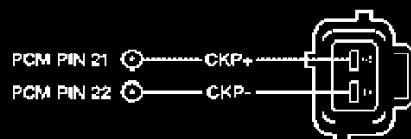
For PCM connector views, refer to Section 1, Powertrain Control Hardware.

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

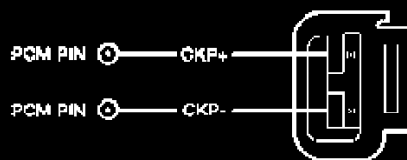


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Escort (4V), 2.3L Ranger, Focus



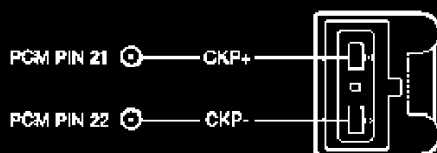
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2.0L (2V) Focus, LS6, Explorer/Mountaineer, Expedition/Navigator, 3.0L Ranger, Aviator

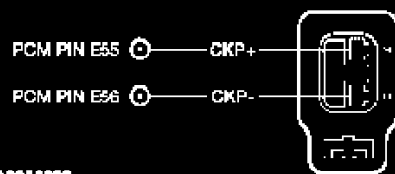
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PCM CONNECTOR PIN NUMBERS

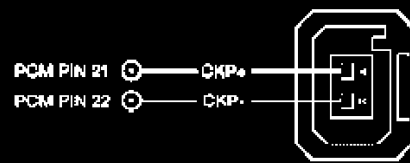
PCM TYPE	CKP(+)	CKP(-)
104	21	22
122	30	40
150	E55	E56
150 Pin PZEV Focus	E34	E45

2.0L (4V) Focus

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LS8, Thunderbird

A0053233

All Others

A0052728

JD INTRODUCTION 3 OF 3

JD: Crankshaft Position (CKP) Sensor**JD****JD1 CHECK CKP SIGNAL SENT TO PCM**

- Connect scan tool.
- Key ON, Engine OFF.
- Select RPM PID.
- Disable inertia switch and crank engine or crank engine at WOT (make certain engine will not start).

Is engine RPM displayed on scan tool while cranking?

Yes	No
CKP, PCM and harness working properly. Concern is elsewhere. GO to Section 3 , Symptom Charts for further direction.	GO to JD2 .

JD2 CHECK TIMING COVER, CKP SENSOR AND EXTERNAL TRIGGER WHEEL (OUTSIDE TIMING COVER) FOR OBVIOUS PHYSICAL DAMAGE

- Key OFF.
- Visually inspect the timing cover, CKP sensor and external trigger wheel for obvious physical damage.

Do any parts appear physically damaged?

Yes	No
REPAIR or REPLACE damaged parts.	GO to JD3 .

JD3 CHECK FOR PROPER CKP BIAS VOLTAGES IN PCM

- Disconnect CKP sensor.
- Key ON, Engine OFF.
- Measure voltages of CKP(+) and CKP (-) circuits individually between the CKP harness connector and battery (-) terminal.

Is each measurement between 1.0V DC and 2.0V DC?

Yes	No
GO to JD4 .	GO to JD8 .

JD1 - JD3

JD4 CHECK CKP SENSOR RESISTANCE

- Measure CKP sensor resistance between the (+) and (-) terminals.

Note: CKP sensor resistance values change significantly with temperature rise.

Is resistance between 250 and 1K ohms?

Yes	No
GO to JD5 .	REPLACE CKP sensor and RESET the KAM. REFER to Section 2, Resetting The Keep Alive Memory (KAM)

JD5 CHECK CKP CIRCUIT HARNESS SHIELD GROUND

Note: The harness shield protects the CKP signal from electrical noise and is grounded at one end, typically near the PCM.

- Measure the resistance between the CKP harness shield and battery (-) terminal. Measure at the closest possible location to the CKP sensor.

Is resistance less than 5 ohms?

Yes	No
GO to JD6 .	REPAIR open circuit or poor ground connection.

JD6 CHECK FOR SHORT BETWEEN CKP(+) AND CKP (-) IN HARNESS

- Disconnect PCM.

Note: On vehicles equipped with 150 pin PCMs and PATS (Passive Anti-Theft System), disconnect ONLY the Engine (E) harness connector. The engine may not crank if the Transmission (T) and Body (B) connectors are disconnected.

- Measure resistance across the CKP(+) and CKP(-) pins at the CKP harness connector.

Is resistance less than 10K ohms?

Yes	No
REPAIR short circuit.	GO to JD7 .

JD7 CRANK ENGINE AND CHECK CKP SENSOR AMPLITUDE AT PCM HARNESS CONNECTOR

- Digital multimeter on low voltage AC scale.
- Crank engine, measure voltage between CKP(+) and CKP(-) at the PCM.

Was settled voltage reading greater than 0.3V AC?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPLACE CKP sensor and RESET the KAM. REFER to Section 2, Resetting The Keep Alive Memory (KAM)

JD8 CHECK FOR OPEN IN CKP HARNESS

Note: Refer to the PCM connector pin numbers in the beginning of this Pinpoint Test.

- Key OFF.
- Disconnect PCM.

Note: On vehicles equipped with 150 pin PCMs and PATS (Passive Anti-Theft System), disconnect ONLY the Engine (E) harness connector.

- Measure resistance of CKP(+) and CKP(-) circuits individually between the PCM harness connector and the CKP harness connector.

Is either resistance measurement greater than 5 ohms?

Yes	No
REPAIR open circuit.	GO to JD9 .

JD9 CHECK FOR SHORT TO GROUND IN CKP HARNESS

- Measure resistance of CKP(+) and CKP(-) circuits individually between the CKP harness connector and battery (-) terminal.

Is either resistance measurement less than 10K ohms?

Yes	No
REPAIR short circuit.	GO to JD10 .

JD7 - JD9

JD10 CHECK FOR SHORT TO POWER IN CKP HARNESS

- Key ON, Engine OFF.
- Measure voltage of CKP(+) and CKP (-) circuits individually between the PCM harness connector and battery (-) terminal.

Is either voltage measurement greater than 2.0V DC?

Yes	No
REPAIR short circuit.	REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).

JD10

Test JE: Integrated Ignition Coil Pack A, B OR C Failure**JE: Integrated Ignition Coil Pack A, B or C Failure**
Introduction**JE****Note**

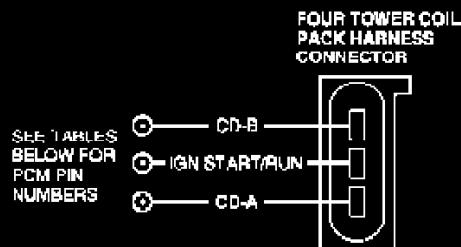
This Pinpoint Test is intended to diagnose the following:

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

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware

Escort, Focus, 2.0L Escape, 2.3L Ranger

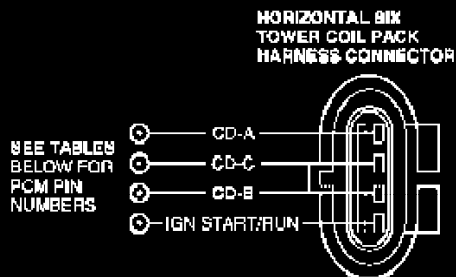


NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

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JE INTRODUCTION 1 OF 3

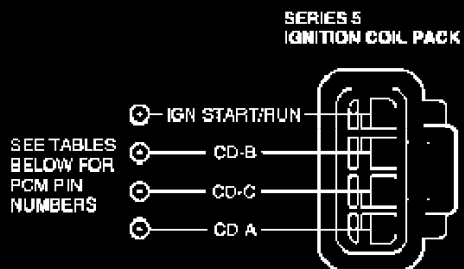
4.0L Ranger, 4.0L Explorer Sport/Sport Trac, 4.0L SOHC Explorer/Mountaineer



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

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



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

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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	E31	P0351
4	B	B	E23	P0352
2	C	C	E13	P0353
5	A	A	E31	P0351
3	B	B	E23	P0352
6	C	C	E13	P0353

JE: Integrated Ignition Coil Pack A, B or C Failure

JE**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 Section 2, Drive Cycles).

JE1 - JE2

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 Section 2, Drive Cycles).

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 Section 2, 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 Section 2, 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 Section 2, 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 Section 2, 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 Section 2, Drive Cycles).

JE8 - JE11

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 Section 2, Drive Cycles).

JE12

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

JF

Note

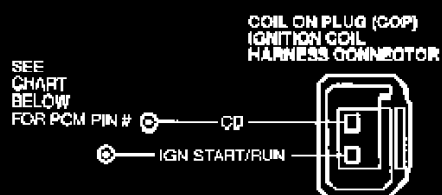
This Pinpoint Test is intended to diagnose the following:

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

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware

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



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AA0782-C

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



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

AA0783-C

Tables

IGNITION COIL TO CYLINDER CORRELATION

Cylinder Number	Ignition Coil	Coil Driver (CD)	PCM Pin	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
6	F	F	53	P0356
LS6				
1	A	A	E31	P0351
4	D	B	E12	P0354
2	B	C	E23	P0352
5	E	D	E22	P0355
3	C	E	E13	P0353
6	F	F	E30	P0356
LS8/Thunderbird				
1	A	A	E31	P0351
5	E	B	E23	P0355
4	D	C	E13	P0354
2	B	D	E1	P0352
6	F	E	E12	P0356
3	C	F	E22	P0353
7	G	G	E30	P0357
8	H	H	E38	P0358
4.6L Explorer/Mountaineer, Aviator				
1	A	A	E31	P0351
3	C	B	E23	P0353
7	G	C	E13	P0357

2	B	D	E1	P0352
6	F	E	E12	P0356
5	E	F	E22	P0355
4	D	G	E30	P0354
8	H	H	E38	P0358
Expedition/Navigator				
1	A	A	E35	P0351
3	C	B	E24	P0353
7	G	C	E12	P0357
2	B	D	E1	P0352
6	F	E	E46	P0356
5	E	F	E34	P0355
4	D	G	E23	P0354
8	H	H	E11	P0358
All Other 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
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

JF INTRODUCTION 3 OF 4

4	D	I	102	P0354
9	I	J	82	P0359

JF INTRODUCTION 4 OF 4

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

JF**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 .

JF1 - JF2

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 Section 2, Drive Cycles).

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. L56, L58, 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 Section 2, 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 Section 2, 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 Section 2, Drive Cycles).

JF5 - JF6

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 Section 2, 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 Section 2, 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 Section 2, 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 Section 2, Drive Cycles).

JF7 - JF8

Test JH: Tachometer Output Failure

JH: Tachometer Output Failure Introduction

JH

Note

This Pinpoint Test is intended to diagnose the following:

- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematic

For PCM connector views, refer to Section 1, Powertrain Control Hardware .

**AA2013-B**

JH INTRODUCTION

JH: Tachometer Output Failure**JH****JH1 CHECK CTO CIRCUIT FOR SHORT TO POWER IN HARNESS**

- 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?

Yes	No
KEY OFF. GO to JH2 .	REPAIR short circuit. VERIFY symptom no longer exists.

JH2 CHECK CTO CIRCUIT FOR SHORT TO GROUND IN HARNESS

- 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?

Yes	No
GO to JH3 .	REPAIR short circuit. VERIFY a symptom no longer exists.

JH3 CHECK CTO CIRCUIT FOR OPEN IN HARNESS

- Measure resistance between PCM harness connector pin 48 and instrument cluster harness pin.

Is the resistance less than 5.0 ohms?

Yes	No
GO to JH4 .	REPAIR open circuit. VERIFY symptom no longer exists.

JH1 - JH3

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	No
REFER to the Instrument Cluster, Section 413 in Workshop Manual for diagnosis and testing.	REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

JH4**Test KA: Fuel Pump Relay**

KA: Fuel Pump Relay Introduction

KA

Note

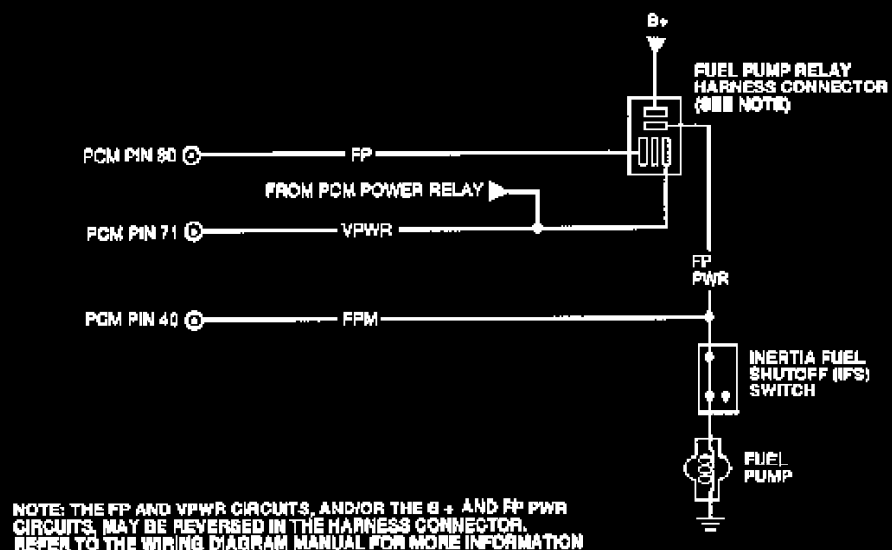
This Pinpoint Test is intended to diagnose the following:

- 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

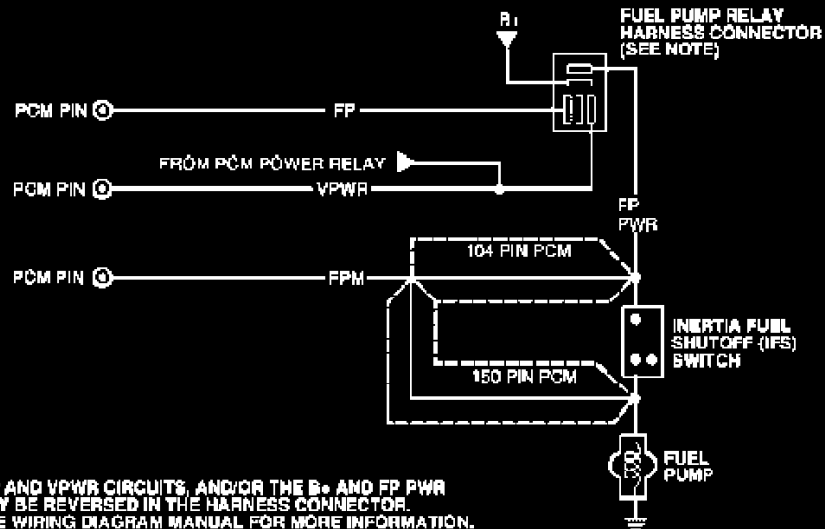
For PCM connector views, refer to Section 1, Powertrain Control Hardware .

Windstar, Ranger



AA0936-E

Explorer/Mountaineer

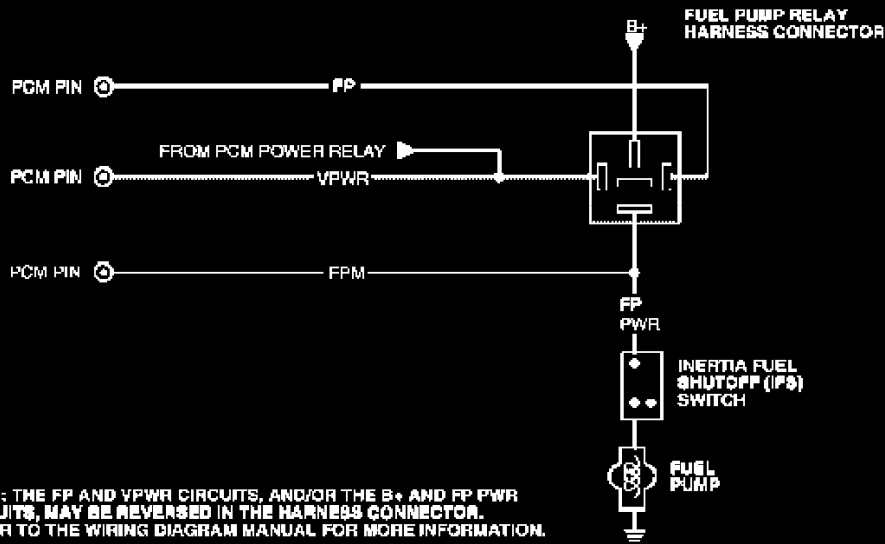


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PCM CONNECTOR PIN NUMBERS

PCM TYPE	FP	VPWR	FPM
104 PIN	80	71	40
150 PIN	B58	B32/B33	B2

Escape, E-Series, Blackwood, F- 150 (Except 5.4L SC)

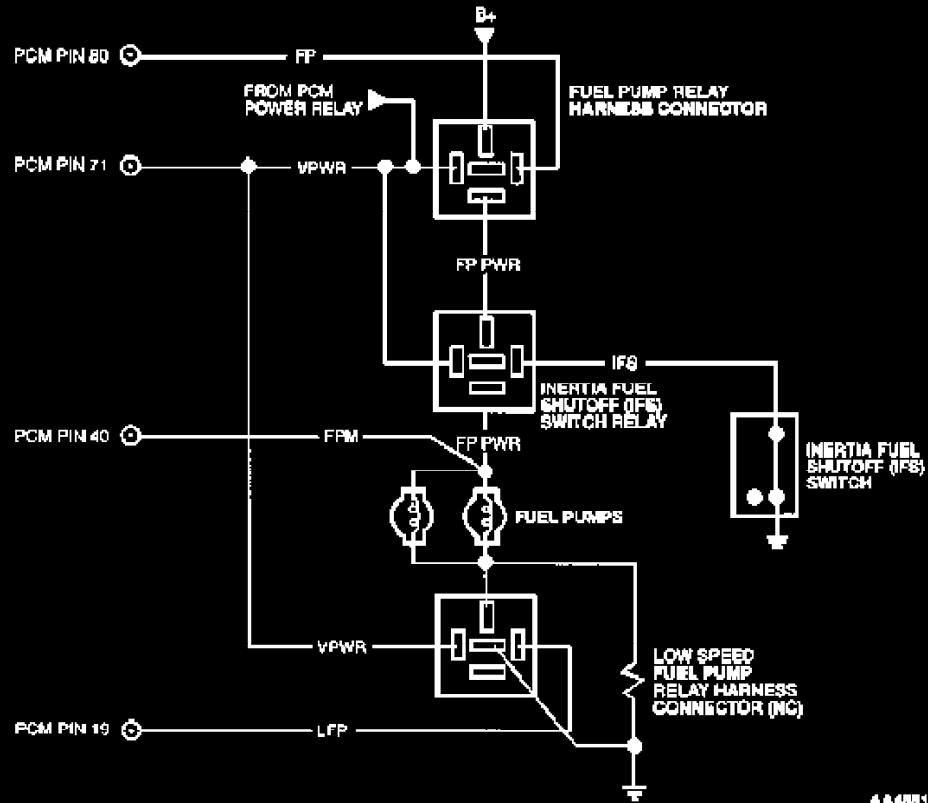


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PCM CONNECTOR PIN NUMBER

Application	FP	FPM	VPWR
2.0L Escape	54	40	71
104 PIN	80	40	71
122 PIN	B27	B20	B34/B46

5.4L SC F-150



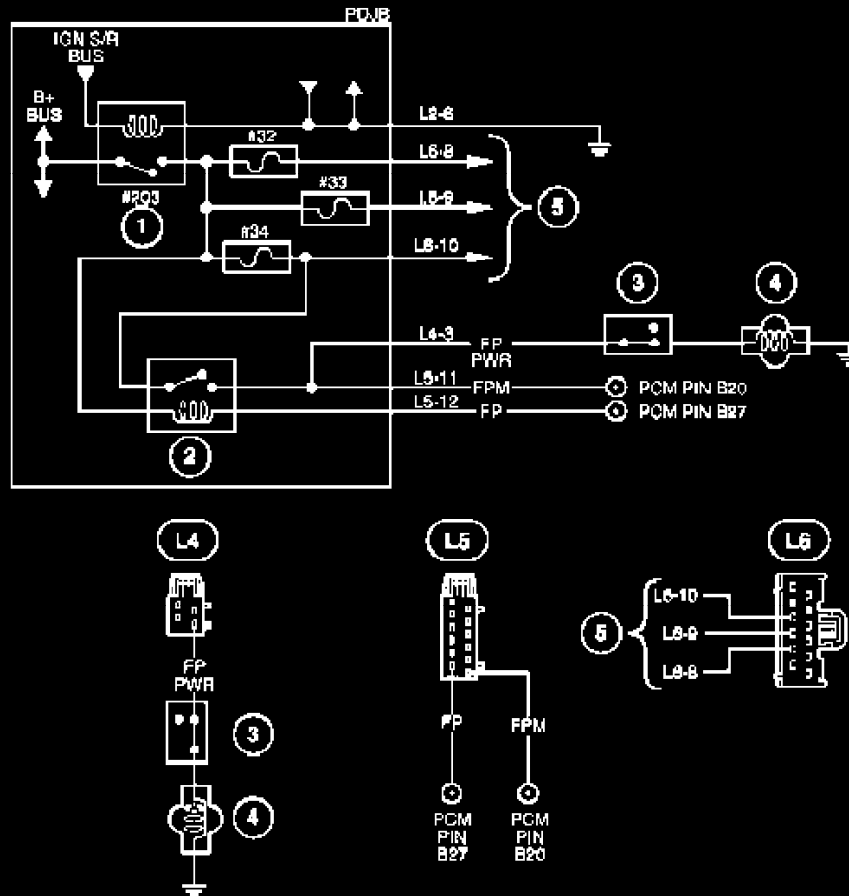
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1	PCM Power Relay (#302)
2	Fuel Pump Relay (#202, soldered on circuit board)
3	Inertia Fuel Shutoff (IFS) Switch
4	Fuel Pump
5	To Powertrain Control System
A	Power Distribution Junction Box (PDJB) harness connector A
F	Power Distribution Junction Box (PDJB) harness connector F
H	Power Distribution Junction Box (PDJB) harness connector H

KA Introduction 6 Of 8

Expedition, Navigator



A0059768

KA Introduction 7 Of 8

1	PCM Power Relay (#302)
2	Fuel Pump Relay (#202, soldered on circuit board)
3	Inertia Fuel Shutoff (IFS) Switch
4	Fuel Pump
5	To Powertrain Control System
L4	Power Distribution Junction Box (PDJB) harness connector L4
L5	Power Distribution Junction Box (PDJB) harness connector L5
L6	Power Distribution Junction Box (PDJB) harness connector L6

KA Introduction 8 Of 8

KA: Fuel Pump Relay**KA****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 10.6 volts?

Yes	No
KEY OFF. GO to KA2 .	REPAIR open circuit.

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.

KA1 - KA3

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 (KOEO) DTC P0231 or P0232 is also present with the P0230: GO to KA6 . All others: REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit.

KA4 - KA5

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	GO to KA7 .

KA7 CHECK THE FUEL PUMP PRIMARY CIRCUIT INSIDE THE PCM WHILE CRANKING ENGINE

Note: The scan tool must be connected to a reliable power source that is powered with the key in the START position (such as directly to the vehicle battery). Also verify that the vehicle battery is fully charged.

- While viewing the FPF PID, crank engine.

Does the FPF PID indicate a fault (or YES) during crank?

Yes	No
KEY OFF. REPLACE PCM (refer to Section 2, 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: 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.

KA10 - KA12

KA13 CHECK FOR OPEN FPM CIRCUIT

- Disconnect PCM.
- Disconnect fuel pump relay.
- Measure resistance between FPM circuit at the PCM harness connector and the 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit.

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 Section 3 , Step 1: Quick Test and CONTINUE diagnosis as directed.	REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

KA13 - KA14

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 Wiring Diagram Manual 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.

KA15 - KA17

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.

KA19 CHECK INTERNAL RESISTANCE OF FUEL PUMP

- Measure internal resistance of fuel pump between FP PWR pin and ground pin of the fuel pump.

Is resistance less than 10.0 ohms?

Yes	No
All fuel pump circuit checks are OK. VERIFY test step results. If all test steps are OK, RECONNECT all components. DISREGARD DTC P0232 at this time. RETURN to Section 3 , Step 1: Quick Test and CONTINUE diagnosis as directed.	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	No
GO to KA13 .	Verify that the inertia fuel shutoff (IFS) switch is set. If OK, GO to KA21 .

KA21 CHECK B+ VOLTAGE TO FUEL PUMP RELAY

- Disconnect fuel pump relay.
- Measure B+ circuit voltage at fuel pump relay harness connector.

Is voltage greater than 10.5 volts?

Yes	No
For 5.4L SC F-Series: GO to KA23 . 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	No
REPLACE fuel pump relay.	REPAIR open in FP PWR circuit between FPM splice and fuel pump relay (Some applications may have the IFS switch in this part of the circuit. First verify that the IFS switch is set).

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	No
KEY OFF. GO to KA28 .	GO to KA24 .

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 Section 3 , 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.

KA28 - KA29

**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	No
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.	Unable to duplicate or identify fault at this time. GO to Z1 .

KA35 CONTINUOUS MEMORY DTC P0231: CHECK HARNESS CIRCUITS

Note: Some applications have the FPM splice to the FP PWR circuit between the inertia fuel shutoff (IFS) switch and the fuel pump. On those applications, be aware that P0231 could be set if the IFS switch was tripped then reset.

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

- Disconnect PCM.
- Install a jumper wire between FP circuit at the PCM harness connector and ground.
- Connect a digital multimeter between the FPM circuit at the PCM harness connector 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 and IFS switch 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	No
ISOLATE fault and REPAIR as necessary.	Unable to duplicate or identify fault at this time. GO to Z1 .

KA35

**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.

KA48 CHECK LFP CIRCUIT FOR SHORT TO GROUND IN HARNESS

- 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?

Yes	No
GO to KA49 .	REPAIR short circuit.

KA49 CHECK FOR OPEN LFP 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 6.0 ohms?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit.

KA55 CHECK FOR OPEN FUEL PUMP GROUND CIRCUIT THROUGH RESISTOR

- Disconnect low speed fuel pump relay.
- Key on, engine off.
- Again, access FPM PID.

Is the FPM PID off?

Yes	No
KEY OFF. No fault is detected. DISREGARD DTC P0232 at this time. RETURN to Section 3 , 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.

