

Computers and Control Systems: Pinpoint Tests

Test A: No Start

PINPOINT TEST A: NO START

No Start

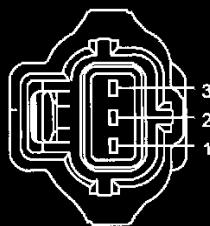
A

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

This pinpoint test is intended to diagnose the following:

- Spark (As related to Electronic Engine Control).
- Powertrain control module (PCM) (12A650).

Throttle Position (TP) Sensor Connector

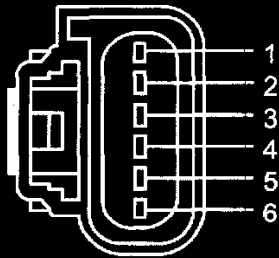
A

A0077554

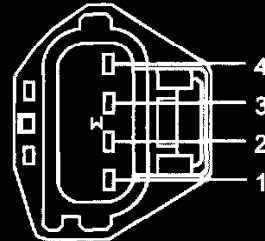
B

A0077555

Vehicle	Connector	Circuit	Pin
Escape 2.3L, Focus, Mariner 2.3L, Ranger 2.3L	A	SIGRTN VREF	1 3
All other vehicles	B	SIGRTN VREF	3 1

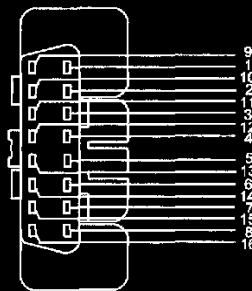
No Start**A****Electronic Throttle Body TPS (ETBTPS) Sensor Connector****A**

A0094772

B

A0077519

Vehicle	Connector	Circuit	Pin
F-150 4.2L, Five Hundred, Freestyle, Montego	A	ETCRTN ETCREF	4 5
All other vehicles	B	ETCRTN ETCREF	3 2

Data Link Connector (DLC)

A0077513

Connectors

No Start

A

Circuit	Pin
FEPS (Flash EEPROM Program Signal)	13

Test Step		Results / Action to Take				
A1	CHECK THE PASSIVE ANTI-THEFT SYSTEM (SECURE LOCK)	Yes REFER to Antitheft and Alarm Systems. No GO to A2.				
• Verify the anti-theft system status. • Is the system activated?						
A2	ATTEMPT TO CRANK THE ENGINE	Yes Key in OFF position. GO to A3. No Key in OFF position. REFER to Starting System.				
Note: Verify the Inertia fuel shutoff (IFS) switch is set (button pushed in). Refer to the Owner's Literature for location. • Does the engine crank?						
A3	IDENTIFY THE TYPE OF NO START	Yes Key in OFF position. Vehicle is an intermittent no start. GO to Z2. No Key in OFF position. GO to A4.				
Note: The purpose of this test step is to identify intermittent no starts in order to determine the proper repair procedure. • Does the vehicle start?						
A4	DETERMINE THE THROTTLE TYPE	Yes GO to A6. No GO to A5.				
• Is vehicle equipped with Electronic Throttle Control?						
A5	CHECK THE VREF VOLTAGE TO TP SENSOR	Yes Key in OFF position. RECONNECT the TP sensor. GO to A7. No Key in OFF position. GO to C1.				
• Key in OFF position. • TP Sensor connector disconnected. • Key in ON position. • Measure the voltage between:						
<table><tr><td>(+) TP Sensor Connector, Harness Side</td><td>(-) TP Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table>			(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side	VREF	SIGRTN
(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side					
VREF	SIGRTN					
• Is the voltage between 4.5 V - 5.5 V?						