KA49 - KA55

KA60 CONTINUOUS MEMORY DIAGNOSTIC TROUBLE CODE (DTC) P1232: CHECK LOW SPEED FUEL PUMP PRIMARY CIRCUITS

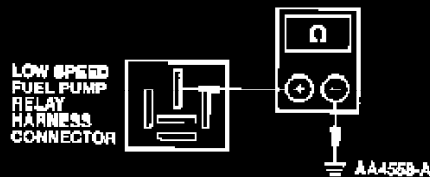
- Key on, engine off. Wait 5 seconds.
- Access LFPF PID. The LFPF PID will indicate no fault (or NO), indicating that the PCM detects VPWR voltage through the low speed fuel pump relay coil and LFP circuit (pin 19) to the PCM.
- Observe the LFPF PID for an indication of a fault while completing the following (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.

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.

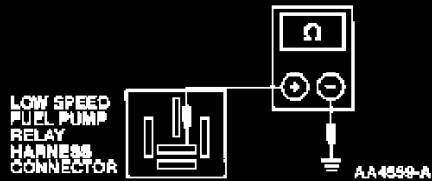
Are both resistances less than 5.0 ohms?

Yes	No
No fault is detected. DISREGARD DTC P0232 at this time. RETURN to Section 3 , 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?

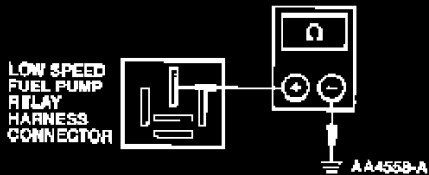


Yes	No
GO to KA71 .	REPAIR open ground circuit.

**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?



Yes	No
GO to KA72 .	REPAIR open circuit between low speed fuel pump relay and splice to ground circuit that goes through resistor.

KA70 - KA71

KA72 CHECK NORMALLY CLOSED CONTACTS OF LOW SPEED FUEL PUMP RELAY

- Measure resistance between pin 30 and pin 37A 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 Section 3 to continue diagnosis.	REPLACE low speed fuel pump relay.

KA75 DTC P0230 (applications with FP relay soldered on PDJB circuit board): CHECK FOR FP CIRCUIT CYCLING AT PDJB

- Disconnect power distribution junction box (PDJB) connector that contains the FP circuit (connector L5 for Expedition, Navigator and F for F-Series, Excursion).
- Connect non-powered test lamp between the FP circuit at the applicable PDJB harness connector and the battery positive post.
- For F-Series and Excursion, connect a jumper wire between pin F5 of the PDJB and ground (this completes the ground circuit for the PCM relay).
- Key on, engine off.
- Access Output Test Mode on scan tool.
- While observing test lamp, command outputs on and off.

Does the test lamp turn on and off when the outputs are commanded on and off?

Yes	No
PCM and FP harness circuit OK. GO to KA76 .	KEY OFF. GO to KA78 .

KA76 CHECK VPWR THROUGH FP RELAY AT PDJB

- Key on, engine off.
- Measure voltage at the FP circuit pin of the PDJB (refer to beginning of pinpoint test for PDJB pin number).

Is voltage greater than 10.0 volts?

Yes	No
Unable to identify fault. Verify previous test results. Return to Section 3 to continue diagnostics.	VERIFY integrity of related fuse(s). If OK, REPLACE FP relay/PDJB.

KA78 CHECK FUEL PUMP (FP) CIRCUIT FOR SHORT TO POWER IN HARNESS

- Disconnect PCM.
- Key on, engine off.
- Measure voltage between FP circuit at the applicable PDJB harness connector and ground.

Is voltage less than 1.0 volt?

Yes	No
KEY OFF. GO to KA79 .	REPAIR short circuit.

KA79 CHECK FP CIRCUIT FOR SHORT TO GROUND IN HARNESS

- Disconnect scan tool from DLC.
- Measure resistance between FP circuit at the applicable PDJB harness connector and ground.

Is resistance greater than 10,000 ohms?

Yes	No
GO to KA80 .	REPAIR short circuit.

KA80 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 applicable PDJB harness connector and PCM harness connector.

Is resistance less than 5.0 ohms?

Yes	No
If Key On Engine Off (KOEO) DTC P0231 or P0232 is also present with the P0230: GO to KA81 . All others: REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit.

KA81 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, PDJB 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	GO to KA82 .

KA82 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 Section 2, 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: GO to KA105 . If KOEO P0232 is present: GO to KA85 .

KA85 DTC P0232 (applications with FP relay soldered on PDJB circuit board); DOES ENGINE START?**Does the engine start?**

Yes	No
GO to KA86 .	GO to KA95 .

KA86 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 KA90 .	KEY OFF. GO to KA87 .

KA87 CHECK FOR FP PWR CIRCUIT SHORT TO POWER

- Disconnect power distribution junction box (PDJB) connector that contains the FP PWR circuit (connector L4 for Expedition, Navigator and A for F-Series, Excursion).
- Key on.

Is the fuel pump off?

Yes	No
GO to KA88 .	REPAIR short to power in FP PWR circuit.

KA88 CHECK FOR FUEL PUMP RELAY ALWAYS CLOSED OR PDJB CONCERN

- Reconnect PDJB connector that contains the FP PWR circuit (connector L4 for Expedition, Navigator and A for F-Series, Excursion).
- Disconnect PDJB connector that contains the FPM circuit (connector L5 for Expedition, Navigator and H for F-Series, Excursion).
- Key on, wait five seconds.

Is the fuel pump off?

Yes	No
GO to KA89 .	FP relay contacts always closed or short to power in PDJB. REPLACE FP relay/PDJB.

KA89 CHECK IF THERE IS A FPM CIRCUIT SHORT TO POWER IN PCM CAUSING FUEL PUMP TO RUN

- Reconnect PDJB connector.
- Disconnect PCM.
- Key on.

Is the fuel pump off?

Yes	No
REPLACE PCM.	REPAIR FPM circuit short to power.

KA90 CHECK FPM TO FP PWR CONTINUITY IN PDJB

- Disconnect PDJB connector that contains the FPM circuit (connector L5 for Expedition, Navigator and H for F-Series, Excursion).
- Disconnect PDJB connector that contains the FP PWR circuit (connector L4 for Expedition, Navigator and A for F-Series, Excursion).
- Measure resistance of PDJB between FPM circuit pin and FP PWR circuit pin (refer to beginning of pinpoint test for PDJB pin number).

Is resistance less than 5.0 ohms?

Yes	No
GO to KA91 .	Open circuit in PDJB. REPLACE PDJB

KA91 CHECK FOR OPEN FPM CIRCUIT IN HARNESS

- Disconnect PCM.
- Measure resistance of FPM circuit between the PCM harness connector and the applicable PDJB harness connector.

Is resistance less than 5.0 ohms?

Yes	No
For P0232: GO to KA92 . For P0231: REPLACE PCM (REFER to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit.

KA92 CHECK FPM CIRCUIT IN PCM

- Reconnect PCM and PDJB.
- Key on, engine off.
- Access FPM PID.

Is the FPM PID OFF?

Yes	No
Key off. No fault is detected. The FPM circuit is OK in the harness and PCM. DISREGARD DTC P0232 at this time. RETURN to Section 3 , Step 1: Quick Test and CONTINUE diagnosis as directed.	REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

KA95 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 KA96 .	REPLACE or RESET IFS switch.

KA96 CHECK FPM TO FP PWR CONTINUITY IN PDJB

- Disconnect power distribution junction box (PDJB) connector that contains the FPM circuit (connector L5 for Expedition, Navigator and H for F-Series, Excursion).
- Disconnect PDJB connector that contains the FP PWR circuit (connector L4 for Expedition, Navigator and A for F-Series, Excursion).
- Measure resistance of PDJB between FPM circuit pin and FP PWR circuit pin (refer to beginning of pinpoint test for PDJB pin number).

Is resistance less than 5.0 ohms?

Yes	No
GO to KA97 .	Open circuit in PDJB. REPLACE PDJB

KA97 CHECK FOR OPEN FP PWR CIRCUIT BETWEEN IFS SWITCH AND PDJB

- Measure resistance of the FP PWR circuit between IFS switch harness connector and applicable PDJB connector (refer to beginning of pinpoint test).

Is resistance less than 5.0 ohms?

Yes	No
RECONNECT PDJB. GO to KA98 .	REPAIR open FP PWR circuit.

KA98 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 KA99 .	REPAIR open circuit.

KA99 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 KA100 .	REPAIR open circuit.

KA100 CHECK INTERNAL RESISTANCE OF FUEL PUMP

- Measure internal resistance of fuel pump between FP PWR pin and ground pin of the fuel pump.

Is resistance less than 10.0 ohms?

Yes	No
All fuel pump circuit checks are OK. VERIFY test step results. If all test steps are OK, RECONNECT all components. DISREGARD DTC P0232 at this time. RETURN to Section 3 , Step 1: Quick Test and CONTINUE diagnosis as directed.	REPLACE fuel pump.

KA105 DTC P0231 (applications with FP relay soldered on PDJB circuit board): DOES ENGINE START?

Note: If key on, engine off DTC P0230 is also present and has not been diagnosed, GO to KA75 (to check the primary fuel pump circuits first).

Does the engine start?

Yes	No
GO to KA91 .	GO to KA106 .

KA106 CHECK FUEL PUMP FUSE

- Check condition of fuel pump fuse (refer to beginning of pinpoint test or wiring diagram)

Is the fuse OK?

Yes	No
GO to KA107 .	Damaged fuse. Verify B+ and FP PWR/FPM circuits are not short to ground. REPLACE fuse.

KA107 CHECK FUEL PUMP SECONDARY CIRCUITS IN PDJB

- Disconnect PDJB connector that contains the FP PWR circuit (connector L4 for Expedition, Navigator and A for F-Series, Excursion).
- Connect DVOM between FP PWR circuit pin of PDJB and ground.
- Key on, engine off.
- Access Output Test Mode on scan tool.
- Command outputs on.

Is voltage at PDJB FP PWR pin greater than 10.5 volts when the outputs are commanded on?

Yes	No
All fuel pump circuit checks are OK. VERIFY test step results. If all test steps are OK, RECONNECT all components. DISREGARD DTC P0232 at this time. RETURN to Section 3 , Step 1: Quick Test and CONTINUE diagnosis as directed.	Fuel pump relay contacts always open, or open circuit in PDJB between B+ supply and FPM splice. REPLACE FP relay/PDJB.

KA110 CONTINUOUS MEMORY DTC P0230 (applications with FP relay soldered on PDJB circuit board): 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 Power Distribution Junction Box (PDJB).
 - Lightly tap the fuel pump relay/PDJB (to simulate road shock).
- Key off.
- Inspect the PCM and applicable PDJB 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 .

KA115 CONTINUOUS MEMORY DTC P0231 (applications with FP relay soldered on PDJB circuit board): CHECK FUEL PUMP SECONDARY CIRCUITS IN PDJB

- Disconnect PDJB connector that contains the FP PWR circuit (connector L4 for Expedition, Navigator and A for F-Series, Excursion).
- Connect DVOM (or non powered test lamp) between FP PWR circuit pin of PDJB and ground.
- Key on, engine off.
- Access Output Test Mode on scan tool.
- Command outputs on.
- Observe DVOM/test lamp for an indication of a fault while performing the following (voltage will drop suddenly when a fault is detected). Be aware that Output Test Mode will turn off the fuel pump after a calibrated time. If this happens, again command the outputs on to continue testing.
 - Lightly shake, wiggle the fuel pump fuse (to simulate road shock).
 - Lightly tap the fuel pump relay/PDJB (to simulate road shock).

Is a fault indicated?

Yes	No
ISOLATE fault and REPAIR as necessary.	Unable to duplicate or identify fault at this time. GO to Z1 .

KA115**KA120 CONTINUOUS MEMORY DTC P0232: CHECK FUEL PUMP SECONDARY CIRCUITS****Note:**

1. If Continuous Memory (DTC) P0230 is also present, GO to KA110 .
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 Power Distribution Junction Box (PDJB) 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 PDJB and the PCM.
 - Lightly tap the fuel pump, inertia fuel shutoff switch and fuel pump relay/PDJB to simulate road shock.
- Key off.

Was a fault indicated/found?

Yes	No
ISOLATE fault and REPAIR as necessary.	Unable to duplicate or identify fault at this time. GO to Z1 .

KA120**Test KB: Fuel Pump Driver Module (FPDM)**

KB: Fuel Pump Driver Module (FPDM) Introduction

KB

Note

This Pinpoint Test is intended to diagnose the following:

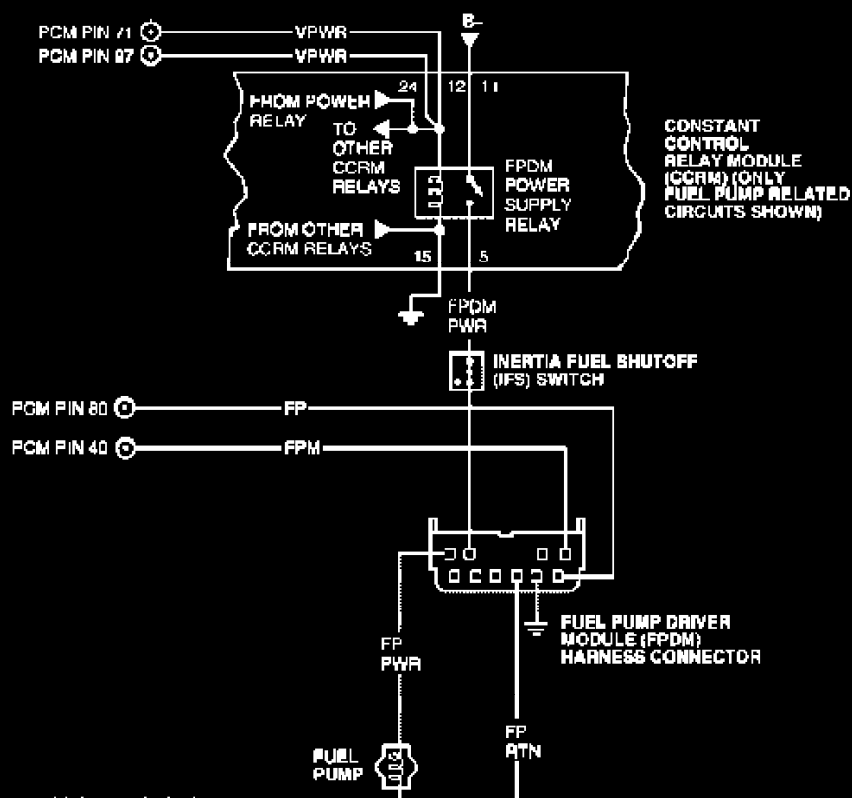
- Harness circuits: B+ and ground to FPDM power supply relay; GND to FPDM; FPM; FP; FP PWR; FP RTN; FPDM PWR
- Inertia fuel shutoff (IFS) switch (9341)
- Fuel pump driver module (FPDM) (9D370)
- FPDM power supply relay
- Powertrain control module (PCM) (12A650)

KB INTRODUCTION 1 OF 6

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware.

Escort

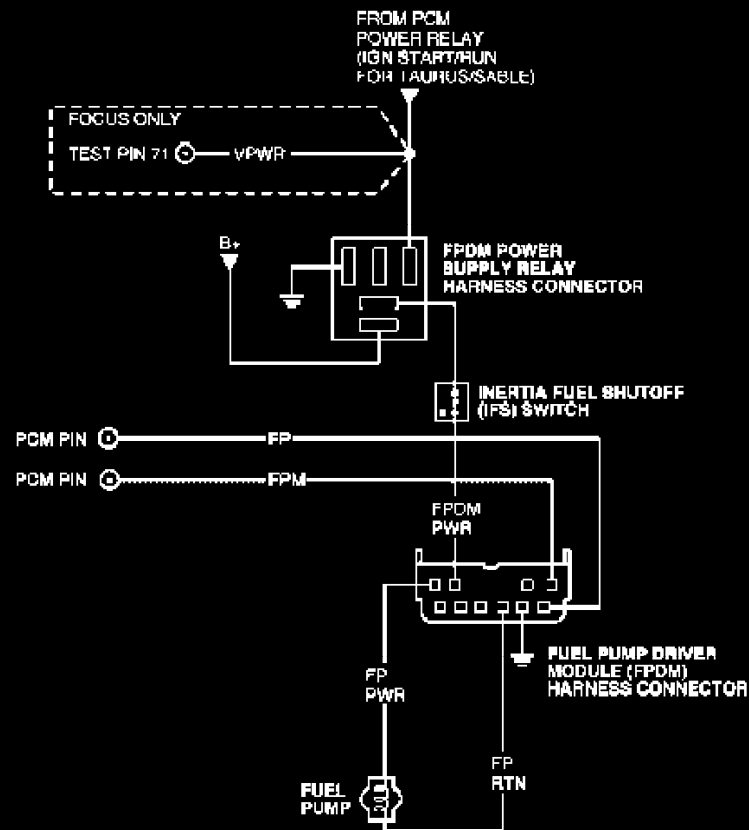


NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0019934

KB INTRODUCTION 2 OF 6

Focus, Taurus/Sable, Crown Victoria/Grand Marquis, Town Car

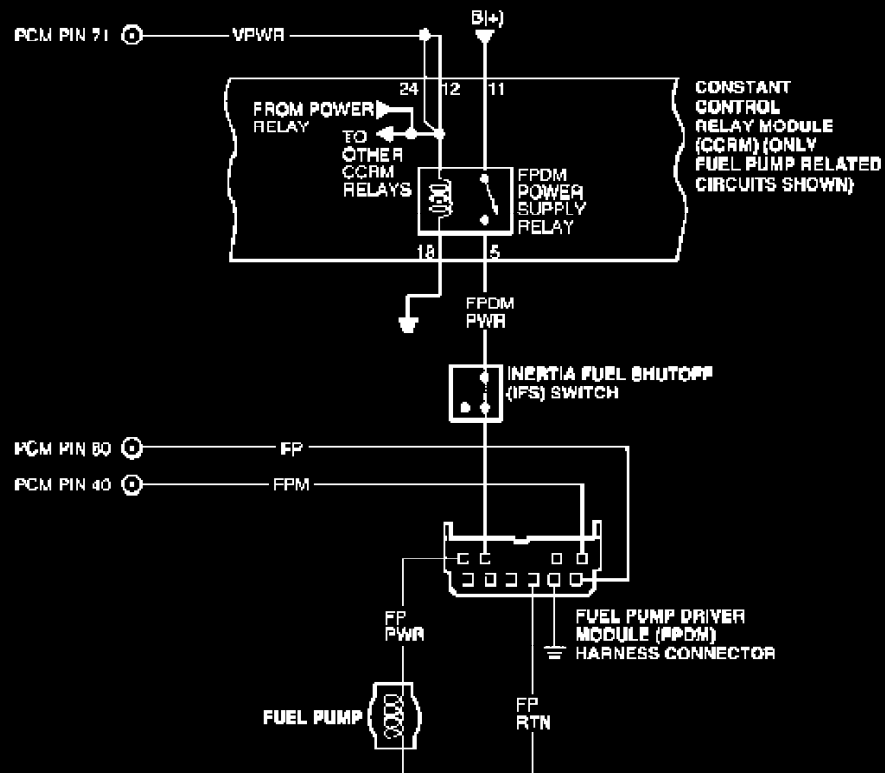


A0051378

PCM CONNECTOR PIN NUMBER

Application	FP	FPM	VPWR
2.0L Focus	54	40	71
2.3L Focus	B12	B21	B35, B36
All others	80	40	n/a

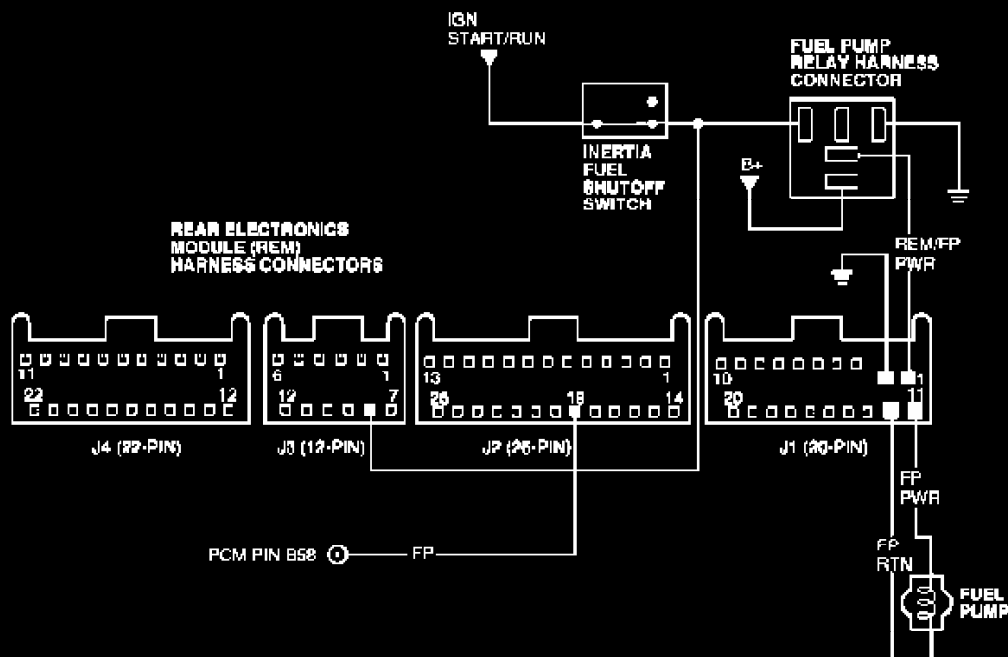
Mustang



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0015025

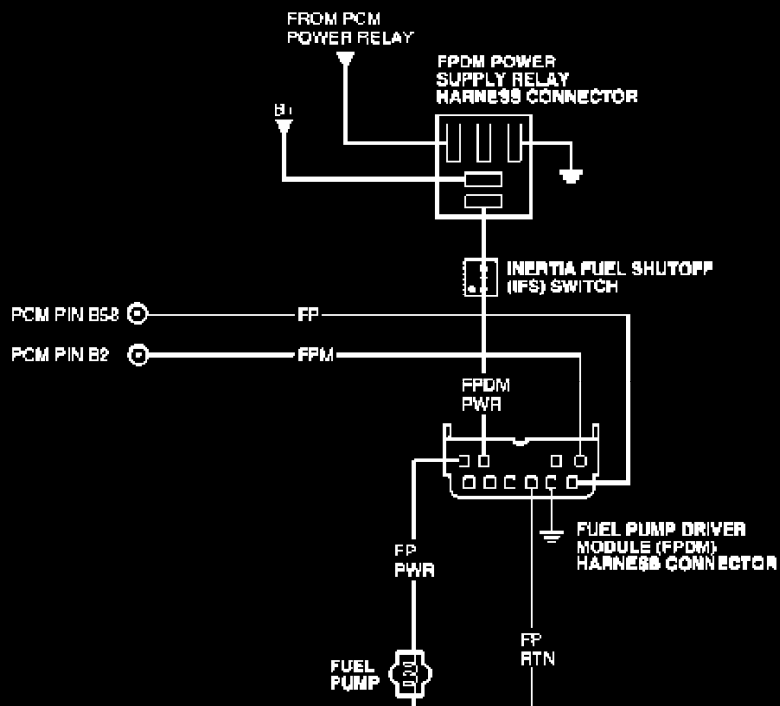
LS6/LS8, Thunderbird



A0051380

KB INTRODUCTION 5 OF 6

Aviator



A0051379

KB INTRODUCTION 6 OF 6

KB: Fuel Pump Driver Module (FPDM)**KB****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 Section 3 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?**

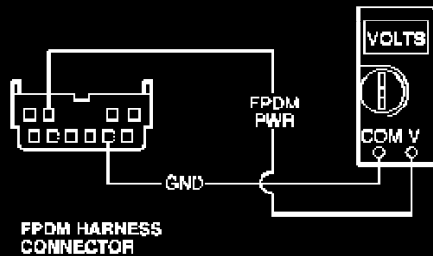
Yes	No
GO to KB15 (to check the FPM circuit).	VERIFY IFS switch is set (button depressed). If OK, GO to KB3 .

KB1 - KB2

KB3 CHECK POWER AND GROUND CIRCUITS TO FPDM

- Disconnect FPDM.
- Key on, engine off.
- Measure voltage between the FPDM PWR pin and ground pin at the FPDM harness connector.

Is voltage greater than 10.5 volts?



A0051301

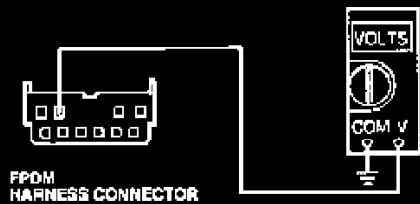
Yes	No
Key off. REPLACE FPDM.	GO to KB4 .

KB3

KB4 CHECK POWER TO FPDM

- Key on, engine off.
- Measure voltage between the FPDM PWR pin at the FPDM harness connector and chassis ground.

Is voltage greater than 10.5 volts?



FPDM
HARNESS CONNECTOR

AA1856-A

Yes	No
REPAIR open ground circuit to FPDM.	KEY OFF. No power to FPDM. For Escort, Mustang: GO to KB5 . 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.

KB4 - KB5

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.

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.

KB6 - KB8

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 and Mustang, CCRM harness connector [pin 5]).
- 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.

KB15 CHECK FOR OPEN FPM CIRCUIT

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

- Disconnect FPDM.
- Disconnect PCM.
- Measure resistance of FPM circuit between PCM harness connector 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 FPM circuit at the PCM harness connector 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 FPM circuit at the PCM harness connector 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 FPM circuit at the PCM harness connector and ground.

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPLACE FPDM.

KB17 - KB18

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.

Note: Be aware that P1233/1234 could be set if the inertia fuel shutoff (IFS) switch was tripped then reset.

- 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.
 - FPDM PWR circuit to FPDM.
 - For Escort and Mustang, the B+ circuit to CCRM pin 11. For Mustang, also the ground circuit to CCRM Pin 18.
 - For all except Escort and Mustang, 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 .

KB25

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, check if Electronic Throttle Control (ETC) DTC P2105 is present. An ETC system concern could cause a P1235/P1236, and should be diagnosed first.

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 .

KB31 CHECK FOR OPEN FP CIRCUIT BETWEEN PCM AND 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 perform an action with the FPDM, complete the action with the REM. Refer to the pin numbers in the beginning of this pinpoint test.

- 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 Section 2, 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 .

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 Section 2, 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 Section 3 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 B (BODY).
- Key on, engine off.
- Measure voltage between pin B58 at PCM harness connector B and ground.

Is voltage greater than 8 volts?

Yes	No
REPLACE PCM (refer to Section 2, 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 B58) 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).

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.

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.

KB51 - KB52

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).

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 .

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 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.

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).

KB62 - KB64

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 .

KB65 - KB67

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 [from less than 10 ohms] 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 [from greater than 10,000 ohms] 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, General Information Section 414-00 in the Workshop Manual.

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 circuit at the FPDM harness connector and the battery negative post.

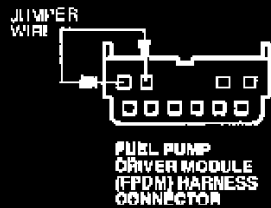
Is voltage greater than 10.5 volts?

Yes	No
KEY OFF. GO to KB73 .	KEY OFF. Improper voltage is being supplied to FPDM. GO to KB75 .

KB73 CHECK FP PWR CIRCUIT

- Connect a jumper wire between the FPDM PWR 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?



AA0797-C

Yes	No
KEY OFF. REMOVE jumper. VERIFY previous test steps. CHECK related connectors for corrosion, etc. If all checks are OK, REPLACE FPDM.	KEY OFF. REMOVE jumper. CHECK for causes of high resistance in FP PWR circuit.

KB72 - KB73

KB75 CHECK B+ TO FPDM POWER SUPPLY RELAY (or CCRM)

- Disconnect CCRM (Escort, Mustang) 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 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	No
KEY OFF. GO to KB76 .	Improper voltage is being supplied to the CCRM or FPDM power supply relay. CHECK associated wiring, connectors, etc. REPAIR as necessary.

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 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 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 Workshop Manual section 419-10, Multifunction Electronic Control Modules, for directions).

Is REM DTC B2172 present?

Yes	No
GO to KB86 .	GO to A1 .

KB80 - KB85

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	No
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 Section 3 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).	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

KC: Fuel Shutoff Valve Relay Introduction

KC

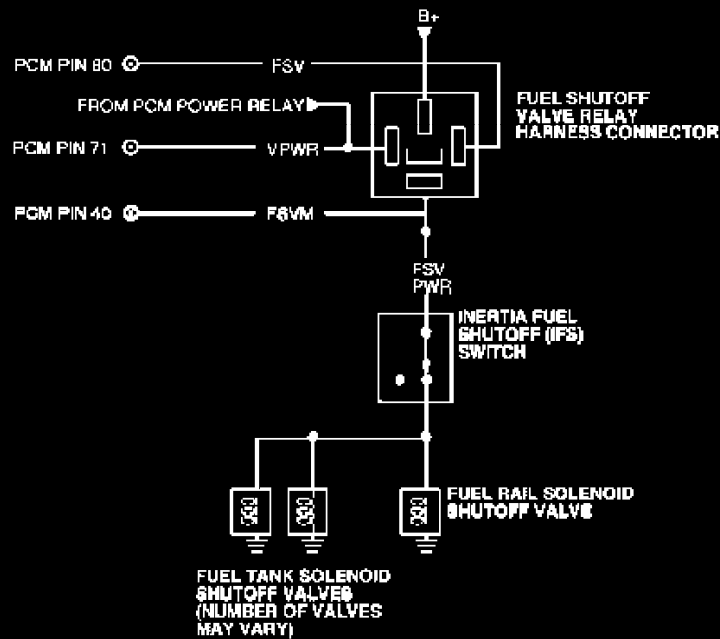
Note

This Pinpoint Test is intended to diagnose the following:

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

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware .



NOTE: THE FSV AND VPWR CIRCUITS MAY BE REVERSED IN THE HARNESS CONNECTOR. REFER TO THE WIRING DIAGRAM MANUAL FOR MORE INFORMATION.

A0029600

KC INTRODUCTION

KC: Fuel Shutoff Valve Relay**KC****KC1 DTC P0230: CHECK VPWR VOLTAGE TO FUEL SHUTOFF VALVE RELAY**

- Disconnect fuel shutoff valve relay.
- Key on, engine off.
- Measure VPWR circuit voltage at the fuel shutoff valve relay harness connector.

Is voltage greater than 10.5 volts?

Yes	No
KEY OFF. GO to KC2 .	REPAIR open in VPWR circuit between the Electronic Engine Control power relay and the fuel shutoff valve relay.

KC2 CHECK FUEL SHUTOFF VALVE RELAY

- Refer to the pin numbers indicated on the fuel shutoff valve 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 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 KC3 .	REPLACE fuel shutoff valve relay.

KC1 - KC2

KC3 CHECK FUEL SHUTOFF VALVE (FSV) CIRCUIT FOR SHORT TO POWER IN HARNESS

- Disconnect PCM.
- Key on.
- Measure voltage between FSV circuit at fuel shutoff valve relay harness connector and ground.

Is voltage less than 1.0 volt?

Yes	No
KEY OFF. GO to KC4 .	REPAIR short circuit.

KC4 CHECK FSV CIRCUIT FOR SHORT TO GROUND IN HARNESS

- Disconnect scan tool from DLC.
- Measure resistance between FSV circuit at fuel shutoff valve relay harness connector and ground.

Is resistance greater than 10,000 ohms?

Yes	No
GO to KC5 .	REPAIR short circuit.

KC3 - KC4

KC5 CHECK FOR OPEN FSV CIRCUIT

- Measure resistance of the FSV circuit between PCM harness connector pin 80 and the fuel shutoff valve relay harness connector.

Is resistance less than 5.0 ohms?

Yes	No
If Key On Engine Off (KOEO) DTC P0231 or P0232 is also present with DTC P0230: GO to KC6 . All others: REPLACE PCM (REFER to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit.

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.

- 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)?

Yes	No
KEY OFF. REPLACE PCM (REFER to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	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.

- Key on, engine off.
- While viewing the FSVF PID, crank the engine.

Does the PID display indicate a fault during crank?

Yes	No
KEY OFF. REPLACE PCM (REFER to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	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	No
GO to KC11 .	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	No
GO to KC13 .	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	No
REPLACE fuel shutoff valve relay.	REPAIR FSV PWR/FSVM circuit short to power.

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 Section 2, 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 chassis ground and the FSV PWR circuit at the IFS switch harness connector (the circuit going to the fuel solenoid shutoff valves).

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 Section 3 , 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 .

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.

KC21 - KC22**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 .

KC30

KC35 CONTINUOUS MEMORY DTC P0231: 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	No
ISOLATE fault and REPAIR as necessary.	Unable to duplicate or identify fault at this time. GO to Z1 .

KC35**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	No
ISOLATE fault and REPAIR as necessary.	Unable to duplicate or identify fault at this time. GO to Z1 .

KC40**Test KD: Electric Exhaust Gas Recirculation (EEGR) System**

KD: Electric Exhaust Gas Recirculation (EEGR) System Introduction

KD

Note

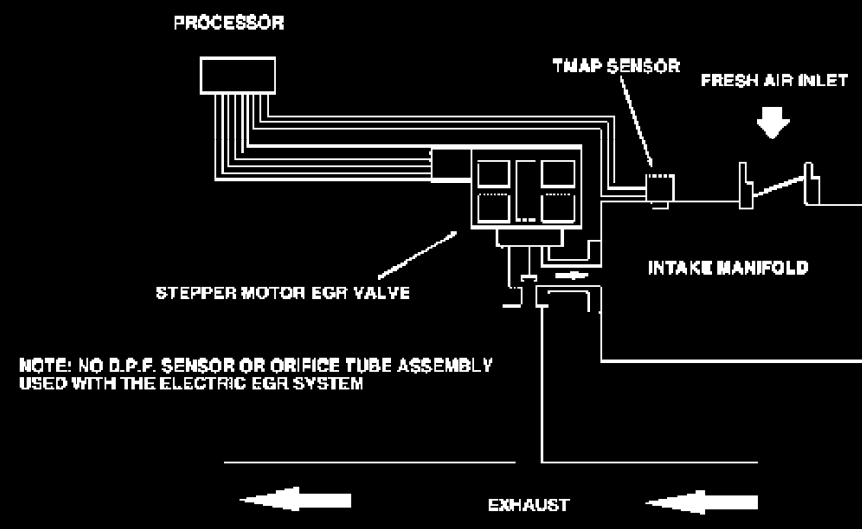
This Pinpoint Test is intended to diagnose the following:

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

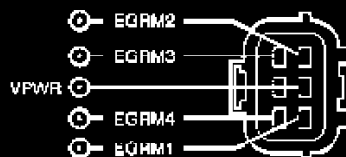
Pinpoint Test Schematics and Connectors

Note: All connector views are from the harness side.

For PCM connector views, refer to Section 1, Powertrain Control Hardware .



A0027514

EEGR Connector

A0061750

PCM CONNECTOR PIN NUMBERS

APPLICATION	VPWR	EGRM1	EGRM2	EGRM3	EGRM4
2.3L Focus	B32 or VPWR	E8	E9	E10	E11
2.3L Ranger	71/97	73	99	72	98

KD INTRODUCTION 2 OF 2

**KD: Electric Exhaust Gas Recirculation
(EEGR) System****KD****KD1 P0403: EGR CONTROL CIRCUIT - CHECK CONNECTION OF
EEGR HARNESS CONNECTOR TO EEGR**

Note: If the DTC was generated by an intermittent condition, wiggle the harness and connectors when making measurements.

- Check the harness connector at the EEGR motor.

Are the connector contacts clean and properly seated?

Yes	No
GO to KD2 .	REPAIR as necessary.

KD2 CHECK FOR VPWR AT THE EEGR HARNESS CONNECTOR

- Key ON, Engine OFF.
- Disconnect EEGR harness connector.
- Measure the voltage at the EEGR harness connector between VPWR and battery (-) terminal.

Is the voltage greater than 10.5V DC?

Yes	No
GO to KD3 .	REPAIR open circuit.

KD1 - KD2

KD3 CHECK FOR OPEN IN EEGR HARNESS

- Key OFF.
- Disconnect PCM.
- Measure the resistance of each EEGR circuit individually between the PCM and EEGR harness connector.

Is resistance of each circuit greater than 5 ohms?

Yes	No
REPAIR open circuit.	GO to KD4 .

KD4 CHECK FOR SHORT TO GROUND IN EEGR HARNESS

- Measure the resistance of the EEGR circuits individually between the EEGR harness connector and battery (-) terminal.

Is the resistance less than 10K ohms?

Yes	No
REPAIR short circuit.	GO to KD5 .

KD5 CHECK FOR SHORTS BETWEEN CIRCUITS IN EEGR HARNESS

Note: Refer to the PCM Connector Pin Numbers chart at the beginning of this pinpoint test.

- At the PCM harness connector, measure the resistance between pin EGRM3 and pins EGRM1, EGRM4 and EGRM2.
- Measure the resistance between pin EGRM1 and pins EGRM4 and EGRM2.

Is the resistance of each measurement less than 10K ohms?

Yes	No
REPAIR short circuit.	GO to KD6 .

KD3 - KD5

KD6 CHECK FOR SHORTS TO POWER IN EEGR HARNESS

- Reconnect PCM.
- Key ON, Engine OFF.
- Measure the voltage between the EEGR connector pins ERGM1, ERGM2, ERGM3, ERGM4 and the battery (-) terminal.

Is the voltage greater than 0.1V DC?

Yes	No
REPAIR short circuit.	GO to KD7 .

KD7 CHECK EEGR FOR OPEN AND SHORT CIRCUITS

- Key OFF.
- Disconnect PCM.
- Reconnect EEGR harness connector.
- At the PCM harness connector, measure the resistance between VPWR and pins EGRM1, EGRM2, EGRM3 and EGRM4.

Is resistance between 20 and 24 ohms?

Yes	No
GO to KD8 .	REPLACE EEGR assembly.

KD8 CHECK THE EEGR FOR SHORTS TO GROUND

- At the PCM harness connector, measure the resistance between the EEGR pins EGRM3, EGRM1, EGRM4, EGRM2 and battery (-) terminal.

Is the resistance greater than 10K ohms?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).	REPLACE EEGR assembly.

KD6 - KD8

KD9 DTC P0400/P1408: EGR FLOW - CHECK FOR STUCK EEGR VALVE OPERATION

Note: Service the following DTCs first, if present: P0102, P0103, P0107, P0108, P1100, P1101

- Select the Output Test Mode function on the scan tool.
- Enter the EEGR PID (EGRMDSD) and the MAP PID (MAP).
- Start engine.
- Engine at normal operating temperature.
- Increase engine RPM to 1200 and hold steady.
- Add a small amount of EGR (approx. 8 to 12 steps) while monitoring the MAP PID.
- The MAP value should increase as EGR is introduced.

Note: Engine RPM must be held steady during this test. DTCs may be generated as a result of this test. After running this test, clear any DTC(s) that may have been induced.

Does the MAP value increase as EGR is introduced?

Yes	No
Condition is not present at this time. Be sure the MAP is properly seated and the vacuum source is not blocked.	REPLACE EEGR assembly.

KD9**Test KE: Idle Air Control (IAC) Valve**

KE: Idle Air Control (IAC) Valve Introduction

KE

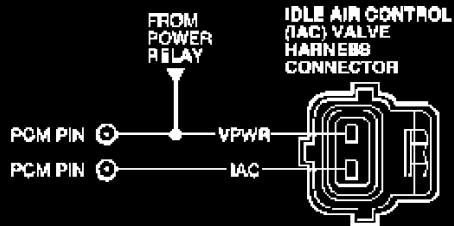
Note

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

For PCM connector views, refer to Section 1, Powertrain Control Hardware.



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

A0041620

PCM CONNECTOR PIN NUMBERS		
APPLICATION	VPWR	IAC
EXPEDITION/NAVIGATOR	B34/B46	E2
EXPLORER/MOUNTAINEER/AVIATOR	E69	E9
ALL OTHERS	71	83

KE INTRODUCTION

KE: Idle Air Control (IAC) Valve**KE****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	No
KEY OFF. GO to KE2 .	The IAC system is OK. RETURN to Section 3 , 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	No
KEY OFF. GO to KE3 .	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	No
GO to KE4 .	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	No
For DTC P1604: GO to KE7 . All others: GO to KE5 .	REPLACE IAC valve.

KE5 CHECK AIR INLET FOR PLUGGING OR STUCK IAC PINTLE

- Inspect the entire intake air system for debris, blockage and other damage.
- Remove and inspect IAC valve, check pintle movement. Check air tubes (if equipped) for blockage and other damage.
- Remove and inspect the air cleaner element for excessive dirt.

Is the IAC valve and intake air system OK?

Yes	No
RESTORE inlet air system. GO to KE6 .	REPLACE IAC valve or repair air inlet as necessary.

KE3 - KE5

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 valve, connectors and hoses.

Are any leaks detected in the above areas?

Yes	No
REPAIR as necessary.	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	No
GO to KE8 .	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	No
KEY OFF. GO to KE9 .	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	No
For KOEO or KOER DTC P1504, P0511: REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). All Others: GO to KE10 .	REPAIR short circuit.

KE9

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 65 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	No
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 the Keep Alive Memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM).	REPLACE IAC valve.

KE10

KE20 DTC P1506: CHECK FOR VACUUM LEAKS

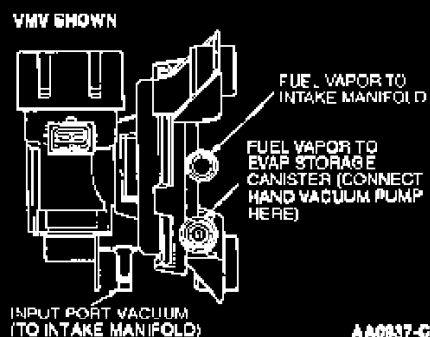
- Key on, engine running.
- With the engine at idle, listen for vacuum leaks.
- Inspect the entire intake air system from the mass air flow (MAF) sensor to the intake manifold for damage or leaks such as:
 - Cracked or punctured intake air tube.
 - Loose or cracked IAC air tubes.
 - Loose intake air 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	No
KEY OFF. REPAIR as necessary.	KEY OFF. GO to KE21 .

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).

**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 the Keep Alive Memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM).

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). All others: Reconnect PCM. GO to KE30 .	REPAIR short circuit.

KE22 - KE23

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 .

KE30**Test KF: Fan Control (FC) Relay**

KF: Fan Control (FC) Relay Introduction

KF

Note

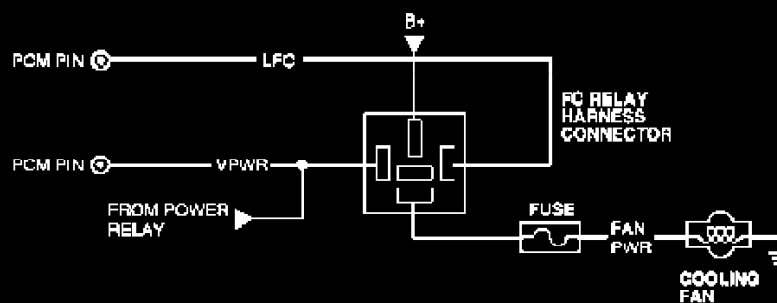
This Pinpoint Test is intended to diagnose the following:

- 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

For PCM connector views, refer to Section 1, Powertrain Control Hardware.

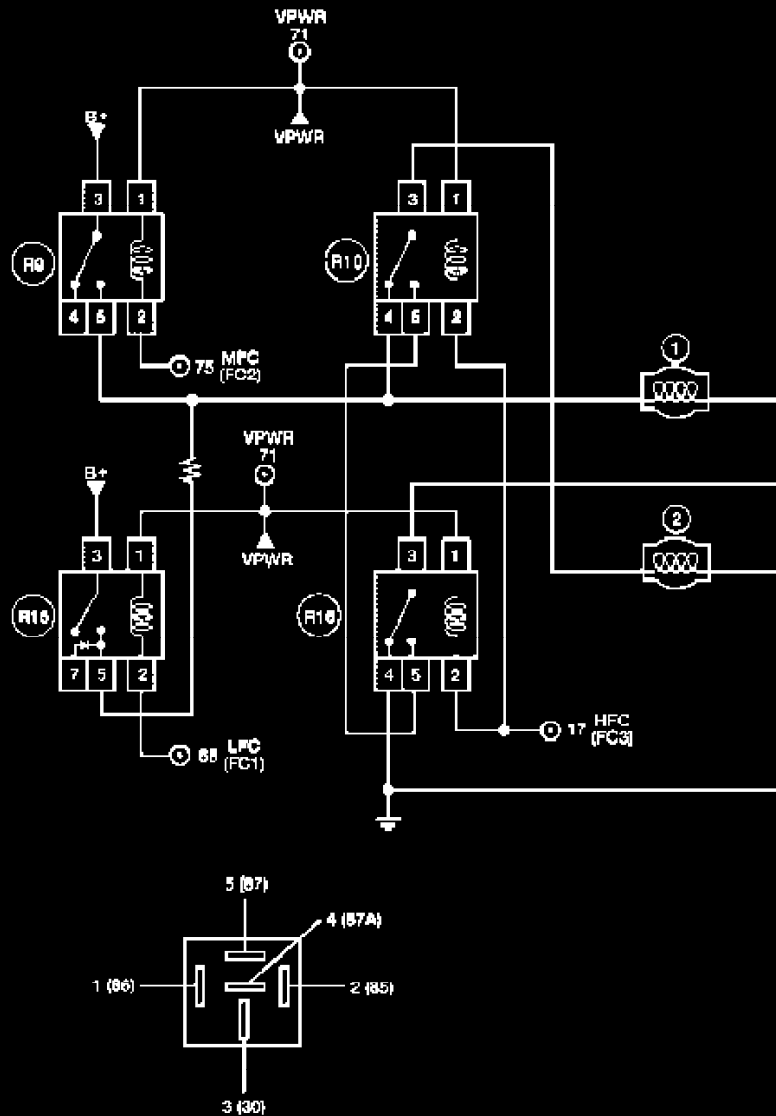
Focus (without A/C)



A0065817

PCM CONNECTOR PIN NUMBERS		
PCM TYPE	VPWR	LFC
104 PIN	71	68
150 PIN	B35, B36	B39

2.0L Focus (with A/C)

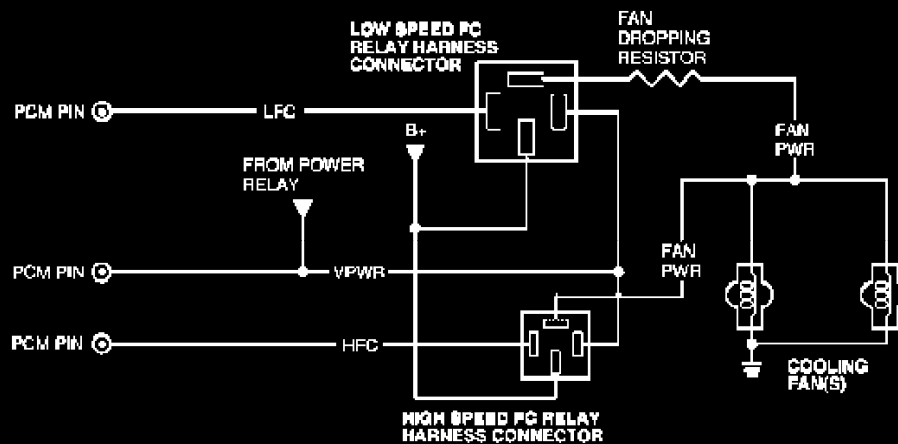


A0006667

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

1	LEFT SIDE COOLING FAN
2	RIGHT SIDE COOLING FAN
R9	MEDIUM SPEED FC RELAY
R10	HIGH SPEED FC RELAY #1
R15	LOW SPEED FC RELAY
R16	HIGH SPEED FC RELAY #2

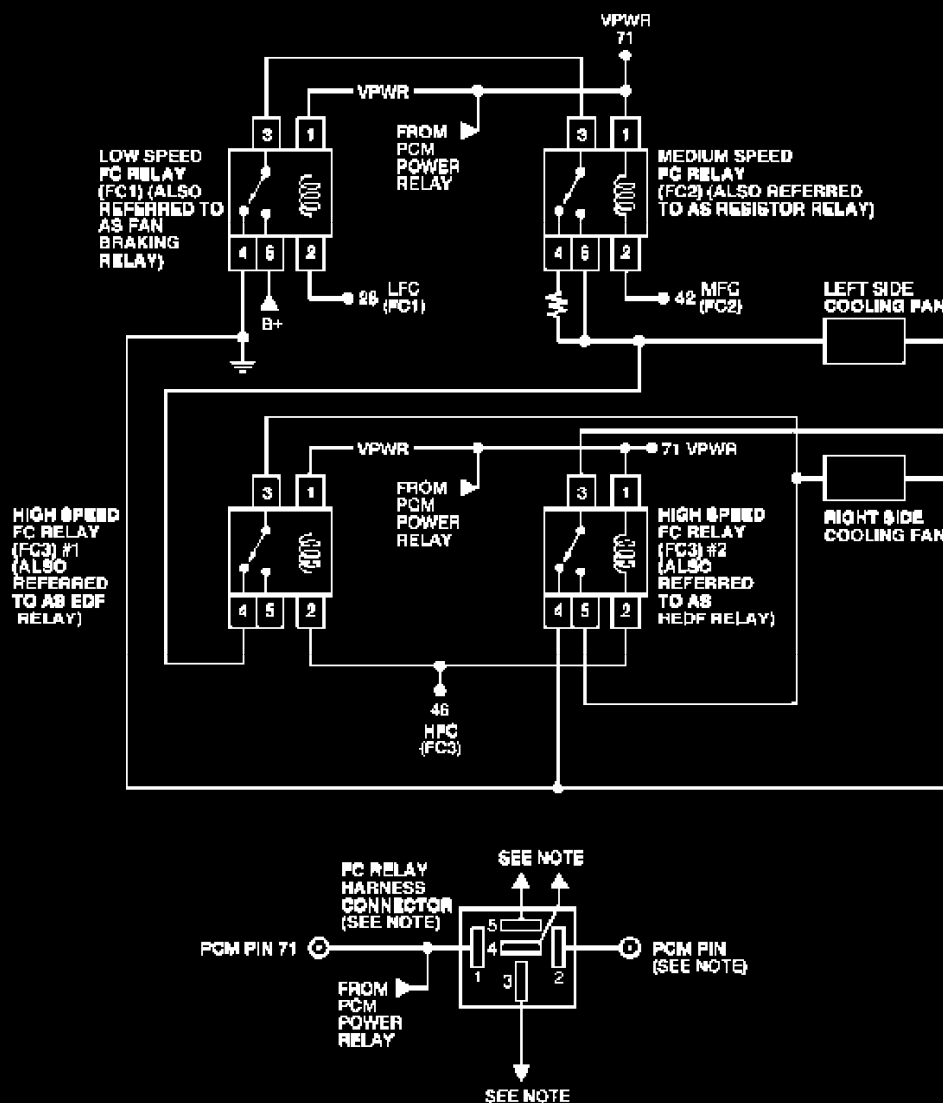
2.3L Focus (with A/C)



A0065B16

PCM CONNECTOR PIN NUMBERS			
PCM TYPE	VPWR	LFC	HFC
150 PIN	B35, B36	B39	B38

Taurus/Sable

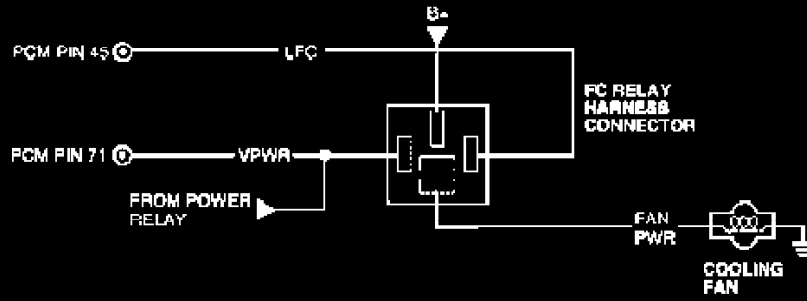


A0042252

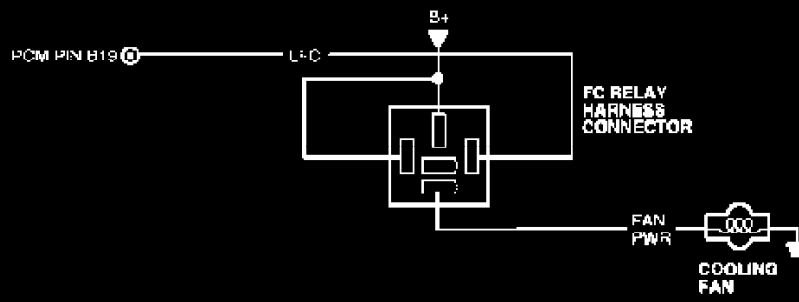
NOTE: REFER TO DRAWING ABOVE

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 Section 1 (PCM Outputs) for more information.