Connector And A1-A5

No Start

A

Test Step		Results / Action to Take				
A6	CHECK VREF VOLTAGE TO ETBTPS SENSOR - Key in OFF position. - ETBTPS Sensor connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) ETBTPS Sensor Connector, Harness Side</td><td>(-) ETBTPS Sensor Connector, Harness Side</td></tr><tr><td>ETCREF</td><td>ETCRTN</td></tr></table> - Is the voltage between 4.5 V - 5.5 V?	(+) ETBTPS Sensor Connector, Harness Side	(-) ETBTPS Sensor Connector, Harness Side	ETCREF	ETCRTN	Yes Key in OFF position. RECONNECT the ETC. GO to A7. No Key in OFF position. GO to C1.
(+) ETBTPS Sensor Connector, Harness Side	(-) ETBTPS Sensor Connector, Harness Side					
ETCREF	ETCRTN					
A7	CHECK THE FLASH EEPROM POWER SUPPLY (FEPS) CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Measure the voltage between:<table><tr><td>(+) DLC, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>FEPS - Pin 13</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 9 V?	(+) DLC, Harness Side	(-) Vehicle Battery	FEPS - Pin 13	Negative terminal	Yes Key in OFF position. REPAIR the short circuit. No Key in OFF position. GO to A8.
(+) DLC, Harness Side	(-) Vehicle Battery					
FEPS - Pin 13	Negative terminal					
A8	CHECK THE PCM DRIVER TO COILS - Connect a test lamp between B+ and each coil driver circuit at the harness connector. - Crank the engine. Note: Test lamp bulb filament wattages vary widely. The intensity and duration of blinking depends on the test lamp being used. - Does the test lamp blink consistently (one blink per engine revolution)?	Yes Key in OFF position. GO to A9. No Key in OFF position. GO to JD1.				
A9	CHECK THE RPM IN THE PCM Note: The diagnostic 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 the PCM and monitor the RPM PID. Note: Normal engine cranking speed is between 150 RPM and 350 RPM. - Crank the engine while viewing the RPM PID. - Is the RPM between 150 RPM - 350 RPM?	Yes Key in OFF position. For vehicles that do not require ignition testing, GO to A10. For Coil-On-Plug Ignition Testing, GO to JB1. For Coil Pack Ignition Testing, GO to JC1. No Key in OFF position. For base engine concerns, REFER to Engine. For all others, GO to JD2.				

No Start

A

Test Step		Results / Action to Take
A10	CHECK THE FUEL PRESSURE	
 WARNING: The fuel system remains pressurized when the engine is not running. To prevent injury or fire, use caution when working on the fuel system. Refer to the fuel system WARNING information at the beginning of Pinpoint Test HC. - Relieve the fuel pressure. - Connect the fuel pressure gauge to the Schrader valve using the appropriate fuel pressure test hose and adaptor. Note: For vehicles not equipped with a fuel rail Schrader valve, a T-adaptor with hoses must be installed on the fuel rail before proceeding with this test. - Diagnostic tool connected. - Key in ON position. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Activate the fuel pump to obtain maximum fuel pressure. Is the fuel pressure within specification (refer to the fuel pressure chart in Pinpoint Test HC)?		Yes Key in OFF position. GO to A11. No Key in OFF position. GO to Pinpoint Test HC.
A11	CHECK THE FUEL PRESSURE LEAKDOWN	
- Diagnostic tool connected. - Key in ON position. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Activate the fuel pump to obtain maximum fuel pressure. - Exit the Output Test Mode. - Verify the fuel pressure remains within 34 kPa (5 psi) of the maximum pressure for 1 minute after turning the pump off. Does fuel pressure remain within 34 kPa (5 psi)?		Yes Key in OFF position. GO to A12. No Key in OFF position. GO to Pinpoint Test HC.
A12	CHECK THE FUEL INJECTORS FOR VPWR	
CHECK at least 2 fuel injectors, 1 on each bank on V type engines. A no start condition typically exists only if greater than half of the fuel injectors are without VPWR. - Disconnect 2 fuel injectors. - Key in ON position. - Measure the VPWR voltage at each fuel injector harness connector. Is the voltage greater than 10.5 volts?		Yes Key in OFF position. GO to A13. No Key in OFF position. REPAIR the VPWR circuit.

No Start**A**

Test Step		Results / Action to Take
A13	CHECK THE FUEL INJECTORS ABILITY TO DELIVER FUEL	
	• Cycle the key several times to charge the fuel system. • Locate and activate the fuel inertia switch to disable fuel pump. • Monitor the fuel pressure gauge while cranking the engine for at least 5 seconds. • Is there a pressure drop greater than 34 kPa (5 psi) while cranking the engine?	Yes Key in OFF position. The electronic engine control (EEC) system is not the cause of the no start. Concern is elsewhere. RETURN to Symptom Charts for further direction. No Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).

A13

Test B: Powertrain Control Module (PCM) Power Relay
PINPOINT TEST B: POWERTRAIN CONTROL MODULE (PCM) POWER RELAY

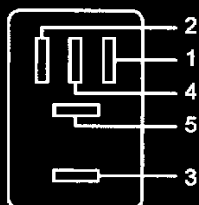
Powertrain Control Module (PCM) Power Relay

B

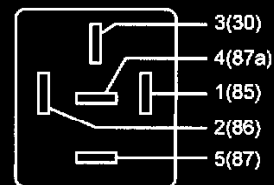
This pinpoint test is intended to diagnose the following:

- Harness Circuit(s):
- Vehicle Power.
- Ignition Start/Run.
- PCM Power Relay Ground.
- Battery positive voltage.
- PCM Power Relay (12A646).