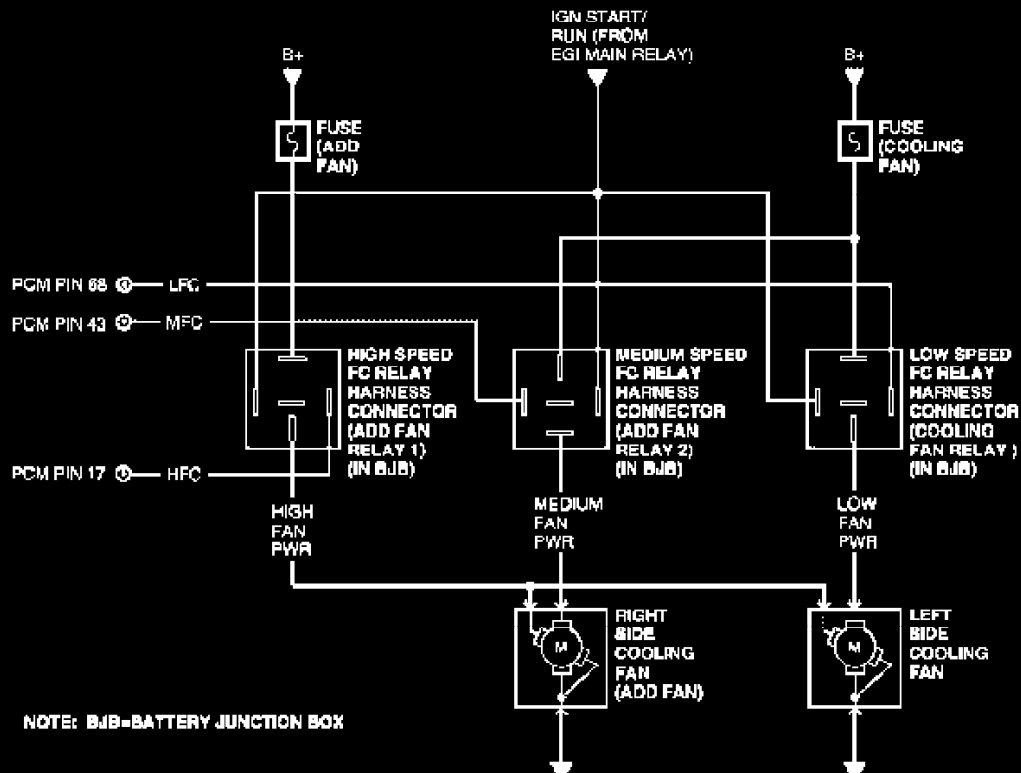
Ranger



Aviator



2.0L Escape

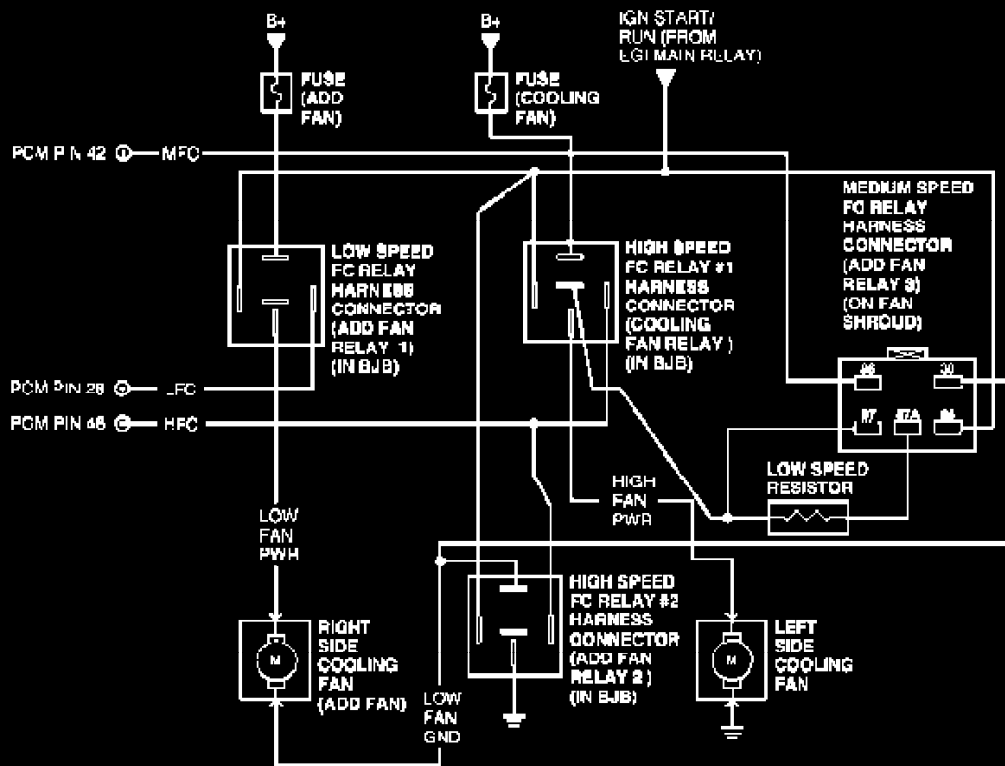


A0071669

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 Section 1 (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
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

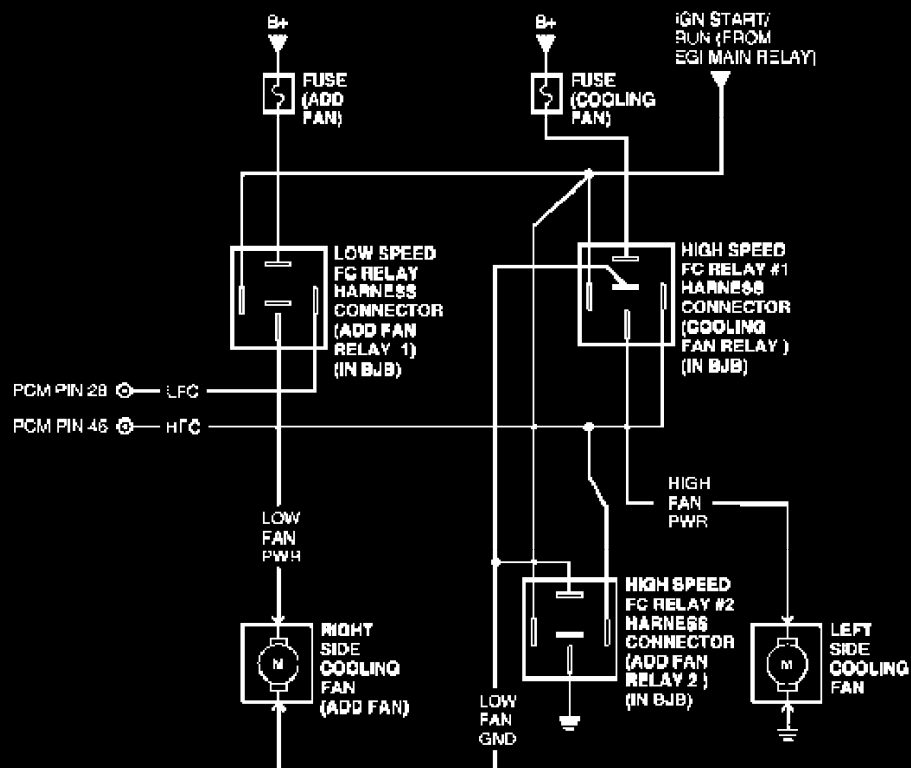
3.0L Escape (Early build with three speed fan. Medium Speed FC Relay will be on fan shroud)


NOTE: BJB=BATTERY JUNCTION BOX

A0071670

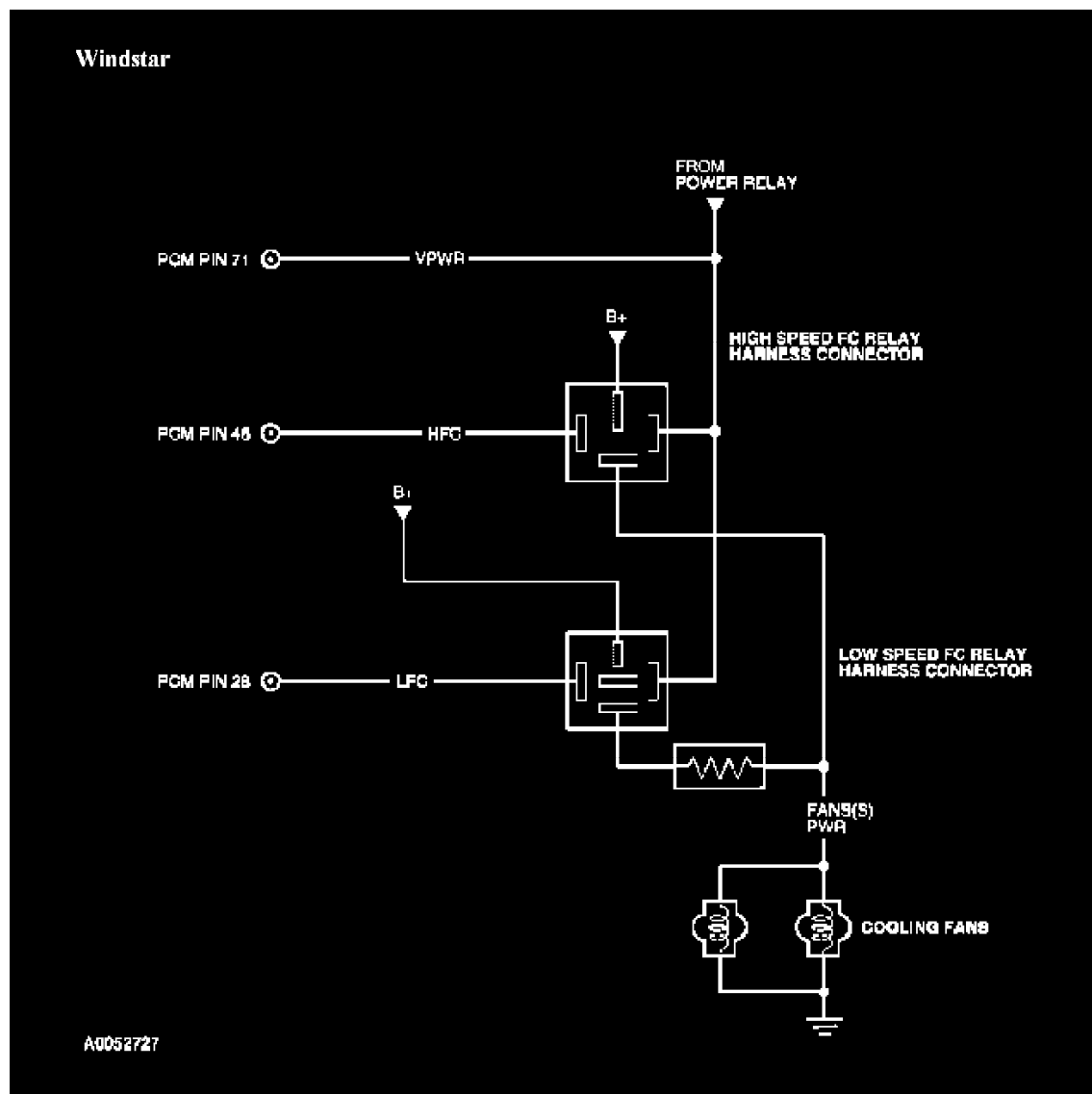
Note: Although the PCM output circuits are named low, medium and high speed fan control (FC), cooling fan speed is controlled by a combination of these outputs. Refer to Section 1 (PCM Outputs) for more information.

3.0L Escape (Late build with two speed fan. There will not be a Medium Speed FC Relay on the fan shroud)



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

A0071205



KF: Fan Control (FC) Relay**KF****KF1 DTC P1474(P0480)/P1477/P1479(P0481) 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.

DTC	Circuit/ Relay
P1474/P0480	LFC
P1477	MFC
P1479/P0481	HFC

- Disconnect appropriate fan control relay.
- Key on, engine off.
- Measure VPWR (IGN START/RUN for Escape, B+ for Aviator) circuit voltage at the applicable fan control relay harness connector.

Is voltage greater than 10.5 volts?

Yes	No
GO to KF2 .	REPAIR open power circuit to the applicable fan control relay.

KF1

KF2 CHECK FOR LFC, MFC or HFC CIRCUIT CYCLING

- Key on, engine off.
- Connect a non-powered test lamp between the power circuit (as tested in KF1) 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 low speed cooling fan on and off. Repeat test, commanding the high speed cooling fan on and off.

Does the test lamp turn on and off when either the low or high speed cooling fan output is commanded on and off?

Yes	No
REPLACE appropriate fan control relay.	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	No
KEY OFF. GO to KF4 .	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	No
GO to KF5 .	REPAIR short circuit.

KF2 - KF4

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit.

**KF6 DTC P1479/P0481 (2.0L Focus, 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 (refer to beginning of pinpoint test for relay naming).
- 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 KF7 .	REPAIR open circuit.

KF5 - KF6

KF7 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 . Repeat test, commanding the low speed cooling fan on and off.

Does the test lamp turn on and off when either the low or high speed cooling fan output is commanded on and off?

Yes	No
REPLACE high speed FC relay #1 (leave relay disconnected). Remain in Output Test Mode. GO to KF9 .	Leave test lamp connected. GO to KF8 .

KF8 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 (refer to beginning of pinpoint test for relay naming).
- While observing test lamp, again command the cooling fan on and off .

Does the test lamp now turn on and off when the cooling fan output is commanded on and off?

Yes	No
REPLACE high speed FC relay #2.	Leave high speed FC relay #2 disconnected. GO to KF3 to diagnose the HFC circuit. Make checks at the high speed FC relay #1 harness connector.

KF7 - KF8

KF9 VERIFY THERE IS NOT AN OPEN IN CIRCUIT SPECIFIC TO HIGH SPEED FC RELAY #2

- High speed FC relay #1 disconnected.
- While viewing the HFCF PID, command the high speed cooling fan on and off . Repeat test, commanding the low speed cooling fan on and off.

Does the HFCF PID indicate a fault (yes) when either the low or high speed cooling fan output is commanded on and off?

Yes	No
GO to KF27 .	High speed FC relay #1 replaced. Testing complete.

KF10 CONTINUOUS MEMORY DTC P1474/P0480: 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 B+, 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 .

KF9 - KF10

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 .

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 2.0L Focus, Taurus/Sable and 3.0L Escape:**
 - Disconnect medium speed FC relay (refer to beginning of pinpoint test for relay naming).
 - 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 VPWR (IGN START/RUN for Escape) circuit to the medium speed FC relay.
 - For 2.0L Escape, 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 Escape, lightly tap on the medium speed FC relay to simulate road shock.
- 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 .

KF20 CONTINUOUS MEMORY DTC P1479/P0481: 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, either one for others).
- Key on, engine off.
- Access Output Test Mode on scan tool.
- Command High Speed Fan on (if the test lamp does not turn on, command the 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 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.
 - Lightly tap on the high speed FC relay to simulate road shock.

Is a fault indicated?

Yes	No
ISOLATE fault and REPAIR as necessary.	GO to KF21 .

KF21 CHECK HFC CIRCUIT FOR SHORT TO GROUND

- Command 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	No
ISOLATE fault and REPAIR as necessary.	KEY OFF. GO to Z1 .

KF23 CONTINUOUS MEMORY DTC P1479/P0481 (2.0L Focus, Taurus/Sable, 3.0L Escape): 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 (if the test lamp does not turn on, command the 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 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	No
ISOLATE fault and REPAIR as necessary.	GO to KF24 .

KF24 CHECK FOR HFC CIRCUIT SHORT TO GROUND

- Key on, engine off.
- Command 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	No
ISOLATE fault and REPAIR as necessary.	KEY OFF. GO to Z1 .

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).
- Also, for 2.0L Focus, Taurus/Sable and 3.0L Escape with fan operates, but not correctly:
 - While viewing HFCF PID, disconnect one high speed FC relay. Reconnect relay and disconnect other high speed FC relay.

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 Escape: . GO to KF85 .
For 2.0L Focus, Taurus/Sable and 3.0L Escape with HFCF PID indicating a fault:	For Focus, Taurus/Sable and Aviator: . PCM primary circuits OK. Refer to Engine Cooling, Section 303-03, of the Workshop Manual to check secondary wiring to cooling fan.
GO to KF26 .	
All others:	All others:
GO to KF1 .	GO to KF30 .

KF26 DID HFCF PID INDICATE FAULT WITH BOTH RELAYS CONNECTED?**Did the HFCF PID indicate a fault with both high speed FC relays connected?**

Yes	No
KEY OFF. GO to KP6 and follow DTC P0481 diagnosis.	KEY OFF. Fault indicated with only one relay connected. GO to KF27 .

KF27 CHECK VPWR TO RELAY THAT WAS CONNECTED

Note: Make the following check at the relay that was CONNECTED when HFCF PID indicated a fault.

- Disconnect applicable high speed FC relay.
- Key on, engine off.
- Check VPWR (IGN START/RUN for Escape) circuit voltage at the applicable high speed FC relay harness connector.

Is voltage greater than 10.5 volts?

Yes	No
KEY OFF. GO to KF28 .	REPAIR open circuit.

KF28 CHECK HFC CIRCUIT BETWEEN HIGH SPEED FC RELAYS?

- Measure resistance of the HFC circuit between the high speed FC relay #1 and #2 harness connectors.

Is resistance less than 5.0 ohms?

Yes	No
REPLACE high speed FC relay that was connected when HFCF PID indicated a fault.	REPAIR open circuit.

**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 Section 3 Chart.	COMMAND cooling fan off. REMAIN in Output Test Mode. For Windstar : GO to KF50 . For Ranger: Fan will not operate. GO to KF41 . All others : GO to KF31 .

KF30

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 .

**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.

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.

KF40 - KF42

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.

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.

KF43 - KF47

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 .

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 .

KF52 - KF53

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.

KF56 - KF57

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 and 2.0L Focus (with A/C): Refer to Engine Cooling, Section 303, of the Workshop Manual 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 pinpoint test KM cover pages 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 the Climate Control System, General Information Section 412 of the Workshop Manual to check for over-pressurized A/C system, etc. If OK, REPLACE A/C high pressure switch.

KF60 - KF61

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

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 the Climate Control System, General Information Section 412 of the Workshop Manual to check for high A/C system pressure and other checks as directed.	Input is not causing the fan to run. GO to KF65 .

KF62 - KF63

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 any fan continue to run?

Yes	No
For Focus (without A/C) and Ranger: REPAIR FAN PWR circuit for short to power.	KEY OFF. GO to KF80 .
All others: KEY OFF. GO to KF66 .	

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, Ranger and Windstar: REPAIR FAN PWR circuit for short to power.	KEY OFF. For 3.0L Escape with two speed fan: GO to KF69 . All others: GO to KF80 .
For 2.0L Escape: KEY OFF. GO to KF68 .	
For 3.0L Escape: If right side fan always runs, REPAIR LOW FAN PWR circuit short to power. If left side fan always runs, REPAIR HIGH FAN PWR (or LEFT FAN PWR) short to power.	
All others: KEY OFF. GO to KF67 .	

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.

KF68 CHECK MEDIUM SPEED FC RELAY

- Low speed and high speed FC relays disconnected.
- Disconnect medium speed FC relay.
- Key on, engine off.

Does fan continue to run?

Yes	No
KEY OFF. If both fans run, REPAIR HIGH FAN PWR circuit short to power. If only one fan runs, REPAIR the circuit to that fan for short to power (either the LOW FAN PWR or MEDIUM FAN PWR circuit).	KEY OFF. REPLACE medium speed FC relay.

KF69 CHECK RIGHT FAN PWR AND FROM RIGHT FAN CIRCUITS FOR SHORT TO POWER

- Low Speed FC relay and High Speed FC relay #1 disconnected.
- Disconnect High Speed FC relay #2.
- Disconnect right cooling fan.
- Key on, engine off.
- Measure voltage between RIGHT FAN PWR circuit and ground at the right cooling fan harness connector.
- Measure voltage between FROM RIGHT FAN circuit and ground at the right cooling fan harness connector.

Are both voltages less than 1.0 volt?

Yes	No
KEY OFF. GO to KF80 .	REPAIR short to power.

KF70 ONE COOLING FAN MOTOR DOES NOT OPERATE WHEN THE OTHER COOLING FAN MOTOR OPERATES (NO DTCs): CHECK FOR OPEN GROUND CIRCUIT TO INOPERATIVE FAN

- Disconnect inoperative cooling fan.
- Measure resistance of ground circuit between fan harness connector and ground.

Is resistance less than 5.0 ohms?

Yes	No
GO to KF71 .	REPAIR open circuit.

KF71 COMMAND FAN ON AND CHECK FOR POWER TO FAN

- Disconnect the other cooling fan (so both are disconnected).
- Access Output Test Mode on scan tool.
- Command high speed fan on.
- Measure voltage to the (HIGH) FAN PWR circuit(s) at the inoperative fan harness connector.

Is voltage greater than 10.0 volts?

Yes	No
REPLACE inoperative cooling fan.	REPAIR open in FAN PWR circuit between inoperative cooling fan and splice to other fan.

KF70 - KF71**KF75 IS SCAN TOOL CAPABLE OF VIEWING PIDS WHILE IN OUTPUT TEST MODE?**

Note: The symptom low, medium and/or high speed fan inoperative can be caused by a primary circuit fault, even though a DTC was not set. The next test step will check the primary circuit operation.

Is scan tool being used capable of viewing PIDs while in Output Test Mode?

Yes	No
GO to KF76 .	For low speed fan inoperative (fan inoperative for one speed fan applications): GO to KF77 . For medium speed fan inoperative (Escape): GO to KF78 . For high speed fan inoperative: GO to KF79 .

KF75

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 P0480 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 P0481 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.	KEY OFF. An LFC primary fault is detected.
REPLACE the low speed FC relay. VERIFY applicable FAN PWR circuit is not short to ground.	GO to KF1 and follow DTC P0480 diagnosis.

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.	KEY OFF. An MFC primary fault is detected.
REPLACE the medium speed FC relay. VERIFY applicable FAN PWR circuit is not short to ground.	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 P0481 diagnosis.

KF79

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	No
KEY OFF. An HFC or LFC primary circuit fault is detected.	
If the LFCF PID indicated a fault:	
GO to KF1 and follow DTC P0480 diagnosis.	Primary circuits OK.
If the HFCF PID indicated a fault:	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.
For 3.0L Escape:	
GO to KF6 and follow DTC P0481 diagnosis.	
All others:	
GO to KF1 and follow DTC P0481 diagnosis.	

KF80

**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 cooling fans should be running at low speed (For 2.0L, both the low speed and medium speed fans will be commanded on by the PCM).
- 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 Section 3 Chart.	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 with two speed fan (refer to pinpoint test intro): GO to KF130 . For 3.0L with three speed fan (refer to pinpoint test intro): ▪ 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 .

KF85

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.

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).

KF86 - KF87

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.

KF88 - KF89

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.

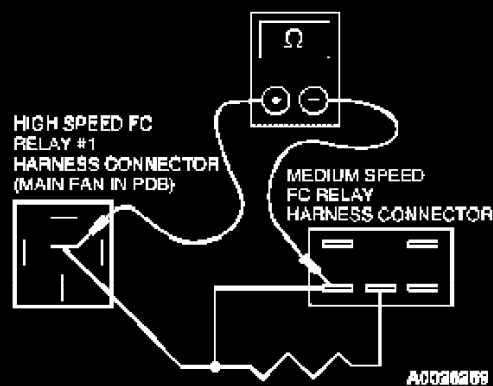
Is resistance less than 5.0 ohms?

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).

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?



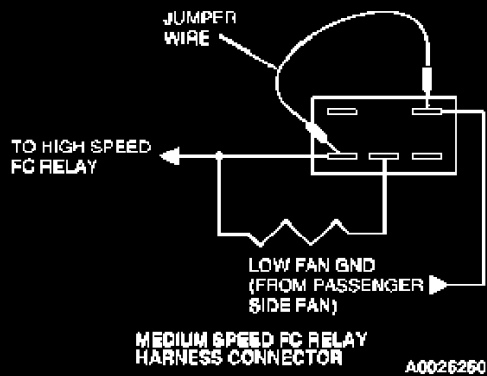
Yes	No
GO to KF97 .	REPAIR open circuit between medium speed FC relay and high speed FC relay #1.

KF95 - KF96

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?



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 Section 3 .	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 .

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 .

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	No
REPLACE passenger side cooling fan.	REPAIR open LOW FAN GND circuit between fan and splice to high speed FC relay #2.

KF110 - KF112

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	No
REPLACE low speed FC relay.	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	No
Passenger side fan did not operate at high speed. GO to KF118 .	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	No
KEY OFF. REPLACE high speed FC relay #1.	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 10.6 volts?

Yes	No
KEY OFF. GO to KF121 .	GO to KF119 .

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.

KF118 - KF121

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 Section 3 .

KF130 DID LOW SPEED FAN OPERATE?**With low speed fan commanded on, did the fans operate?**

Yes	No
Low speed fan operates. For left fan does not operate with high speed fan commanded on: GO to KF134 . For right fan does not operate with high speed fan commanded on: GO to KF135 .	Low speed fan does not operate correctly. GO to KF131 .

KF131 DID AT LEAST ONE FAN MOTOR OPERATE WITH HIGH SPEED FAN COMMANDED ON?**Did at least one fan operate with high speed fan commanded on?**

Yes	No
For left fan does not operate with high speed fan commanded on: GO to KF140 . For right fan does not operate with high speed fan commanded on: GO to KF145 . For both fans operate with high speed fan commanded on: GO to KF150 .	B+ fault to both the Low Speed FC relay and High Speed FC relay #1. CHECK condition of related fuses. If OK, REPAIR open circuit. If fuse is damaged, CHECK B+ and LEFT FAN PWR circuits for short to ground before replacing.

KF134 CHECK B+ VOLTAGE TO HIGH SPEED FC RELAY #1

- Disconnect High Speed FC relay #1.
- Measure B+ circuit voltage at the High Speed FC relay #1 harness connector.

Is voltage greater than 10.5 volts?

Yes	No
REPLACE High Speed FC relay #1.	B+ fault to High Speed FC relay #1. CHECK condition of related fuses. If OK, REPAIR open circuit. If fuse is damaged, CHECK B+ and LEFT FAN PWR circuits for short to ground before replacing.

KF135 CHECK GROUND TO HIGH SPEED FC RELAY #2

- Disconnect High Speed FC relay #2.
- Measure resistance of ground circuit between the High Speed FC relay #2 harness connector and chassis ground.

Is resistance less than 5.0 ohms?

Yes	No
GO to KF136 .	REPAIR open circuit.

KF131 - KF135

KF136 CHECK CIRCUIT CONTINUITY BETWEEN HIGH SPEED FC RELAY #2 AND RIGHT FAN

- Disconnect right fan.
- Measure resistance of FROM RIGHT FAN circuit between the High Speed FC relay #2 and right fan harness connectors.

Is resistance less than 5.0 ohms?

Yes	No
REPLACE High Speed FC relay #2.	REPAIR open circuit between High Speed FC relay #2 and splice.

KF140 CHECK GROUND TO LEFT FAN

- Disconnect left fan.
- Measure resistance of the ground circuit between the left fan harness connector and chassis ground.

Is resistance less than 5.0 ohms?

Yes	No
GO to KF140 .	REPAIR open circuit.

KF141 CHECK LEFT FAN FOR OPEN

- Measure resistance of left fan.

Is resistance less than 5.0 ohms?

Yes	No
GO to KF142 .	REPLACE left fan.

KF142 CHECK FOR OPEN LEFT FAN PWR CIRCUIT

- Disconnect High Speed FC relay #1.
- Measure resistance of LEFT FAN PWR circuit between the High Speed FC relay #1 and left fan harness connectors.

Is resistance less than 5.0 ohms?

Yes	No
REPLACE High Speed FC relay #1.	REPAIR open circuit.

KF145 CHECK B+ VOLTAGE TO LOW SPEED FC RELAY

- Disconnect Low Speed FC relay.
- Measure B+ voltage at Low Speed FC relay harness connector.

Is voltage greater than 10.5 volts?

Yes	No
GO to KF146 .	B+ fault to Low Speed FC relay. CHECK condition of related fuses. If OK, REPAIR open circuit. If fuse is damaged, CHECK B+ and right fan circuits for short to ground before replacing.

KF146 CHECK FOR OPEN RIGHT FAN PWR CIRCUIT

- Disconnect right fan.
- Measure resistance of RIGHT FAN PWR circuit between the Low Speed FC relay and right fan harness connectors.

Is resistance less than 6.0 ohms?

Yes	No
GO to KF147 .	REPAIR open circuit.

KF147 CHECK RIGHT FAN FOR OPEN

- Measure resistance of right fan.

Is resistance less than 5.0 ohms?

Yes	No
GO to KF148 .	REPLACE right fan.

KF148 CHECK FROM RIGHT FAN CIRCUIT FOR OPEN

- Disconnect High Speed FC relay #1.
- Measure resistance of FROM RIGHT FAN circuit between the High Speed FC relay #1 and Low Speed FC relay harness connectors.

Is resistance less than 5.0 ohms?

Yes	No
REPLACE Low Speed FC relay.	REPAIR open circuit between right fan and splice.

KF150 CHECK FROM RIGHT FAN CIRCUIT FOR OPEN

- Disconnect right fan.
- Disconnect High Speed FC relay #1.
- Measure resistance of FROM RIGHT FAN circuit between the right fan and High Speed FC relay #1 harness connectors.

Is resistance less than 5.0 ohms?

Yes	No
REPLACE High Speed FC relay #1.	REPAIR open circuit between High Speed FC relay #1 and splice.

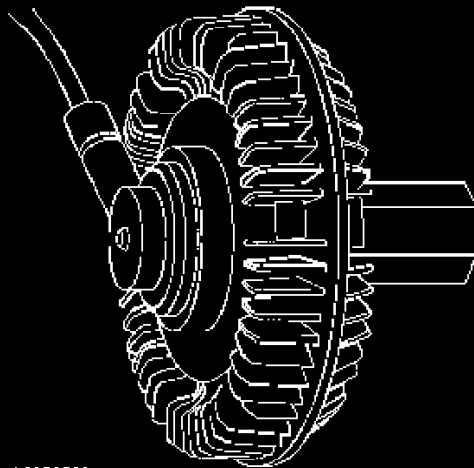
KF150**Test KG: Viscronic Drive Fan (VDF) Clutch****KG: Viscronic Drive Fan (VDF) Clutch
Introduction****KG****Note**

This Pinpoint Test is intended to diagnose the following:

- Viscronic Drive Fan Clutch(8A616)
- Viscronic 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

For PCM connector views, refer to Section 1, Powertrain Control Hardware

Viscronic Drive Fan (VDF) Clutch**A0009260**

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

KG INTRODUCTION 2 OF 2

KG: Viscronic Drive Fan (VDF) Clutch**KG****KG1 DTC P0480****Is DTC P0480 a Continuous DTC only?**

Yes	No
GO to KG2 .	GO to KG4 .

KG2 CONTINUOUS DTC P0480:

- Access FANVAR_F PID (depending on scan tool, the PID may be named VFCE).
- Key On, Engine Off.
- 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?

Yes	No
ISOLATE fault and REPAIR as Necessary.	GO to Z1 for intermittent fault diagnosis.

KG4 CHECK VDF SOLENOID RESISTANCE

- Key off.
- Disconnect VDF solenoid.
- Measure VDF solenoid resistance between VPWR and FC-V pins at VDF pigtail.

Is resistance between 6.0 and 10.0 ohms?

Yes	No
GO to KG5 .	CHECK VDF harness pigtail from the connector to the VDF, for open or short circuits. REPAIR if necessary. If OK, REPLACE VDF assembly.

KG1 - KG4

KG5 CHECK VPWR VOLTAGE TO VDF SOLENOID

- Key on, engine off.
- Measure VPWR circuit voltage at VDF vehicle connector.

Is voltage greater than 10.5 volts?

Yes	No
KEY OFF. GO to KG6 .	REPAIR open or short circuit.

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.

KG5 - KG7

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 Engine Cooling, Section 303 in the Workshop Manual for diagnosis and testing. If OK, REPLACE PCM (refer to Section 2, 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 .

KG8 - KG10

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 Engine Cooling, Section 303 in the Workshop Manual for diagnosis and testing.	GO to Z1 for intermittent fault diagnosis.

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.

KG12 - KG14

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.

KG15 - KG17

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 Engine Cooling, Section 303 in the Workshop Manual for diagnosis and testing. If OK, REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

KG18 - KG19**Test KJ: Supercharge Bypass Control****KJ: Supercharge Bypass Control**
Introduction**KJ****Note**

This Pinpoint Test is intended to diagnose the following:

- Supercharger (boost) bypass solenoid (9H465) (service part name is: thermactor air control solenoid/vacuum valve assembly)
- Vacuum reservoir assembly (9J442)
- Vacuum hoses/tubes
- Harness circuits: SCB, vehicle power (VPWR), and power ground (PWR GND)
- Powertrain control module (PCM) (12A650)

This Pinpoint Test is used to assist in diagnosing the following Supercharger components:

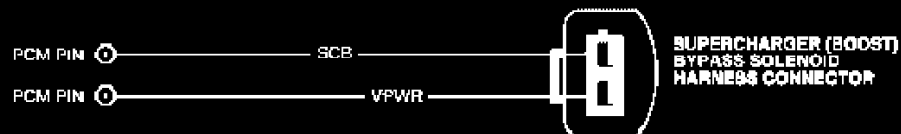
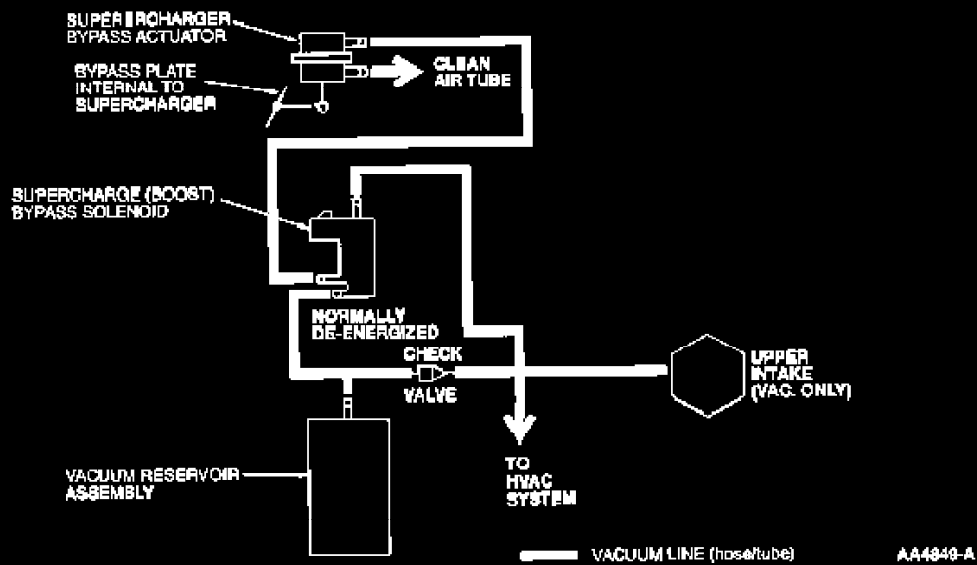
- Supercharger assembly (including supercharger bypass actuator) (6F076)

KJ INTRODUCTION 1 OF 2

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware

Typical Supercharger Bypass Solenoid Vacuum Routing



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
A0050880

PCM Connector Pin Number Chart		
Vehicle Application	SCB	VPWR
5.4L SC	42	71/97
4.6L SC	45	71/97

KJ: Supercharge Bypass Control**KJ****KJ1 DTC P0234: CHECK FOR OTHER DTCS**

Note: The supercharger will be bypassed when the brake is on and the throttle is depressed in the wide open throttle position. This is called brake torque and the engine torque is too high.

- Check that the engine has not been subjected to brake torque causing the P0234.
- Drive the vehicle for 10 to 15 minutes with the engine exceeding 2,000 rpm and the engine temperature stabilizing.
 - **No Starts:**
 - GO to A1 .
 - **For Stalls:**
 - Return to Section 3 , Symptom Charts.
- Return to repair area and check that upper radiator hose is hot and pressurized.
- Rerun Quick Test and retrieve KOER and continuous and retrieve DTCs.

Are any other KOEO, KOER and Continuous Memory DTCs present with the KOER or Continuous Memory P0234?

Yes	No
KEY OFF. GO to Section 4, Powertrain Diagnostic Trouble Code (DTC) Charts , for Pinpoint Test direction and REPAIR DTCs.	GO to KJ2 .

KJ1

KJ2 CHECK SCAN TOOL PIDS FOR CAUSES OF OVERBOOST CONDITION

- Key on, engine running.
- Access IAT2, TFT (5.4L SC only) and RPM PIDs.
- Observe the PIDs for values exceeding the following limits:
 - Intake air temperature (downstream), IAT2 PID greater than 230°F.
 - Transmission fluid temperature, TFT PID greater than 275°F (5.4L SC only).

Do any of the above PIDs exceed the limit?

Yes	No
For IAT2: CHECK for low fluid level in Intercooler System. CHECK for cracked intercooler lines. REPAIR as necessary. For TFT (5.4L only): CHECK for low transmission fluid level. REFER to Automatic Transmission Section 307 in the Workshop Manual for fluid changes.	GO to KJ3 .

KJ3 CHECK FOR LOW SPEED FUEL PUMP RELAY NOT SWITCHING

- Key on, engine running.
- Access LPPF PID.

Is a fault indicated on the low speed fuel pump (FP) output?

Yes	No
KEY OFF. GO to Section 4, Powertrain Diagnostic Trouble Code (DTC) Charts for diagnostic direction following DTC P1232.	CHECK for indications of engine knock while driving the vehicle. REPAIR as necessary. If OK, indicate to vehicle owner that transmission damage will occur upon brake torque (reference: GO to KJ1). Otherwise, unable to determine cause of overboost condition at this time.

KJ6 DTC P0243: CHECK SUPERCHARGER (BOOST) BYPASS SOLENOID OUTPUT

- Key off.
- Disconnect supercharger (boost) bypass (SCB) solenoid.
- Connect a non-powered test lamp between SCB and VPWR circuits at the SCB solenoid harness connector.
- Key on, engine off.
- Attempt to close and open SCB solenoid driver in PCM by accessing Output Test Mode or scan tool.
- While observing the test lamp, command the PCM outputs on and off.

Does the test lamp cycle on and off (light up and turn off)?

Yes	No
KEY OFF. GO to KJ7 .	For test lamp always off : GO to KJ8 . For test lamp always on : KEY OFF. GO to KJ11 .

KJ7 CHECK SCB SOLENOID RESISTANCE

- Measure SCB solenoid resistance.

Is resistance between 68 and 78 ohms?

Yes	No
CHECK for damaged vacuum hoses between engine intake manifold and SCB solenoid. CHECK for vacuum reservoir assembly leaks. REPAIR or REPLACE as necessary. If OK, GO to Z1 for intermittent diagnosis.	REPLACE damaged SCB solenoid.

KJ8 CHECK FOR OPEN VPWR CIRCUIT BETWEEN SCB SOLENOID AND POWER RELAY

- Measure voltage between VPWR circuit at the SCB solenoid harness connector and battery negative post.

Is voltage greater than 10.5 volts?

Yes	No
KEY OFF. GO to KJ10 .	KEY OFF. GO to KJ9

KJ9 CHECK VPWR CIRCUIT FOR OPEN IN HARNESS

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

- Disconnect PCM.
- Measure resistance of VPWR circuit between PCM harness connector pin and SCB solenoid harness connector.

Is resistance less than 5.0 ohms?

Yes	No
GO to KJ10 .	REPAIR open circuit.

KJ10 CHECK SCB CIRCUIT FOR OPEN IN HARNESS

- Measure resistance of SCB circuit between PCM harness connector pin and SCB solenoid harness connector.

Is resistance less than 5.0 ohms?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit.

KJ11 CHECK SCB CIRCUIT FOR SHORT TO PWR GND IN HARNESS

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

- Disconnect PCM.
- Disconnect scan tool from DLC.
- Measure resistance between SCB circuit and multiple PWR GND circuits at the PCM harness connector.

Are all resistances greater than 10,000 ohms?

Yes	No
RECONNECT scan tool. GO to KJ12 .	REPAIR short circuit.

KJ12 CHECK SCB CIRCUIT FOR SHORT TO PWR OR CHASSIS GND IN HARNESS

- Key on, engine off.
- Measure voltage between SCB circuit at the PCM harness connector and chassis ground.

Is voltage less than 1.0 volts?

Yes	No
KEY OFF. REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	KEY OFF. REPAIR short circuit to VPWR, VREF or chassis ground.

KJ13 LACK OF POWER (LOW BOOST) - CHECK VACUUM HOSES

Note: For vehicle specific vacuum hose routing, refer to the vehicle information decal located in the front of the engine compartment.

- Check for holes or cracks in the vacuum hose/tube between the supercharger bypass actuator and the supercharger bypass solenoid.
- Check for holes or cracks in the vacuum hose/tube between the supercharger bypass solenoid and vacuum reservoir assembly.
- Check for bends or kinks in the vacuum hose/tube between the supercharger bypass actuator and the supercharger bypass solenoid.
- Check for bends or kinks in the vacuum hose/tube between the supercharger bypass solenoid and vacuum reservoir assembly.
- Check for disconnect hose(s) between the supercharger bypass actuator, supercharger bypass solenoid and vacuum reservoir assembly.

Are any leaks (holes or cracks) or restrictions (bends or kinks) in the vacuum hose(s) present?

Yes	No
REPAIR or REPLACE vacuum hose(s)/tube as necessary.	RETURN to Section 3 , Symptom Chart 8 for Lack/Loss of Power.

KJ12 - KJ13

Test KL: Shift Indicator Lamp (SIL)

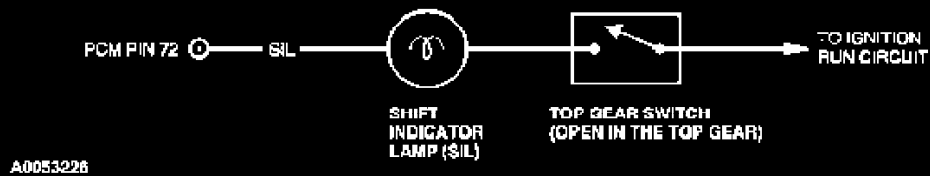
KL: Shift Indicator Lamp (SIL)**KL****Introduction****Note**

This Pinpoint Test is intended to diagnose the following:

- Harness circuit: SIL
- SIL bulb and SIL circuit fuse
- Top (high) gear switch
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematic

Escort ZX2

**KL INTRODUCTION**

KL: Shift Indicator Lamp (SIL)**KL****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 completed, accelerating from a sustained moderate engine speed or while in high 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 high gear.

Is the 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 the fuse OK?

Yes	No
INSTALL SIL circuit fuse. GO to KL3 .	REPAIR short circuit, REPLACE SIL circuit fuse.

KL3 CHECK SIL BULB

- Remove SIL bulb and inspect. Perform a continuity check if you suspect an open filament and cannot determine the bulb's condition visually.

Is the SIL bulb OK?

Yes	No
GO to KL5 .	REPLACE SIL bulb.

KL1 - KL3

KL4 CHECK SIL CIRCUIT FOR SHORT TO GROUND IN HARNESS

- Shift transmission into high gear.
- Disconnect PCM.
- Measure resistance between the SIL circuit at PCM harness connector and the battery (-) terminal.

Is resistance greater than 10K ohms?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

KL5 CHECK IGN START/RUN VOLTAGE TO SIL SOCKET

- Remove SIL bulb.
- Place transmission in any forward gear except high.
- Key ON, Engine OFF.
- Measure voltage of the SIL circuit between the SIL socket and chassis ground.

Is the voltage greater than 10.5V DC?

Yes	No
KEY OFF. GO to KL8 .	KEY OFF. GO to KL6 .

KL6 CHECK FOR PRESENCE OF A TOP (HIGH) GEAR SWITCH**Is the vehicle equipped with a top gear switch?**

Yes	No
KEY OFF. GO to KL7 .	KEY OFF. GO to KL8 .

KL7 CHECK OPERATION OF TOP GEAR SWITCH

- Place transmission in any forward gear except high.
- Disconnect top gear switch.
- Measure resistance of top gear switch.

Is resistance less than 5 ohms?

Yes	No
REPAIR open circuit.	REPLACE top gear switch.

KL8 CHECK SIL CIRCUIT FOR OPEN IN HARNESS

- Disconnect PCM.
- Measure resistance between SIL circuit at PCM harness connector and SIL bulb socket.

Is resistance less than 5 ohms?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit.

KL8**Test KM: A/C Clutch Relay, A/C Circuits****KM: A/C Clutch Relay, A/C Circuits
Introduction****KM****Note**

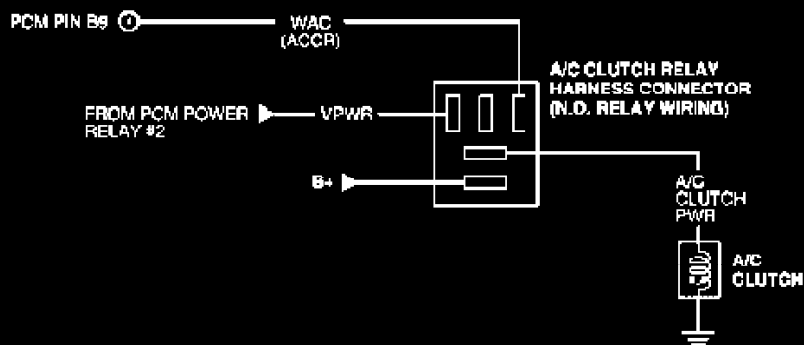
This Pinpoint Test is intended to diagnose the following:

- Harness circuits: VPWR, A/CCS, WAC, A/C Clutch PWR
- A/C clutch relay
- Powertrain control module (PCM) (12A650)

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware.

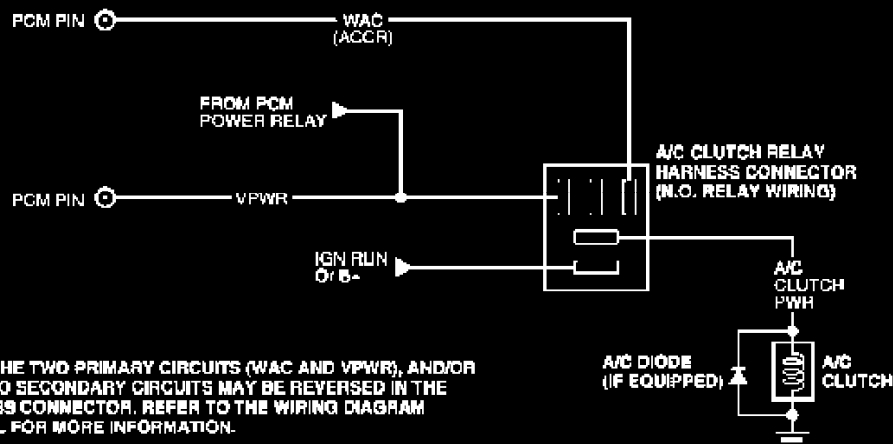
LS6/LS8, Thunderbird



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KM INTRODUCTION 1 OF 6

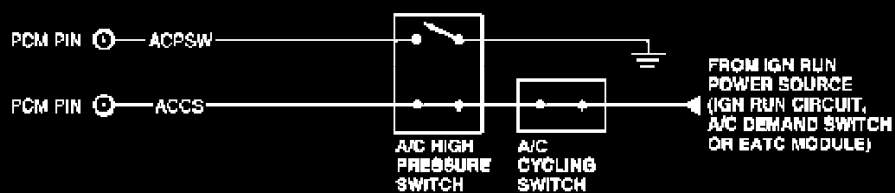
Focus, Taurus/Sable, Crown Victoria/Grand Marquis, Town Car, Escape, Ranger,
Explorer/Mountaineer, Windstar, Aviator



A0051424

PCM CONNECTOR PIN NUMBERS		
PCM TYPE	WAC (ACCR)	VPWR
104 PIN	69	71
150 PIN (2.3L Focus)	B25	B35/B36
150 PIN (except 2.3L Focus)	B9	B32/B33

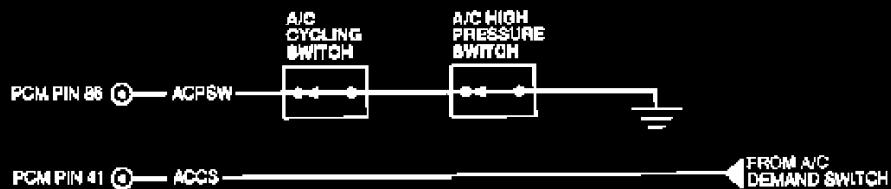
Focus, Taurus/Sable, Escape, (ACPSW and ACCS circuits)



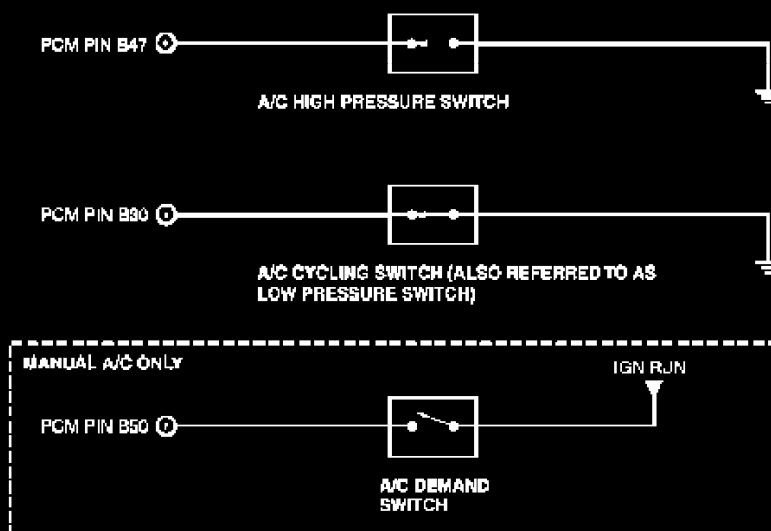
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PCM CONNECTOR PIN NUMBERS		
APPLICATION	ACPSW	ACCS

2.3L Focus	B26	B3
All Others	86	41

Ranger, Explorer Sport/Sport Trac, (ACPSW and ACCS circuits)

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Aviator, Explorer/Mountaineer (except Sport/Sport Trac)(ACPSW circuits)

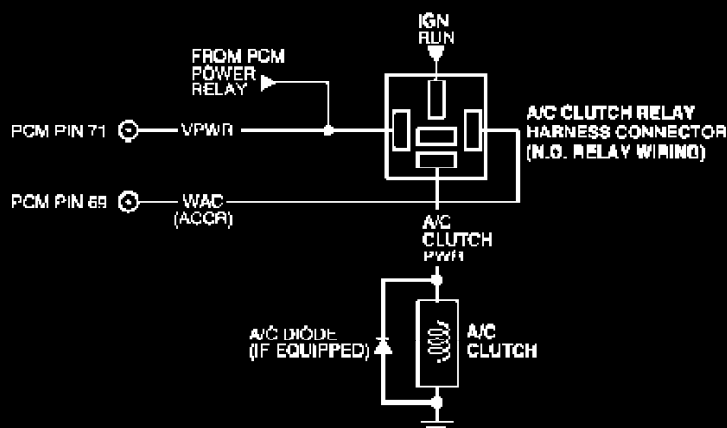
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Crown Victoria/Grand Marquis, Town Car, Windstar (ACCS Circuit)



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F-Series, Expedition, Navigator, Blackwood, Excursion, 4.2L E-Series

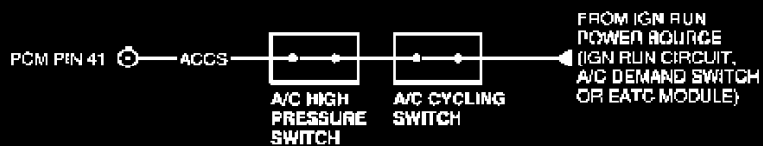


NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

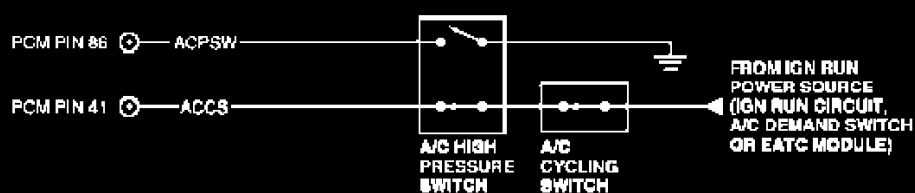
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Note: The two primary circuits (WAC and VPWR), and/or the two secondary circuits may be reversed in the harness connector. Refer to the Wiring Diagram Manual for more information.