Powertrain Control Module Power (PCMPWR) Relay Connector

A**B**

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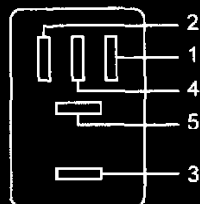


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Vehicle	Connector	Circuit	Pin
Escape, Focus, Sable, Taurus	A	VPWR GND IGN START/RUN B+	5 2 1 3
All other vehicles	B	VPWR GND IGN START/RUN B+	87 85 86 30

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

Note And Connector

**Powertrain Control Module (PCM)
Power Relay****B****Powertrain Control Module Power - 2 (PCMPWR-2)
Relay Connector**

A0077584

Circuit	Pin
GND (Ground)	1
IGN START/RUN	2
B+ (Battery Positive Voltage)	3
VPWR (Power Supply)	5

Powertrain Control Module (PCM) Connector

Vehicle	Connector	Circuit	Pin
Aviator, LS, Thunderbird	150 (60-32-58) Pin	VPWR	B32, B33
E-Series 4.6L, E-Series 5.4L 4R75E, Mustang	170 Pin	VPWR	B35, B36
E-Series 6.8L, E-Series 5.4L 5R100, F-Super Duty	170 Pin	VPWR	B35, B36, T39

(Continued)

Powertrain Control Module (PCM) Power Relay

B

Vehicle	Connector	Circuit	Pin
Excursion, Explorer SportTrac, Freestar/Monterey, Ford GT, Ranger, Sable, Taurus	104 Pin	VPWR	71, 97
Expedition, F-150, Navigator	190 Pin	VPWR	B51, B52, B53
All other vehicles	150 (50-50-50) Pin	VPWR	B35, B36

Test Step		Results / Action to Take						
B1	CHECK THE B+ AND IGN START/RUN VOLTAGE TO PCM POWER RELAY - Key in OFF position. - PCMPWR Relay connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCMPWR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>B+</td><td>Ground</td></tr><tr><td>IGN START/RUN</td><td>Ground</td></tr></table> - Are the voltages greater than 10.5 V?	(+) PCMPWR Relay Connector, Harness Side	(-)	B+	Ground	IGN START/RUN	Ground	Yes GO to B2. No REPAIR the open circuit.
(+) PCMPWR Relay Connector, Harness Side	(-)							
B+	Ground							
IGN START/RUN	Ground							
B2	CHECK THE PCM POWER RELAY GROUND CIRCUIT FOR AN OPEN - Measure the voltage between:<table><tr><td>(+) PCMPWR Relay Connector, Harness Side</td><td>(-) PCMPWR Relay Connector, Harness Side</td></tr><tr><td>B+</td><td>GND</td></tr></table> - Is the voltage greater than 10.5 V?	(+) PCMPWR Relay Connector, Harness Side	(-) PCMPWR Relay Connector, Harness Side	B+	GND	Yes GO to B3. No REPAIR the open circuit.		
(+) PCMPWR Relay Connector, Harness Side	(-) PCMPWR Relay Connector, Harness Side							
B+	GND							
B3	CHECK FOR AN OPEN VPWR CIRCUIT BETWEEN THE PCM AND POWER RELAY - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCMPWR Relay Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VPWR</td><td>VPWR</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCMPWR Relay Connector, Harness Side	(-) PCM Connector, Harness Side	VPWR	VPWR	Yes INSTALL a new PCMPWR relay. No REPAIR the open circuit.		
(+) PCMPWR Relay Connector, Harness Side	(-) PCM Connector, Harness Side							
VPWR	VPWR							