PCM CONNECTOR PIN NUMBERS		
PCM TYPE	WAC (ACCR)	VPWR
Expedition, Navigator	B2	B34/B46
All others	69	71

F-Series (F-150 without electric fan control), Blackwood, Excursion, 4.2L E-Series (ACCS Circuit)

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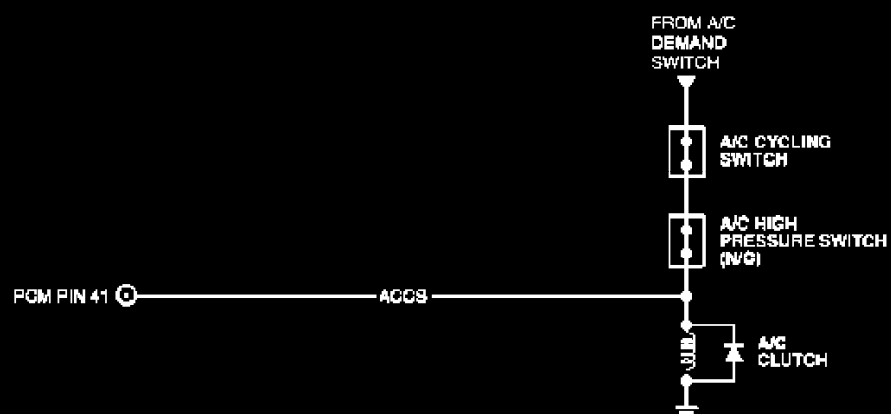
F-150 (with electric fan control)(ACPSW and ACCS circuits)

A0005283

Expedition, Navigator (ACCS Circuit)

A0051427

E-Series (Except 4.2L)



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

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KM INTRODUCTION 6 OF 6

KM: A/C Clutch Relay, A/C Circuits**KM****KM1 KOEO/KOER DTC P1460 or P0645: 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 DTC P1460/P0645 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 the Climate Control System, Section 412, in the Workshop Manual 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.

KM1 - KM2

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 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 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.

KM3 - KM5

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 Section 2, 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 Section 3 to continue low idle diagnosis, or REFER to the Climate Control System, Section 412, in the Workshop Manual to diagnose A/C system concerns.

KM6 - KM10

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit.

KM19 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
E-Series (except 4.2L): GO to KM20 . All others: ACCS input to PCM is requesting A/C. REFER to the Climate Control System, Section 412, in the Workshop Manual to diagnose symptom (A/C always on).	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	No
VERIFY operation of A/C demand switch. REFER to the Climate Control System, Section 412 in the Workshop Manual. If OK, REPAIR short to power in A/C Demand circuit to A/C cycling switch.	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	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

KM20 - KM21

KM30 CONTINUOUS MEMORY DTC P1460 or P0645: 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/P0645 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. CLEAR the 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. CLEAR the 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 KN: Variable Speed Electric Cooling Fan

KN: Variable Speed Electric Cooling Fan Introduction

KN

Note

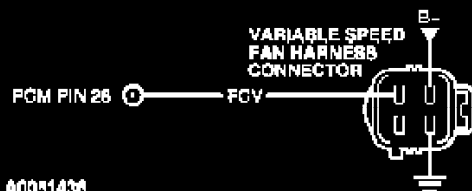
This Pinpoint Test is intended to diagnose the following:

- Variable Speed Electric Cooling Fan (8T00)
- Harness circuits: FCV, B+, VPWR, ground
- Powertrain control module (PCM) (12A650)

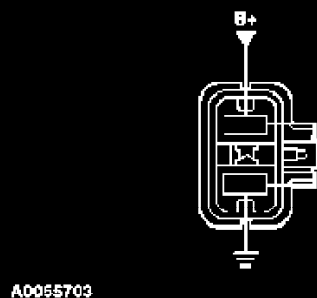
Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware

Crown Victoria/Grand Marquis, Town Car

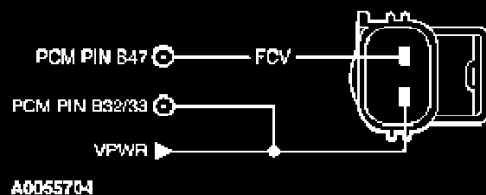


LS6/LS8 and Thunderbird: COOLING FAN MOTOR HARNESS CONNECTOR



KN INTRODUCTION 1 OF 2

LS6/LS8 and Thunderbird: COOLING FAN CONTROLLER HARNESS CONNECTOR



KN INTRODUCTION 2 OF 2

KN: Variable Speed Electric Cooling Fan**KN****KN1 DTC P1474 OR P0480 (CROWN VICTORIA/GRAND MARQUIS, TOWN CAR): CHECK B+ AND GROUND TO COOLING FAN**

- Key off.
- Disconnect cooling fan.
- Measure voltage between B+ and ground circuits at the cooling fan harness connector.

Is voltage greater than 10.5 volts?

Yes	No
GO to KN5 .	GO to KN2 .

KN2 CHECK B+ VOLTAGE TO FAN USING CHASSIS GROUND AS REFERENCE

- Measure voltage between B+ at the cooling fan harness connector and chassis ground.

Is voltage greater than 10.5 volts?

Yes	No
REPAIR open ground circuit.	VERIFY integrity of related fuse. If OK, REPAIR open B+ circuit. If fuse is damaged, CHECK B+ circuit for short to ground before replacing.

KN1 - KN2

KN5 CHECK FCV CIRCUITS TO FAN

- Connect 1.6K ohm resistor between the FCV and B+ circuits at the cooling fan harness connector (this simulates cooling fan circuitry).
- Key on, engine off.
- Perform Key On, Engine Off (KOEO) Self-Test

Is KOEO P0480 or P1474 still present?

Yes	No
KEY OFF. GO to KN6 .	REPLACE cooling fan module.

KN6 CHECK FCV CIRCUIT FOR SHORT TO POWER IN HARNESS

- Disconnect PCM.
- Key on.
- Measure voltage between FCV circuit at the cooling fan harness connector and ground.

Is voltage less than 1.0 volt?

Yes	No
KEY OFF. GO to KN7 .	REPAIR short circuit.

KN7 CHECK FCV CIRCUIT FOR SHORT TO GROUND IN HARNESS

- Disconnect scan tool from DLC.
- Measure resistance between FCV circuit at the cooling fan harness connector and ground.

Is resistance greater than 10,000 ohms?

Yes	No
GO to KN8 .	REPAIR short circuit.

KN5 - KN7

KN8 CHECK FOR OPEN FCV CIRCUIT

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

- Measure resistance of the FCV circuit between the PCM and the cooling fan harness connector.

Is resistance less than 5.0 ohms?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit.

KN10 CONTINUOUS MEMORY DTC P1474 OR P0480: CHECK FOR INTERMITTENT B+ AND GROUND TO COOLING FAN

- Key off.
- Disconnect cooling fan.
- Connect a non-powered test lamp between the B+ and ground circuits at the cooling fan harness connector.
- Observe test lamp for an indication of a fault while performing the following (the lamp will turn off when a fault is detected):
 - Shake, wiggle, bend the B+ and ground circuits to the cooling fan.
 - Lightly tap/wiggle the associated fuse.

Is a fault indicated?

Yes	No
ISOLATE fault and repair as necessary.	GO to KN11 .

KN8 - KN10

KN11 CHECK FOR INTERMITTENT FCV CIRCUIT TO COOLING FAN

- Connect 1.6K ohm resistor between the FCV and B+ circuits at the cooling fan harness connector (this simulates cooling fan circuitry).
- Connect DVOM between FCV circuit at the cooling fan harness connector and ground.
- Key on, engine off.
- Access Output Test Mode on scan tool.
- Command low speed fan on.
- Observe DVOM for an indication of a fault while performing the following (The DVOM volts will change suddenly when a fault is detected):
 - Shake, wiggle, bend the FCV circuit between the cooling fan and PCM.

Is a fault indicated?

Yes	No
KEY OFF. ISOLATE fault and REPAIR as necessary.	KEY OFF. GO to Z1 .

**KN15 COOLING FAN DOES NOT OPERATE (W/ no DTCs):
COMMAND FAN ON TO CHECK OPERATION**

- While listening to cooling fan, perform Key On Engine Off (KOEO) self test.

Does fan run sometime during KOEO self test?

Yes	No
KEY OFF. RETURN to Section 3 to continue diagnosis.	KEY OFF. GO to KN16

KN16 CHECK B+ AND GROUND TO COOLING FAN

- Disconnect cooling fan (cooling fan motor connector for LS6/LS8 and Thunderbird).
- Measure voltage between B+ and ground circuits at the cooling fan (motor) harness connector.

Is voltage greater than 10.5 volts?

Yes	No
REPLACE cooling fan module/assembly.	GO to KN17 .

KN17 CHECK B+ TO FAN USING CHASSIS GROUND AS REFERENCE

- Measure voltage between B+ at the cooling fan (motor) harness connector and chassis ground.

Is voltage greater than 10.5 volts?

Yes	No
REPAIR open ground circuit.	VERIFY integrity of related fuse. If OK, REPAIR open B+ circuit. If fuse is damaged, CHECK B+ circuit for short to ground before replacing.

KN20 DTC P0480 (LS6/8, THUNDERBIRD): CHECK B+ AND GROUND TO COOLING FAN MOTOR

- Key off.
- Disconnect cooling fan motor connector.
- Measure voltage between B+ and ground circuits at the cooling fan motor harness connector.

Is voltage greater than 10.5 volts?

Yes	No
GO to KN23 .	GO to KN21 .

KN21 CHECK B+ VOLTAGE TO FAN MOTOR USING CHASSIS GROUND AS REFERENCE

- Measure voltage between B+ at the cooling fan motor harness connector and chassis ground.

Is voltage greater than 10.5 volts?

Yes	No
REPAIR open ground circuit.	VERIFY integrity of related fuse. If OK, REPAIR open B+ circuit. If fuse is damaged, CHECK B+ circuit for short to ground before replacing.

KN23 CHECK VPWR TO COOLING FAN CONTROLLER

- Disconnect cooling fan controller.
- Key on, engine off.
- Measure VPWR voltage at the cooling fan controller harness connector.

Is voltage greater than 10.5 volts?

Yes	No
KEY OFF. GO to KN24 .	REPAIR open circuit.

KN24 CHECK FCV CIRCUITS TO FAN

- Connect 1.6K ohm resistor between the FCV and VPWR circuits at the cooling fan controller harness connector (this simulates cooling fan circuitry).
- If a DVOM that measures duty cycle (%) is available:
 - Connect DVOM between FCV circuit at the cooling fan controller harness connector (red probe) and ground (black probe).
 - Set DVOM to measure % (positive duty cycle).
- Key on, engine off.
- Perform Key On, Engine Off (KOEO) Self-Test

During KOEO Self-Test, does the duty cycle change from approximately 10% to approximately 90% (or is P0480 NOT present)?

Yes	No
REPLACE cooling fan module.	KEY OFF. P0480 is still present or duty cycle did not change as expected. GO to KN25 .

KN25 CHECK FCV CIRCUIT FOR SHORT TO POWER IN HARNESS

- Disconnect PCM.
- Key on.
- Measure voltage between FCV circuit at the cooling fan controller harness connector and ground.

Is voltage less than 1.0 volt?

Yes	No
KEY OFF. GO to KN26 .	REPAIR short circuit.

KN26 CHECK FCV CIRCUIT FOR SHORT TO GROUND IN HARNESS

- Disconnect scan tool from DLC.
- Measure resistance between FCV circuit at the cooling fan controller harness connector and ground.

Is resistance greater than 10,000 ohms?

Yes	No
GO to KN27 .	REPAIR short circuit.

KN27 CHECK FOR OPEN FCV CIRCUIT

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

- Measure resistance of the FCV circuit between the PCM and the cooling fan controller harness connector.

Is resistance less than 5.0 ohms?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit.

KN30 CONTINUOUS MEMORY DTC P0480: CHECK FOR INTERMITTENT B+ AND GROUND TO COOLING FAN MOTOR

- Key off.
- Disconnect cooling fan motor connector.
- Connect a non-powered test lamp between the B+ and ground circuits at the cooling fan motor harness connector.
- Observe test lamp for an indication of a fault while performing the following (the lamp will turn off when a fault is detected):
 - Shake, wiggle, bend the B+ and ground circuits to the cooling fan motor connector.
 - Lightly tap/wiggle the associated fuse.

Is a fault indicated?

Yes	No
ISOLATE fault and repair as necessary.	GO to KN31 .

KN31 CHECK FOR INTERMITTENT VPWR CIRCUIT TO COOLING FAN CONTROLLER

- Key off.
- Disconnect cooling fan controller connector.
- Connect a non-powered test lamp between the VPWR circuit at the cooling fan controller harness connector and ground.
- Key on, engine off.
- Observe test lamp for an indication of a fault while performing the following (the lamp will turn off when a fault is detected):
 - Shake, wiggle, bend the VPWR circuit to the cooling fan controller connector.

Is a fault indicated?

Yes	No
ISOLATE fault and repair as necessary.	GO to KN32 .

KN32 CHECK FOR INTERMITTENT FCV CIRCUIT TO COOLING FAN

- Connect 1.6K ohm resistor between the FCV and VPWR circuits at the cooling fan controller harness connector (this simulates cooling fan circuitry).
- Connect DVOM between FCV circuit at the cooling fan controller harness connector and ground.
- Key on, engine off.
- Access Output Test Mode on scan tool.
- Command low speed cooling fan on.
- Observe DVOM for an indication of a fault while performing the following (The DVOM volts will change suddenly when a fault is detected):
 - Shake, wiggle, bend the FCV circuit between the cooling fan and PCM.

Is a fault indicated?

Yes	No
KEY OFF. ISOLATE fault and REPAIR as necessary.	KEY OFF. GO to Z1 .

KN31 - KN32

Test KP: Charge Air Cooler Pump (CAC)

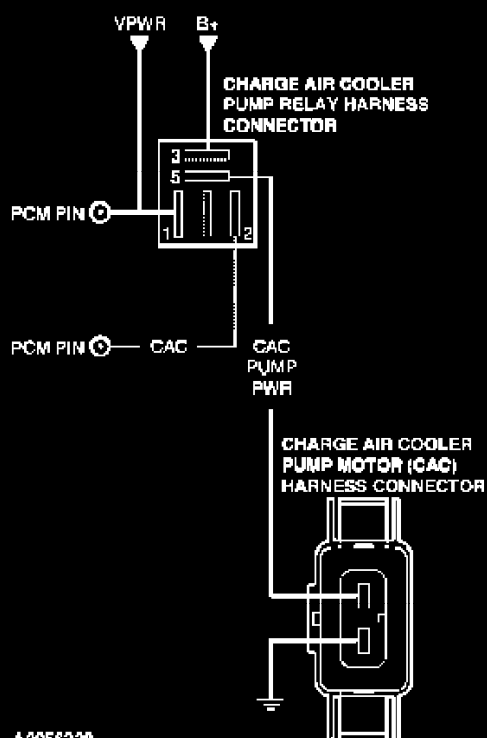
KP: Charge Air Cooler Pump (CAC)**Introduction****KP****Note**

This Pinpoint test is intended to diagnose the following:

- Charge Air Cooler Pump Relay (148192)
- Charge Air Cooler Pump Motor (8501)
- Harness circuits: CAC, vehicle power (VPWR) and ground (GND)

Pinpoint Test Schematics and Connector

4.6L SC, 5.4L SC



A0058320

KP INTRODUCTION 1 OF 2**PCM CONNECTOR PIN NUMBERS**

APPLICATION	VPWR	CAC
5.4L SC	71/97	43
4.6L SC	71/97	82

KP INTRODUCTION 2 OF 2

KP: Charge Air Cooler Pump (CAC)**KP****KP1 P1229: CHECK POWER FEED TO CAC PUMP RELAY COIL**

- Disconnect CAC pump relay.
- Key on, engine off.
- Measure VPWR circuit voltage at the CAC pump relay harness connector.

Is the voltage greater than 10.5 volts?

Yes	No
GO to KP2 .	REPAIR open circuit.

KP2 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 90-110 ohms and all other readings must be greater than 10K ohms.

Are resistance checks OK?

Yes	No
GO to KP3 .	REPLACE CAC pump relay.

KP3 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 KP4 .	REPAIR open circuit.

**KP4 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 KP5 .	REPAIR short to B+.

**KP5 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 KP6 .	REPAIR short to ground condition.

KP6 CHECK STATUS OF PID

- Key on, engine off.
- Access SCICP PID.

Does the SCICP 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)	Unable to duplicate or identify fault at this time. GO to Z1 .

KP4 - KP6

KP7 CHECK CHARGE AIR COOLER PUMP OPERATION

- Connect scan tool.
- Access Output Test Mode.
- Select Mode: ALL ON.

Does charge air intercooler pump run?

Yes	No
CHECK for low fluid level in intercooler system. CHECK for cracked or incorrectly routed intercooler lines or airflow blockage at the CAC radiator. REPAIR as necessary. If symptom still exists, RETURN to Section 3 , Symptom Charts.	GO to KP8 .

KP8 CHECK POWER AND GROUND CIRCUITS AT CAC PUMP MOTOR

- Disconnect the CAC pump
- Connect scan tool.
- Key on, engine off.
- Access Output Test Mode.
- Select Mode: ALL ON.
- Measure the voltage at the CAC pump motor harness connector.

Is the voltage greater than 10.5 volts?

Yes	No
REPLACE CAC pump motor.	GO to KP9 .

KP9 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 5 ohms?

Yes	No
GO to KP10 .	CHECK the tightness of the ground lug. If tight, CHECK wire back to the CAC connector.

KP10 CHECK B+ TO CAC PUMP RELAY

- Disconnect CAC pump relay.
- Measure B+ circuit voltage at the CAC pump relay connector.

Is voltage greater than 10.5 volts?

Yes	No
GO to KP11 .	B+ circuit fault. CHECK condition of related fuses. If OK, REPAIR open circuit. If fuse is damaged, CHECK B+ and CAC pump motor circuits for short to ground before replacing.

KP11 CHECK FOR OPEN CAC PUMP MOTOR CIRCUIT

- Measure resistance of the CAC pump motor circuit between the CAC pump motor relay harness connector and the pump motor harness connector.

Is the resistance less than 5 ohms?

Yes	No
REPLACE CAC pump motor relay.	REPAIR open circuit.

KP10 - KP11

Test KQ: Thermostat Heater Control (THTRC)

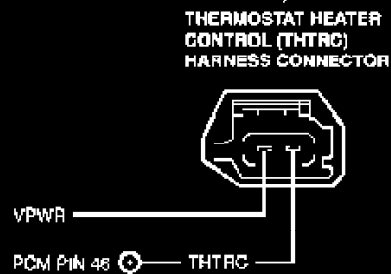
KQ: Thermostat Heater Control (THTRC)**Introduction****KQ****Note**

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

For PCM connector views, refer to Section 1, Powertrain Control Hardware .



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

A0027497

KQ INTRODUCTION

KQ: Thermostat Heater Control (THTRC)**KQ****KQ10 DTC P0597/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	No
KEY OFF. GO to KQ11 .	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	No
GO to KQ12 .	REPLACE thermostat.

KQ12 CHECK THTRC CIRCUIT FOR OPEN IN HARNESS

- 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?

Yes	No
GO to KQ13 .	REPAIR open circuit.

KQ10 - KQ12

KQ13 CHECK THTRC CIRCUIT FOR SHORT TO GROUND OR VPWR IN HARNESS

- Measure resistance between THTRC PCM pin and PCM pins VPWR, SIG RTN and PWR GND.

Is each resistance greater than 10,000 ohms?

Yes	No
For Continuous DTC P0597/P1432, GO to Z1 . For KOEO or KOER DTC P0597/P1432, REPLACE PCM.	REPAIR short to GND or VPWR.

KQ13**Test NB: Malfunction Indicator Lamp (MIL)****NB: Malfunction Indicator Lamp (MIL)**
Introduction**NB****Note**

This Pinpoint Test is intended to diagnose only the following:

- Malfunction Indicator Lamp (MIL) circuit
- Powertrain Control Module (PCM)
- Fuse

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware

B+ (DURING RUN OR START)



AA0942-A

NB INTRODUCTION

NB: Malfunction Indicator Lamp (MIL)**NB****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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

NB2 MALFUNCTION INDICATOR LAMP (MIL) NEVER ON

Note: If vehicle will not start, GO to A1 .

- Key on, engine off.
- Jumper PCM pin 2 at the PCM harness connector to battery negative post.

Does the MIL lamp illuminate?

Yes	No
KEY OFF. REPLACE PCM.	KEY OFF. GO to NB4 .

NB1 - NB2

NB4 CHECK VOLTAGE ON THE B+ CIRCUIT

Note: Refer to the Wiring 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 Instrumental Cluster, Section 413 in the Workshop Manual to diagnose Instrument Cluster and Bulb. If OK, REPLACE PCM (refer to Section 2, 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.

NB4 - NB5

Test NC: Ignition Engine Speed Input Circuit

NC: Ignition Engine Speed Input Circuit
Introduction

NC

Note

This Pinpoint Test is intended to diagnose the following:

- Powertrain Control Module (PCM) (12A650)

NC INTRODUCTION

NC: Ignition Engine Speed Input Circuit**NC****NC1 DTC P0320: ERRATIC IGNITION**

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?

Yes	No
REPAIR as necessary.	For No Starts: GO to A1 . For Intermittent Faults: GO to Z1 . All others: Loss of PIP. GO to JD1 .

NC1

Test ND: Engine RPM/Vehicle Speed Limiter**ND: Engine RPM/Vehicle Speed Limiter**
Introduction**ND****Note**

Enter this Pinpoint Test only when directed here.

ND INTRODUCTION

ND: Engine RPM/Vehicle Speed Limiter**ND****ND1 DTC P0219, P0297 or P1270: EXCESSIVE ENGINE RPM/VEHICLE SPEED**

P0219 (engine over speed), P0297 (vehicle over speed) or P1270 Diagnostic Trouble Codes indicate that the vehicle has been operated in a manner which caused the engine or vehicle speed to exceed a calibrated limit.

Check for:

- Excessive engine rpm in NEUTRAL or operated in the wrong transmission gear.
- Excessive wheel slippage (water, ice, mud or snow).

Note: Vehicles with 4x4. Verify proper 4x4 operation and use. Improper use or operation of the 4x4 system may cause the PCM to generate a P0219 or P1270 DTC. Refer to Workshop manual as needed Section 308, Transfer Case Diagnosis and Testing.

- Vehicle driven at high rate of speed.

Was the vehicle operating in any of the above conditions?

Yes	No
OBD system is OK. RETURN vehicle to customer with information about DTC.	GO to Section 3 , Symptom Charts if there are other driveability concerns. If there are no other symptoms, RETURN vehicle to customer.

ND1**Test QA: Unable to Activate Self-Test/SCP Comm. Error/DTC Not Listed**

QA: Unable To Activate Self-Test/Network Communication

Error/DTC Not Listed

QA**Introduction**

Note

This Pinpoint Test is intended to diagnose the following:

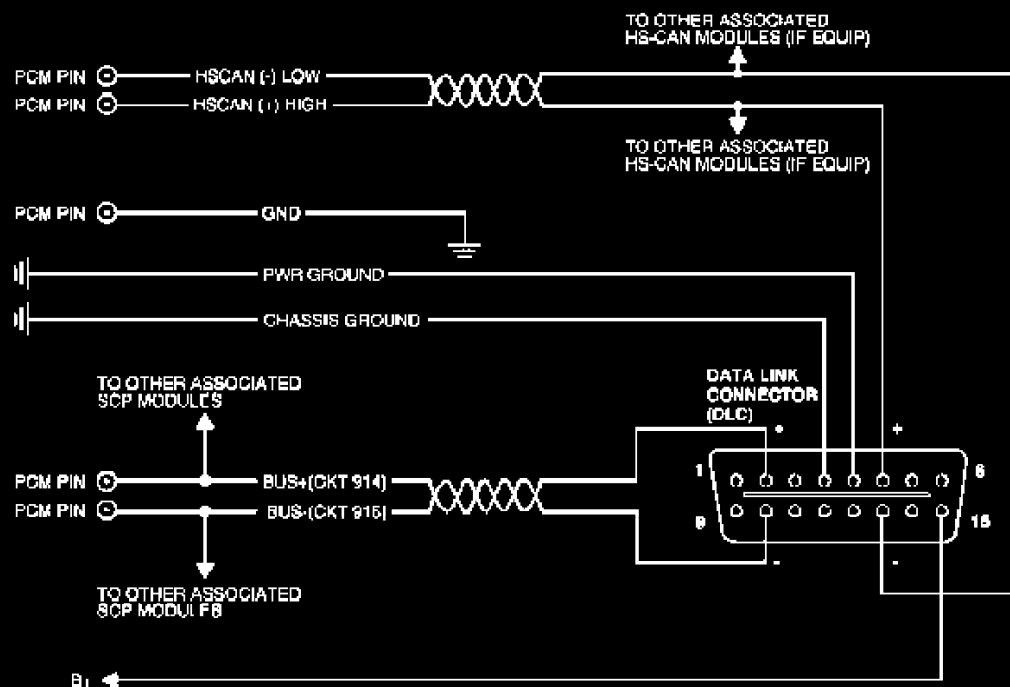
- Data link connector (DLC) harness circuits: chassis ground, power ground (PWR GND), battery positive voltage (B+)
- Standard corporate protocol (SCP) communication bus harness circuits: BUS(+), BUS(-), between DLC and PCM
- High Speed-Controller Area Network (HS-CAN) 500 kB/sec (kilobytes per second) communication bus harness circuits: HS-CAN(+) High, HS-CAN(-) Low, between DLC and PCM
- Open VPWR to Powertrain Control Module (PCM) (12A650)
- Powertrain control module (PCM) (12A650)

Note: Concerns found that affect the entire network are referred to the Module Communication Network, Section 418 in the Workshop Manual.

Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware .

2.3L Focus, LS6/8, Thunderbird

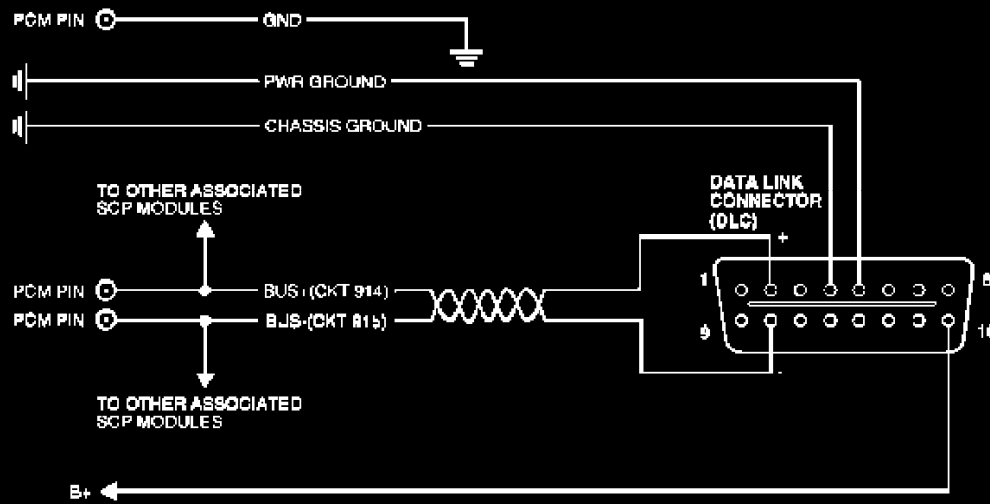


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See appropriate vehicle wiring diagram for other associated network modules.

PCM CONNECTOR PIN NUMBERS					
Application	HS-CAN (+)	HS-CAN (-)	BUS (+)	BUS (-)	GND
LS6/8, Thunderbird	B53	B54	B3	B4	B24,25,26,27
2.3L Focus (PZEV)	B11	B23	-	-	B47, 48

All Others



A0051426

See appropriate vehicle wiring diagram for other associated network modules.

PCM CONNECTOR PIN NUMBERS

Application	BUS (+)	BUS (-)	GND
Aviator, Explorer/Mountaineer (150 pin PCM only)	B3	B4	B24,25,26,27
Expedition/Navigator (122 pin PCM)	B32	B44	B1,11,23
All Others (104 pin PCM)	16	15	51,103

QA: Unable To Activate Self-Test/Network Communication Error/DTC Not Listed

QA

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.

Note: If Self-Test or communication concerns only occurred after a failed or aborted PCM reprogram. The PCM may be blank. If this is the case, try reprogramming the PCM again before continuing with this pinpoint.

- 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 Section 2, Diagnostic Methods).

Was the correct Self-Test procedure used?

Yes	No
Correct procedure was used for activating Self-Test. For DTC P1001: GO to QA6 . All Others: GO to QA2 .	Correct procedure was not used for activating Self-Test. RETURN to Section 3 , Symptom Charts, Step 1: PCM Quick Test, and COMPLETE Self-Test using the correct procedure.

QA1

QA2 VEHICLE TYPE

Note: For 2003 model year, the LS6, LS8 and Thunderbird are equipped with an Electronic Throttle Control (ETC) system and a High Speed - Controller Area Network (HS-CAN) communication protocol.

Is the vehicle a LS6, LS8 or Thunderbird?

Yes	No
GO to QA30 .	GO to QA3 .

QA3 CHECK PCM SUPPLIED 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: A loss of VREF caused by a short to power or ground can cause a network link communication error and/or unable to self-test.

Is the voltage between 4.0 and 6.0 volts?

Yes	No
Voltage is in specification. GO to QA4 .	Voltage is not in specification. GO to C1 .

QA2 - QA3

QA4 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 QA5 .

- Reconnect TP sensor while monitoring PID.

Does scan tool communication error occur only when TP sensor is reconnected?

Yes	No
VREF shorted to SIG RTN in the sensor. REPLACE TP sensor.	GO to QA5 .

QA5 ABILITY TO ACTIVATE KOEO SELF-TEST

Can KOEO Self-Test be activated?

Yes	No
GO to QA6 .	UNABLE to activate KOEO Self-Test. GO to QA7 .

QA6 ABILITY TO ACTIVATE KOER SELF-TEST

Can KOER Self-Test be activated and completed?

Yes	No
If here for P1001 and other KOER DTCs are present, GO to Section 4, Diagnostic Trouble Code (DTC) Charts and Diagnostic Trouble Code (DTC) Descriptions, for Pinpoint Test direction. Begin diagnosis with the first KOER DTC after P1001. If here for DTC not listed in Section 4 (DTC) Charts, CHECK that the correct PCM is installed in the vehicle. Verify correct PCM part number and calibration. Also CHECK for a Technical Service Bulletin (TSB) or OASIS message that indicates a PCM change or calibration (flash) update. Repair as necessary.	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 Section 2, 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 Section 4, Diagnostic Trouble Code (DTC) Charts and Diagnostic Trouble Code (DTC) Discriptions, for Pinpoint Test direction.	UNABLE to retrieve any Self-Test DTCs. For 2.3L (PZEV) Focus with HS-CAN: GO to QA31 . All Others: 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.

QA9 CHECK DLC CHASSIS GROUND CIRCUIT FOR OPEN IN HARNESS

- Measure resistance between chassis ground circuit at the DLC and chassis ground.

Is resistance less than 5.0 ohms?

Yes	No
GO to QA10 .	REPAIR open circuit.

QA10 CHECK DLC PWR GND CIRCUIT FOR OPEN IN HARNESS

- Measure resistance between PWR GND circuit at the DLC and battery negative post.

Is resistance less than 5.0 ohms?

Yes	No
GO to QA11 .	REPAIR open circuit.

QA11 DATA LINK DIAGNOSTIC NETWORK TEST

- 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 CKT914\BUS(+)
 - PCM: NO RESPONSE CKT915\BUS(-)

Are there any PCM network error messages displayed?

Yes	No
GO to QA12 .	Data link network test passed for PCM. RERUN PCM Quick Test. Refer to Section 3 , Symptom Charts, Step 1: PCM Quick Test, QT1.

QA12 NETWORK TEST RESULT — CIRCUIT 914\BUS(+) AND CIRCUIT 915\BUS(-)

- 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(+)\CKT914=SOME MODULE NO RESP/NOT EQUIP, PCM: NO RESPONSE ON BUS(+)\CKT914. GO to QA15 .
For BUS(-)\CKT915=ALL MODULE NO RESP/NOT EQUIP. GO to QA16 .	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=ALL MODULE NO RESP/NOT EQUIP. GO to QA22 .	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, Section 418 in Workshop Manual 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, Section 418 in Workshop Manual for further diagnosis.	GO to QA15 .

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, Section 418 in Workshop Manual 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, Section 418 in Workshop Manual for further diagnosis.	GO to QA18 .

QA16 - QA17

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.

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 the 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 .	Key off. REPAIR VPWR circuit from PCM relay.
For scan tools without Data Link Diagnostic Network Test capability, REFER to Module Communication Network, Section 418 in the Workshop Manual for further diagnosis. NOTE: If after completing Workshop Manual diagnosis and referred back to PC/ED. REPLACE PCM.	

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (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 Section 2, 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, Section 418 in the Workshop Manual for further diagnosis.

QA23 CHECK FOR OPEN BUS(+/-) CIRCUITS 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	No
For scan tools with Data Link Diagnostic Network Test capability, GO to QA19 .	REPAIR open circuit.
For scan tools without Data Link Diagnostic Network Test capability, REFER to Module Communication Network, Section 418 in the Workshop Manual for further diagnosis. NOTE: If after completing Workshop Manual diagnosis and referred back to PC/ED, REPLACE PCM.	

QA30 CHECK VREF VOLTAGE TO FRP SENSOR

The purpose of this test step is to determine if the PCM is powering up by checking the VREF from the PCM.

- Disconnect fuel rail pressure (FRP) sensor.

Note: GO to Pinpoint Test DD and refer to **Pinpoint Test Schematics and Connectors** for FRP harness connector pin-out information.

- Key on, engine off.
- Measure voltage between VREF and SIG RTN circuits at the FRP sensor harness connector.

Is the voltage between 4.0 and 6.0 volts?

Yes	No
Voltage is in specification. GO to QA31 .	Voltage is not in specification. GO to C1 .

QA31 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 QA32 .	REPAIR open in DLC B+ circuit.

QA32 CHECK DLC CHASSIS GROUND CIRCUIT FOR OPEN IN HARNESS

- Measure resistance between chassis ground circuit at the DLC and chassis ground.

Is resistance less than 5.0 ohms?

Yes	No
GO to QA33 .	REPAIR open circuit.

QA33 CHECK DLC PWR GND CIRCUIT FOR OPEN IN HARNESS

- Measure resistance between PWR GND circuit at the DLC and battery negative post.

Is resistance less than 5.0 ohms?

Yes	No
GO to QA34 .	REPAIR open circuit.

QA34 CHECK FOR HS-CAN(+) SHORT TO HS-CAN(-)

- Key Off.
- Disconnect PCM.
- Measure resistance between HS-CAN(+) and HS-CAN(-) circuits at the DLC harness connector.

Is resistance greater than 5.0 ohms?

Yes	No
GO to QA35 .	GO to QA39 .

QA35 CHECK FOR OPEN HS-CAN(+/-) CIRCUITS IN HARNESS

- Measure resistance of HS-CAN(+) circuit between PCM harness connector pin and HS-CAN(+) circuit at the DLC.
- Measure resistance of HS-CAN(-) circuit between PCM harness connector pin and HS-CAN(-) circuit at the DLC.

Are both resistances less than 5.0 ohms?

Yes	No
GO to QA36 .	REPAIR open circuit.

QA36 CHECK HS-CAN(+/-) CIRCUITS FOR SHORT TO B+ IN HARNESS

- Key on, engine off.
- Measure voltage between HS-CAN(+) circuit at the PCM harness connector pin and chassis ground.
- Measure voltage between HS-CAN(-) circuit at the PCM harness connector pin and chassis ground.

Is either voltage greater than 6.0 volts?

Yes	No
GO to QA39 .	GO to QA37 .

QA37 CHECK HS-CAN(+/-) CIRCUITS FOR SHORT TO GROUND IN HARNESS

- Key off.
- Measure resistance of HS-CAN(+) circuit between PCM harness connector pin and chassis ground.
- Measure resistance of HS-CAN(-) circuit between PCM harness connector pin and chassis ground.

Are both resistances greater than 50 ohms?

Yes	No
REPLACE PCM.	GO to QA39 .

QA39 VERIFY IF HS-CAN(+/-) IS SHORTED IN HARNESS OR ANOTHER MODULE

- Determine which, if any, module are connected to the HS-CAN network (Refer to Wiring Diagram Manual). If no other modules are connected to the HS-CAN network, GO to the "YES" Action To Take.
- One at a time, disconnect the modules associated with HS-CAN network. After disconnecting each module, again test for short circuit. 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.	REFER to the Workshop Manual for further diagnosis of appropriate module.

QA39**Test QB: Diagnostic Trouble Code (DTC) P0603/P1633****QB: Diagnostic Trouble Code (DTC) P0603/P1633**

Introduction

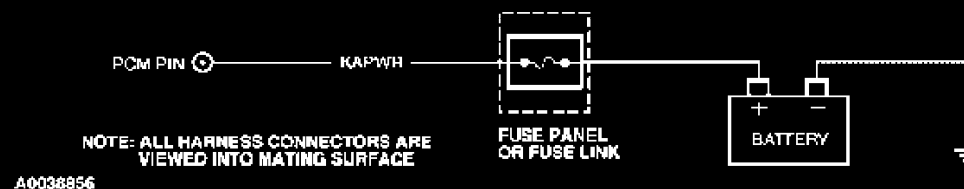
QB**Note**

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

For PCM connector views, refer to Section 1, Powertrain Control Hardware .

**PCM CONNECTOR PIN NUMBERS**

PCM TYPE	KAPWR
104 PIN	55
122 PIN	B40
150 PIN	B44

QB INTRODUCTION

**QB: Diagnostic Trouble Code (DTC)
P0603/P1633****QB****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 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	No
KEY OFF. Battery terminals are OK. GO to QB2 .	REPAIR battery terminals as necessary.

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 .

QB1 - QB2

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/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 or P1633 present?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	Unable to duplicate or identify fault at this time. GO to Z1 (Also refer to Section 4 , Diagnostic Trouble Code (DTC) Descriptions for a list of possible causes.)

QB3 - QB4

Test QC: OBD Systems Readiness Test Not Complete - DTC P1000

QC: OBD (On Board Diagnostic) Systems Readiness Test Not Complete - DTC P1000

QC

Introduction

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.

Diagnostic Trouble Code (DTC) P1000 indicates that all of the On Board Diagnostic monitors have not yet been successfully tested. In some areas, 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 Section 2, Drive Cycles.

The only way a DTC P1000 can be removed from memory is when all the OBD 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 Drive Cycle.
- The battery or PCM has been disconnected.
- An OBD monitor failure had occurred before completion of an OBD 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 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.

QC INTRODUCTION

**QC: OBD (On Board Diagnostic) Systems
Readiness Test Not Complete - DTCP1000**

QC**QC1 DTC P1000: CHECK FOR OTHER DTCS**

Note: Only perform this pinpoint test if a Diagnostic Trouble Code (DTC) P1000 was received from Continuous Memory. Ignore any DTC P1000s in KOEO or KOER.

DTC P1000 indicates that all of the OBD monitors have not yet been successfully tested.

Were any other DTCs received with the P1000?

Yes	No
GO to Section 4, Powertrain Diagnostic Trouble Code (DTC) Charts , for Pinpoint Test direction and REPAIR other DTCs.	For vehicles with PTO: GO to QC2 . All others: GO to QC3 .

QC2 CHECK PTO PID

- Connect scan tool.
- Key on, engine running.
- Access PTO STAT PID.
- Cycle PTO switch/actuator ON and OFF (follow PTO aftermarket instructions).

Did PTO PID cycle ON, delay, then OFF?

Yes	No
PTO circuit is OK. GO to QC3 .	GO to FB1 .

QC1 - QC2**QC3 REQUEST TO CLEAR DTC P1000**

Note: A complete OBD Drive Cycle has not yet been performed to clear the DTC P1000 from the PCM.

Has the customer requested the DTC P1000 be cleared from the PCM memory?

Yes	No
COMPLETE an OBD Drive Cycle (REFER to Section 2, Drive Cycles).	INFORM the customer that if the law in your area requires additional driving in order to clear the DTC P1000 from the PCM memory, it must be completed before an inspection/maintenance test.

QC3

Test QD: Diagnostic Trouble Code (DTC) P1260**QD: Diagnostic Trouble Code (DTC) P1260**
Introduction**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.

QD INTRODUCTION**QD: Diagnostic Trouble Code (DTC) P1260****QD****QD1 CHECK FOR PATS DTCs**

- Repair all Passive Anti-Theft (PATS) DTCs before P1260. (Refer to Workshop Manual, Anti-Theft Section 419 for System Description and Operation).

Have all PATS DTCs been diagnosed?

Yes	No
GO to QD2 .	REFER to Workshop Manual Anti-Theft Section 419 for DTC diagnosis.

QD2 CHECK FOR OTHER POWERTRAIN DTCs

- Repair all powertrain DTCs other than P1260.

Have all other powertrain DTCs been diagnosed?

Yes	No
GO to QD3 .	REFER to Section 4, Powertrain Diagnostic Trouble Code (DTC) Charts, for Pinpoint Test direction and REPAIR other DTCs.

QD3 ATTEMPT TO START ENGINE

- Reset the Keep Alive Memory (KAM) to clear DTC P1260. Refer to Section 2, Resetting The Keep Alive Memory (KAM) for instructions.
- Attempt to start the engine.

Will the engine start?

Yes	No
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.	DTC P1260 is not the cause of the No Start. GO to Section 3 , Symptom Charts to diagnose the No Start symptom.

QD3**Test TA: Park/Neutral Position/Clutch Pedal Position Switches**

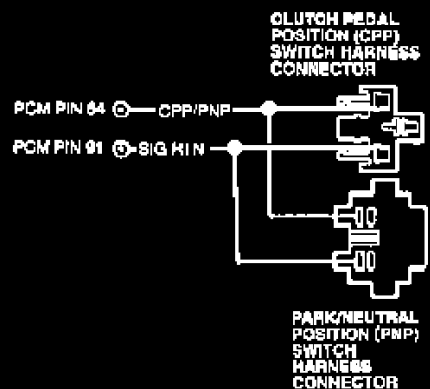
TA: Park/Neutral Position (PNP)/Clutch Pedal Position (CPP)**Switches****TA****Introduction****Note**

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 Schematics and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware

Escort

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

AA3079-G

Focus



A0062024

PCM CONNECTOR PIN NUMBERS

PCM TYPE	CPP/PNP	SIG RTN
104 PIN	64	91
150 PIN	T16	T41

Ranger/Explorer



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

AA3076-C

TA INTRODUCTION 2 OF 3

F-Series



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

AA3077-C

TA INTRODUCTION 3 OF 3

TA: Park/Neutral Position (PNP)/Clutch Pedal Position (CPP) Switches

TA

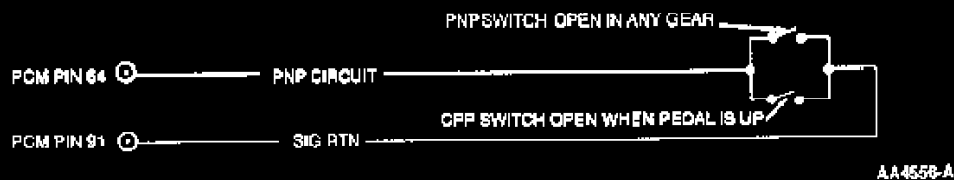
TA1 CHECK CPP AND/OR PNP SWITCH FUNCTION

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 and/or 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	No
Fault intermittent DISCONNECT PCM. INSPECT both ends of the connector for damaged or pushed out pins, corrosion and loose wires. REPAIR as necessary. If OK, REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	GO to TA2 .

TA1

TA2 CHECK CPP AND/OR 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/or PNP harness connector.
- Measure CPP switch resistance with the clutch pedal down.
- Measure PNP switch resistance with the shift lever in NEUTRAL.

Is the resistance less than 5.0 ohms for both switches?

Yes	No
GO to TA3	REPLACE damaged CPP or PNP switch.

TA3 CHECK CPP AND/OR PNP SWITCHES FOR SHORT IN SWITCH

- CPP and/or PNP harness connector disconnected.
- Measure CPP switch resistance with the clutch pedal UP.
- Measure PNP switch resistance with the shift lever IN GEAR.

Is the resistance less than 5.0 ohms for both switches?

Yes	No
REPLACE damaged CPP and/or PNP switch.	GO to TA4

TA4 CHECK CPP AND/OR 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	No
GO to TA5	REPAIR open circuit.

TA2 - TA4

TA5 CHECK CPP AND/OR 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

TA5

Test TB: Trans Control Switch/Trans Control Indicator Lamp

TB: Transmission Control Switch (TCS)/Transmission Control Indicator Lamp(TCIL)
Introduction

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

For PCM connector views, refer to Section 1, Powertrain Control Hardware

LS6/LS8, Aviator, Explorer/Mountaineer with 150pin PCM



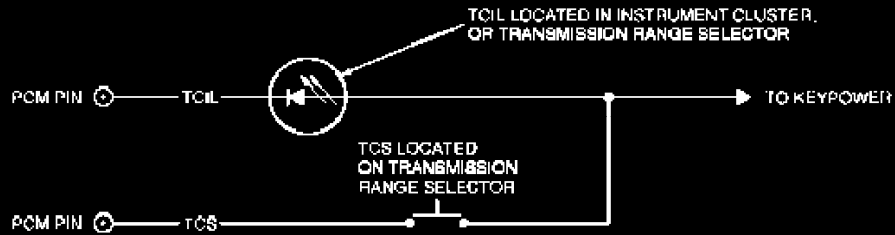
A0062023

PCM CONNECTOR PIN NUMBERS

VEHICLE TYPE	LS6/LS8	AVIATOR	EXPLORER/MOUNTAINEER	PZEV FOCUS (2.3L)
TCS PCM PIN	B41	B41	B41	B27

TB INTRODUCTION 1 OF 3

Heavy Duty Trucks, E/F-Series, Expedition/Navigator, Excursion



A0059235

PCM CONNECTOR PIN NUMBERS

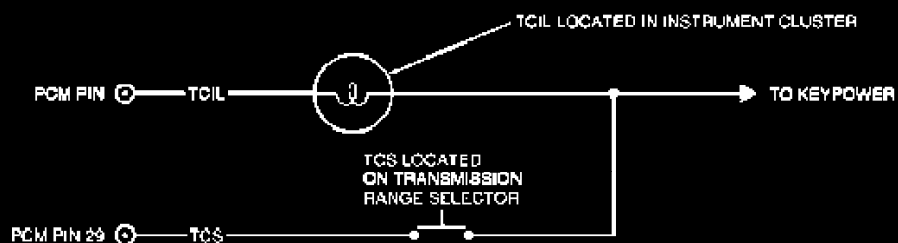
PCM TYPE	TCS
104 PIN	29
122 PIN	B22

PCM CONNECTOR PIN NUMBERS

APPLICATION	PCM PIN / TCIL
6.8L E-SERIES	28
4.6L, 5.4L E/F SERIES, EXCURSION	12
ALL OTHERS	79

TB INTRODUCTION 2 OF 3

All Others



A0053224

APPLICATIONS	PCM PIN / TCIL
CROWN VIC / GRAND MARQUIS	12
FOCUS	103
ALL OTHERS	79

**TB: Transmission Control Switch
(TCS)/Transmission Control Indicator
Lamp(TCIL)**

TB**TB1 CHECK TCS FUNCTION**

DTC P1780

- 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?

Yes	No
RERUN KOER Self-Test to cycle TCS.	GO to TB2 . FOR WINDSTAR, REFER to Section 307 Automatic Transaxle/Transmission External Controls in the Workshop Manual.

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	GO to TB3 .

TB1 - TB2

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit between bulb and the TCIL Test Pin. VERIFY a symptom no longer exists.

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 Section 2, 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.

TB9**Test TG: 4X4 Low (4X4L) Range**

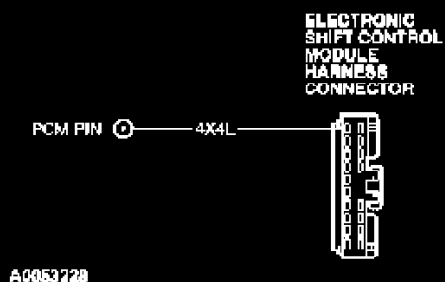
TG: 4x4 Low (4x4L) Range
Introduction**TG****Note**

This Pinpoint Test is intended to diagnose the following:

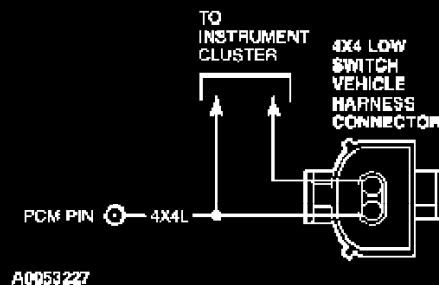
- Harness circuits from Electronic Shift Control Module
- Harness circuit for mechanical 4x4L
- Powertrain Control Module (PCM) (12A650)

Pinpoint Test Schematic and Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware

Electronic Shift**PCM CONNECTOR PIN NUMBERS**

PCM TYPE	4X4 LOW Pin
104 Pin	14
150 Pin	E23

TG INTRODUCTION 1 OF 2**Mechanical Shift****TG INTRODUCTION 2 OF 2**

TG: 4x4 Low (4x4L) Range**TG****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.

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 .

TG1 - TG2

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 Section 2, 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 the Transfer Case, Section 308 "Four Wheel Drive Systems" in the Workshop Manual for diagnosis.	REPAIR short circuit.

TG3 - TG5

Test TH: Reverse Switch (RS)

TH: Reverse Switch (RS)Introduction

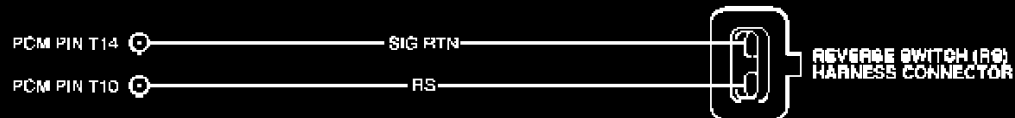
TH**Note**

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

For PCM connector views, refer to Section 1, Powertrain Control Hardware



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

A0061375

TH INTRODUCTION

TH: Reverse Switch (RS)**TH****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	No
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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	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	No
GO to TH3 .	REPLACE the RS switch.

TH1 - TH2

TH3 CHECK RS CIRCUIT FOR OPEN IN HARNESS

- 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?

Yes	No
GO to TH4 .	REPAIR open circuit.

TH4 CHECK RS CIRCUIT FOR SHORT TO SIG RTN OR CHASSIS GROUND IN HARNESS

- 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?

Yes	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

TH3 - TH4

Test TJ: Output Shaft Speed (OSS) Sensor

TJ: Output Shaft Speed (OSS) Sensor Introduction

TJ

Note

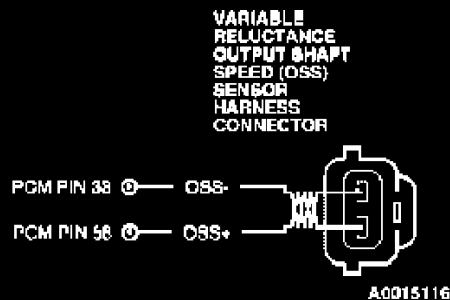
This Pinpoint Test is intended to diagnose the following:

- OSS harness circuits OSS and SIG RTN
- OSS Sensor
- PCM

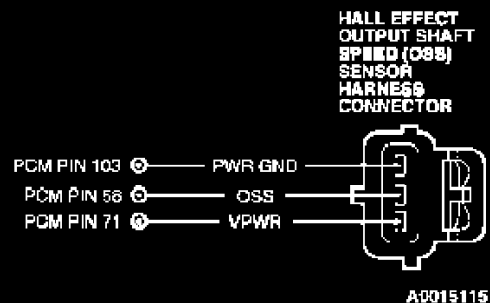
Schematics and Harness Connectors

For PCM connector views, refer to Section 1, Powertrain Control Hardware .

Focus (Automatic Transmission)

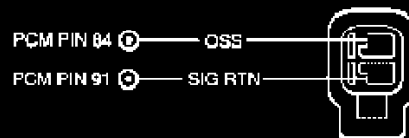


2.0L (MTX) , Focus



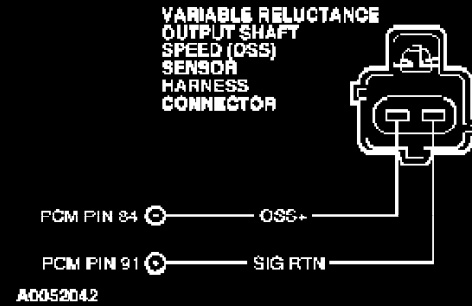
Windstar, Escape**A0015114****PCM CONNECTOR PIN NUMBERS**

VEHICLE TYPE	OSS	Sig Ret
Windstar	84	91
Escape	84	3

F, E series, Expedition Navigator, Mustang, Explorer**4R70W APPLICATIONS****A0028510****PCM CONNECTOR PIN NUMBERS**

PCM TYPE	OSS	Sig Ret
104 Pin	84	91
122 Pin	T25	T27

Ranger, Explorer/Mountaineer, LS6/LS8, Thunderbird, Aviator



PCM CONNECTOR PIN NUMBERS

PCM TYPE	OSS	Sig Ret
104 Pin	84	91
150 Pin	T26	T14

All Others



NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE

A0015020

TJ: Output Shaft Speed (OSS) Sensor**TJ****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.

TJ1 - TJ2

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.

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.

TJ3 - TJ5

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 1.25K ohms?

Yes	No
REPLACE PCM (REFER to Section 2, 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPLACE OSS sensor. REFER to the workshop manual group for manual transmissions.

TJ9

Test X: Constant Control Relay Module (CCRM)

X: Constant Control Relay Module (CCRM)
Introduction

X

Note

This Pinpoint Test is intended to diagnose the following:

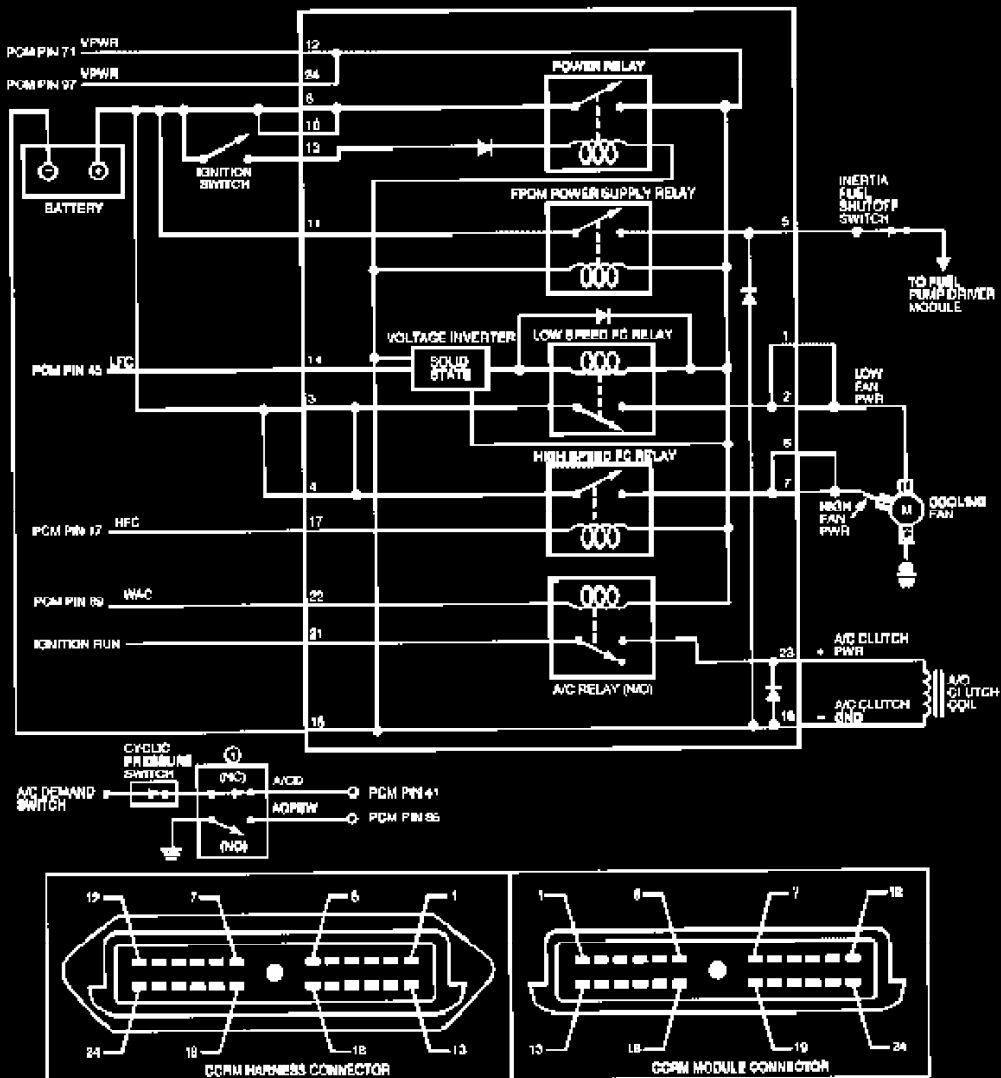
- Constant Control Relay Module (CCRM) (12B581 (w/ bracket), 12B577 (module only))
- Harness circuits: B+, FC, LFC, HFC, ACCS, WAC, VPWR (TO CCRM), A/C Clutch PWR, (Low/High) Fan PWR, GND
- Powertrain Control Module (PCM) (12A650)

X INTRODUCTION 1 OF 4

Pinpoint Test Schematics and Connectors

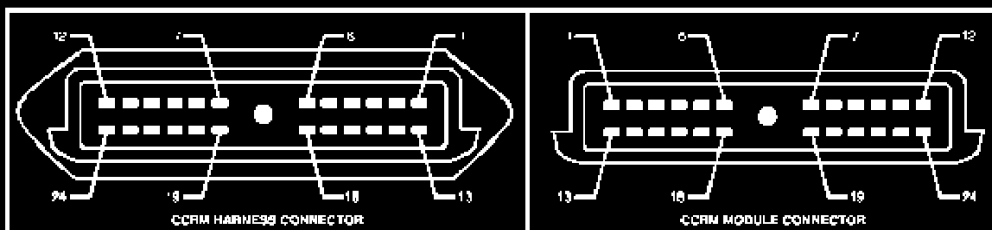
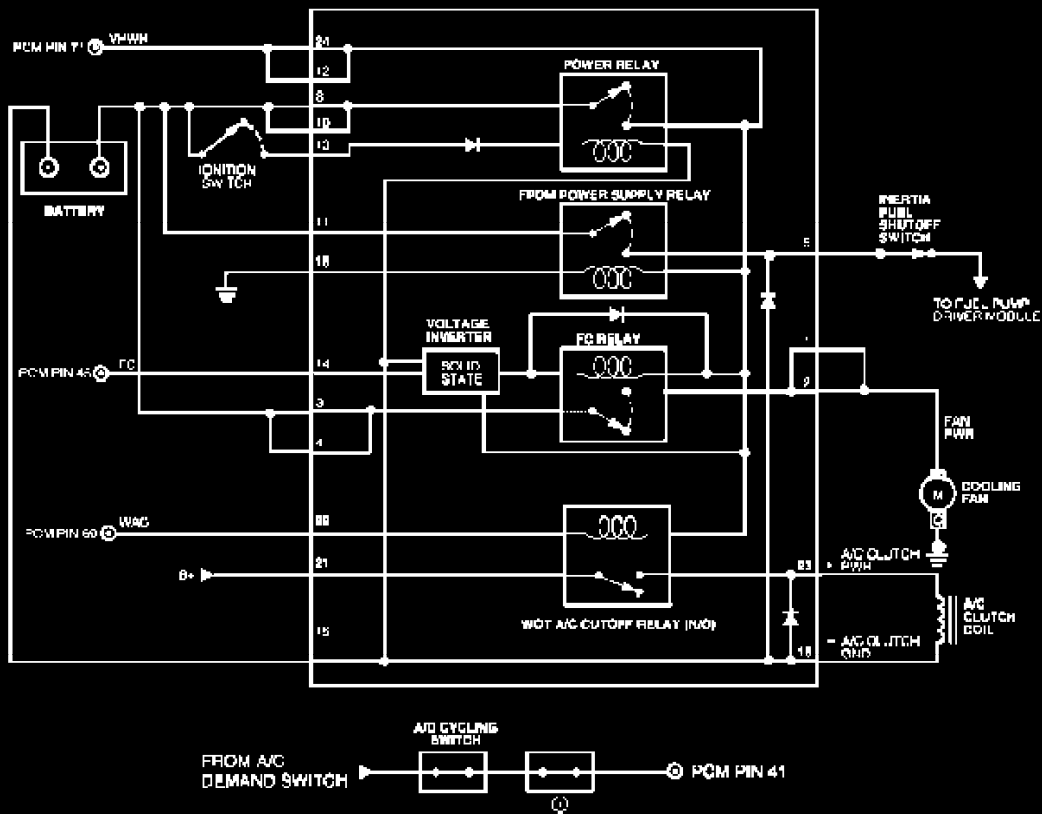
For PCM connector views, refer to Section 1, Powertrain Control Hardware.

Escort



AA0022-E

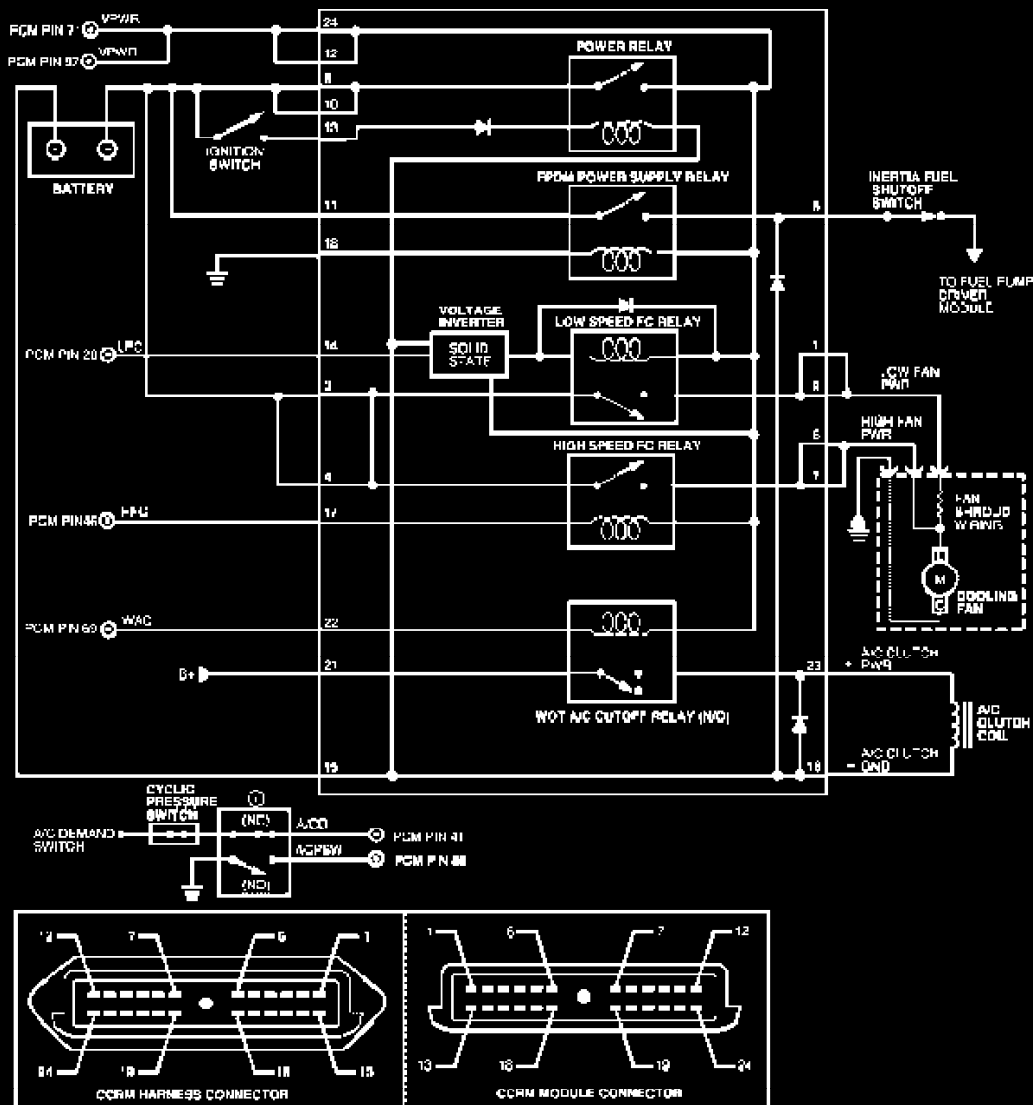
3.8L Mustang



① A/C High Pressure Switch

A0031610

4.6L Mustang



1 A/C High Pressure Switch
A0038676

X: Constant Control Relay Module (CCRM)**X****X1 VPWR CHECK AT FUEL INJECTOR FAILED IN PINPOINT TEST C: CHECK FOR OPEN VPWR CIRCUIT BETWEEN CCRM AND THE FUEL INJECTOR**

- Fuel injector disconnected.
- Disconnect CCRM.
- Disconnect scan tool from DLC.
- Measure resistance of VPWR circuit between the fuel injector harness connector and both pins 12 and 24 (VPWR) of the CCRM harness connector.

Is either resistance less than 5.0 ohms?

Yes	No
RECONNECT fuel injector. GO to X2 .	BOTH resistances GREATER than 5.0 ohms. REPAIR open VPWR circuit between the CCRM and the splice to the fuel injector.

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.

X1 - X2

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 OR P0481: CHECK HIGH SPEED FAN CONTROL (FC) RELAY AND HFC CIRCUIT IN CCRM

Note: For one-speed fan applications, disregard DTC P1479/P0481.

- 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 110 ohms.
- Check CCRM for internal shorts (each of the following resistances must be greater than 1,000 ohms):
 - Measure resistance of CCRM between pin 17 and the following pins: 1 through 11, 13 and 21.
 - Measure resistance of CCRM between pins 17 and 15 (it may be necessary to switch the red and black DVOM probes to get resistance reading greater than 1,000 ohms).
 - Measure resistance between pin 17 and the CCRM case.

Are the CCRM checks OK?

Yes	No
GO to X16 .	REPLACE CCRM.

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?

Application	HFC PCM Pin
Escort	17
Mustang	46

Yes	No
GO to X17 .	REPAIR open circuit.

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.

X16 - X17

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	No
If DTC P1479/P0481 was received in Quick Test: CONNECT scan tool to DLC. Key on, engine off. Access Output Test Mode on scan tool. Command high speed fan on, wait 10 seconds, then turn fan off. If high speed fan turns on, and off as expected, disregard P1479/P0481 and return to Section 3 . If fan does not operate correctly, REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). All others: REPLACE CCRM. VERIFY HIGH FAN PWR circuit is not short to ground.	REPAIR short circuit.

X20 DTC P1474 OR P0480: DOES FAN RUN WITH KEY ON?

Note: During diagnosis, FC applies to the fan control circuit (single-speed fans), and LFC applies to the low fan control circuit (two-speed fans).

Does the cooling fan always run with the key on?

Yes	No
KEY OFF. GO to X24 .	KEY OFF. GO to X21 .

X21 CHECK FC/LFC CIRCUIT FOR SHORT TO GROUND IN HARNESS

- Disconnect scan tool from DLC.
- 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 Section 2, 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?

Application	FC/LFC PCM Pin
4.6L Mustang	28
All Others	45

Yes	No
GO to X25 .	REPAIR open circuit.

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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).

X30 CONTINUOUS MEMORY DTC P1474 OR P0480: 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 .

X35 DTC P1479 OR P0481: CHECK HIGH FAN CONTROL (HFC) CIRCUIT FOR OPEN OR SHORT TO POWER

Note: For one-speed fan applications, disregard DTC P1479/P0481.

- 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 Section 3 chart.	COMMAND cooling fan off. REMAIN in Output Test Mode. GO to X41 .

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.

X42 - X43

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).

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.

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 .

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 P0481 diagnosis. If the LFCF PID indicated a fault: GO to X20 and follow DTC P0480 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 .

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 the Climate Control System, Section 412 of the Workshop Manual 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 Section 3 for further diagnosis of this or any other symptom.	REPAIR short circuit.

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.	Primary circuits OK. REPLACE CCRM.
If the HFCF PID indicated a fault:	
GO to X15 and follow DTC P0481 diagnosis.	
If the LFCF PID indicated a fault:	
GO to X20 and follow DTC P0480 diagnosis.	

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 the Climate Control System, Section 412 of the Workshop Manual 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 .

X100 ACCS PID OFF WITH A/C ON: CHECK FOR VOLTAGE TO A/C CYCLING SWITCH

- Key on, engine off.
- Disconnect A/C cycling switch.
- A/C demand switch to A/C on.
- Measure voltage at the A/C demand switch side of the A/C cycling switch harness connector.

Is voltage greater than 10.5 volts?

Yes	No
KEY OFF. GO to X101 .	KEY OFF. REFER to the Climate Control System, Section 412 in the Workshop Manual to check for causes of no voltage to the A/C cycling switch.

X101 CHECK IF A/C CYCLING SWITCH CONTACTS ARE CLOSED

- Measure resistance of the A/C cycling switch contacts at the A/C cycling switch connector.

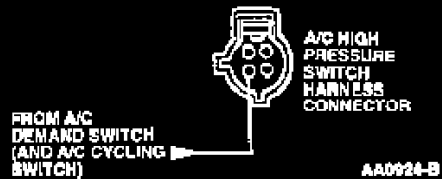
Is resistance less than 5.0 ohms?

Yes	No
GO to X102 .	REFER to the Climate Control System, Section 412 in the Workshop Manual to check the operation of the A/C cycling switch and proper refrigerant charge. REPAIR as necessary.

X102 CHECK FOR VOLTAGE TO DUAL FUNCTION A/C HIGH PRESSURE SWITCH

- Reconnect A/C cycling switch.
- Disconnect A/C high pressure switch.
- Key on, engine off.
- A/C on.
- Measure voltage on the A/C demand switch pin at the A/C high pressure switch harness connector.

Is voltage greater than 10.5 volts?



Yes	No
KEY OFF. GO to X103 .	REPAIR open between A/C cycling switch and A/C high pressure switch.

X102

X103 CHECK RESISTANCE OF A/C HIGH PRESSURE SWITCH HIGH PRESSURE CONTACTS

- Measure resistance of the normally closed A/C high pressure switch high pressure contacts.

Is resistance less than 5.0 ohms?



Yes	No
GO to X104 .	REFER to the Climate Control System, Section 412 in the Workshop Manual to check for overpressurized A/C system, etc. If OK, REPLACE A/C high pressure switch, following instructions in the Climate Control System, Section 412 of the Workshop Manual.

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 Section 2, 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 OR P0645: 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/P0645 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).

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 (each of the following resistances must be greater than 1,000 ohms):
 - Measure resistance of CCRM between pin 22 and the following pins: 1 through 11, 13 and 21.
 - Measure resistance of CCRM between pins 22 and 15 (it may be necessary to switch the red and black DVOM probes to get resistance reading greater than 1,000 ohms).
 - Measure resistance between pin 22 and the CCRM case.

Are the CCRM checks OK?

Yes	No
GO to X107 .	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	No
KEY OFF. GO to X108 .	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	No
GO to X109 .	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	No
REPLACE PCM (refer to Section 2, 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.

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	No
KEY OFF, A/C OFF. GO to X111 .	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	No
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.	REPAIR open circuit.

X110 - X111

X115 DTC P1469 OR P0534: CHECK FOR CAUSES OF FAST A/C COMPRESSOR CLUTCH CYCLING

- Refer to the Climate Control System, Section 412 in the Workshop Manual to test A/C compressor clutch cycle times, and to check causes of fast A/C compressor clutch cycling.

Is a fault indicated?

Yes	No
REPAIR as required according to Workshop Manual direction. CLEAR the DTC(s). START engine and turn A/C on for about 2 minutes. A/C off. RERUN Quick Test.	GO to X116 to CHECK for intermittent electrical concern.

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	No
KEY OFF. ISOLATE fault and REPAIR as necessary. CLEAR the DTC(s). START engine and TURN A/C on for about two minutes. A/C off. RERUN Quick Test.	UNABLE to duplicate fault at this time. CLEAR the DTCs. RETURN to Section 3 to service any additional symptoms.

X115 - X116

X120 DTC P1460 OR P0645: 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/P0645 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 Section 2).
 - 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 .

X120

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.

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 the Climate Control System, Section 412 of the Workshop Manual). 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 .

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 Section 3 to service any other concerns.	GO to X132 .

X130 - X131

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 Section 3 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 Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR short circuit.

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	No
The electrical portion of the A/C system is not at fault. REFER to Climate Control System, Section 412 in the Workshop Manual.	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"?

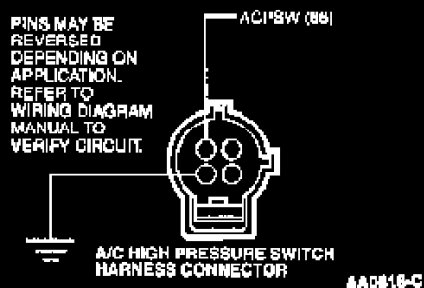
Yes	No
KEY OFF. REFER to Climate Control System, Section 412 in the Workshop Manual.	KEY OFF. GO to X125 .

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?



Yes	No
KEY OFF. A/C high pressure switch medium pressure circuits are OK. REMOVE jumper. RECONNECT A/C high pressure switch. REFER to the Climate Control System, Section 412 in the Workshop Manual to diagnose symptom.	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	No
KEY OFF. REPAIR open ground circuit to the A/C high pressure switch. REMOVE jumper wire.	KEY OFF. REMOVE jumper wire. GO to X147 .

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	No
REPLACE PCM (refer to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)).	REPAIR open circuit.

X146 - X147**Test Z: Intermittent**

**Z: Intermittent
Introduction****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 Section 6. 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
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
EGRMDSD	EGRMDSD	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, EVAPPDC	EVAPCP	output
EVAPCV	EVAPCV	output
EVAPPF	EVAPPF	input
LFC	FC	output
FF	FF	input
FLI, FLI V	FLI	input
FP	FP	output
FPM, FP M	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
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	OCT ADJ	input
OSS	OSS	input
Use digital multimeter	PATSIL	output
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
VFCDC	VFCDC	output
VPWR	VPWR	input
Use digital multimeter	VREF	output
Use digital multimeter	VSO	output
VSS	VSS+	input
WAC	WAC	output

Z: Intermittent**Z****Z1 DIRECTION FOR INTERMITTENT DIAGNOSTIC PATH**

- There are two main procedures used in this section 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	No
GO to Z50 for a coil pack application except 2.0L Cougar/Focus, GO to Z2 .	GO to Z2 .
GO to Z2 for coil on plug application.	

Z2 CLEAR THE DTCs TO CLEAR THE FMEM

Note: Proceed with this step only if clearing the DTCs 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 clearing the DTCs.

- Clear the DTCs.

Have the DTCs been cleared?

Yes	No
GO to Z3 .	Clear the DTCs.
	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/M Measurement Signal Chart. These are located in the beginning of Section 6 , 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	No
GO to Z4 .	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	No
GO to Z5 .	GO to Z11 .

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 in Section 3 .
- 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 .

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 Section 6, 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 Section 6 .
- 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 Section 6 .
- 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 .

Z9 RECREATE SYMPTOM USING 48 KMH (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 KMH (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 .

Z9 - Z10

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 from Section 6 . 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 Section 3 , Symptom Charts.

Z11

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 Section 6 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 Section 6, Reference Values.

Are any values fluctuating in and out of range?

Yes	No
REPAIR as necessary. VERIFY repair.	GO to Z14 .

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 Section 6, 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 Section 6, Reference Values.

Are values fluctuating in and out of range?

Yes	No
REPAIR as necessary. VERIFY repair.	GO to Z16 .

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 Section 6, Reference Values.

Is there a mismatch or are any values fluctuating in and out of range on the Reference Value Charts?

Yes	No
REPAIR as necessary. VERIFY repair.	GO to Z17 .

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.

- 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 Section 6, Reference Values.

Is there an idle fluctuation, a digital multimeter value mismatch or fluctuation?

Yes	No
REPAIR as necessary. VERIFY repair.	GO to Z18 .

Z17

Z18 KOEO WATER SOAK TEST PROCEDURE FOR PCM ACTUATORS

WARNING: WHEN PERFORMING WATER SOAK TEST ON ELECTRICAL COMPONENTS AND/OR HARNESES, AVOID CONTACT WITH EEC, GEM AND OTHER MODULES IF POSSIBLE. ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS OR HOT SURFACES.

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 Section 6, Reference Values.

Is there a PID to digital multimeter value mismatch or fluctuation in and out of range according to the Reference Value Charts?

Yes	No
REPAIR as necessary. VERIFY repair.	GO to Z19 .

Z18

**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 Section 6, Reference Values.

Is there an idle fluctuation, value mismatch or values fluctuating in and out of range according to the Reference Value Charts?

Yes	No
REPAIR as necessary. VERIFY repair.	KEY OFF. GO to Z20 .

Z19

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 in an earlier section. 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	No
REPAIR as necessary. VERIFY repair.	It is necessary to seek additional help. REFER to the (PTS) Professional Technician Society web site, the OASIS system or the Technical Hotline. A (VDR) Vehicle Data Recorder or similar flight recorder may also be useful.

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 Section 5 Pinpoint Test steps completed before starting the intermittent ignition procedure.

- Check sensor shield connector.
- Be certain the battery is fully charged.
- All accessories must be off during diagnosis.

Is vehicle prepared for equipment set-up?

Yes	No
GO to Z51 .	REPEAT Z50 .

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 .

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	No
PRESS RESET and WAIT for WIGGLE TEST ACTIVE LED to light. CONTINUE to test until intermittent is isolated. REPAIR as necessary. VERIFY repair.	REPLACE PCM (REFER to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM)). VERIFY repair.

Z234