Connector And B1-B3

Powertrain Control Module (PCM) Power Relay

B

Test Step		Results / Action to Take							
B4	CHECK FOR VEHICLES THAT HAVE 2 PCM POWER RELAYS	Yes GO to B5. No CHECK the VPWR circuit for short to ground. INSTALL a new fuse.							
Note: The PCM power relay No. 2 (also referred to as the COPS and HO2S relay) supplies VPWR to two separately fused circuits. REFER to the applicable ALLDATA System/Component to determine fuse locations. - Inspect the VPWR circuit fuse that goes to the component where the VPWR check failed. - Is the fuse OK?									
B5	CHECK FOR VPWR TO BOTH FUSES CONNECTED TO THE PCMPWR-2 RELAY	Yes REPAIR the open circuit. (The open circuit is between the fuse and the component where the VPWR check failed). No If only 1 voltage is less than 10.5 volts, repair the open circuit between the fuse and the splice. Otherwise, GO to B6.							
- Key in ON position. - Measure the voltage between: <table><tr><td>(+) Component: Fuse Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Remove and inspect the other VPWR circuit fuse that goes to the components supplied by the PCMPWR-2 relay. Repair as necessary. - Measure the voltage between: <table><tr><td>(+) Component: Fuse Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Is the voltage to both fuses greater than 10.5 volts?			(+) Component: Fuse Connector, Harness Side	(-)	VPWR	Ground	(+) Component: Fuse Connector, Harness Side	(-)	VPWR
(+) Component: Fuse Connector, Harness Side	(-)								
VPWR	Ground								
(+) Component: Fuse Connector, Harness Side	(-)								
VPWR	Ground								
B6	CHECK VPWR CIRCUIT CONTINUITY BETWEEN THE FUSE AND PCM POWER RELAY NO. 2	Yes GO to B7. No REPAIR the open circuit. (The open is between the splice and the PCMPWR-2 relay).							
- Key in OFF position. - PCMPWR-2 Relay connector disconnected. - Measure the resistance between: <table><tr><td>(+) PCMPWR-2 Relay Connector, Harness Side</td><td>(-) Component: Fuse Connector, Harness Side</td></tr><tr><td>VPWR - Pin 5</td><td>FUSE</td></tr></table> - Is the resistance less than 5 ohms?			(+) PCMPWR-2 Relay Connector, Harness Side	(-) Component: Fuse Connector, Harness Side	VPWR - Pin 5	FUSE			
(+) PCMPWR-2 Relay Connector, Harness Side	(-) Component: Fuse Connector, Harness Side								
VPWR - Pin 5	FUSE								

B4-B6

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

Test Step		Results / Action to Take						
B7	CHECK THE B+ AND IGN START/RUN VOLTAGE TO PCMPWR-2 - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCMPWR-2 Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>B+ - Pin 3</td><td>Ground</td></tr><tr><td>IGN START/RUN - Pin 2</td><td>Ground</td></tr></table> - Are the voltages greater than 10.5 V?	(+) PCMPWR-2 Relay Connector, Harness Side	(-)	B+ - Pin 3	Ground	IGN START/RUN - Pin 2	Ground	Yes GO to B8. No REPAIR the open circuit.
(+) PCMPWR-2 Relay Connector, Harness Side	(-)							
B+ - Pin 3	Ground							
IGN START/RUN - Pin 2	Ground							
B8	CHECK THE PCMPWR-2 GND CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the voltage between:<table><tr><td>(+) PCMPWR-2 Relay Connector, Harness Side</td><td>(-) PCMPWR-2 Relay Connector, Harness Side</td></tr><tr><td>B+ - Pin 3</td><td>GND - Pin 1</td></tr></table> - Is the voltage greater than 10.5 V?	(+) PCMPWR-2 Relay Connector, Harness Side	(-) PCMPWR-2 Relay Connector, Harness Side	B+ - Pin 3	GND - Pin 1	Yes INSTALL a new PCMPWR-2 relay. No REPAIR the open circuit.		
(+) PCMPWR-2 Relay Connector, Harness Side	(-) PCMPWR-2 Relay Connector, Harness Side							
B+ - Pin 3	GND - Pin 1							

B7-B8

Test C: Reference Voltage

PINPOINT TEST C: REFERENCE VOLTAGE

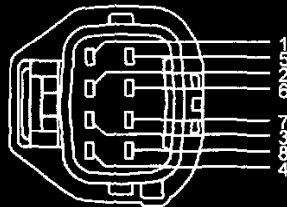
Reference Voltage

C

This pinpoint test is intended to diagnose the following:

- Accelerator Pedal Position (APP) Sensor.
- Air Conditioning Pressure Transducer (ACPT).
- Differential Pressure Feedback EGR (DPFE) Sensor.
- EGR System Module (ESM).
- Fuel Rail Pressure (FRP) Sensor.
- Fuel Rail Pressure Temperature (FRPT) Sensor.
- Manifold Absolute Pressure (MAP) Sensor.
- Power Steering Pressure (PSP) Sensor.
- Powertrain Control Module (PCM).
- Throttle Position (TP) Sensor.

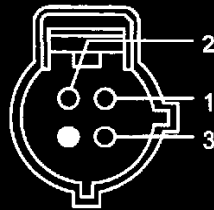
Accelerator Pedal Position (APP) Sensor Connector



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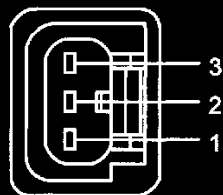
Circuit	Pin
ETCRTN (Electronic Throttle Control Return)	1, 3
ETCREF (Electronic Throttle Control Reference Voltage to TP)	6, 7

Note, Accelerator Pedal Position (APP) Sensor Connector

Reference Voltage**C****Air Conditioning Pressure (ACP) Sensor Connector**

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Circuit	Pin
SIGRTN (Signal return)	1
VREF (Reference Voltage)	2

Differential Pressure Feedback EGR (DPFEGR) Sensor Connector**A**

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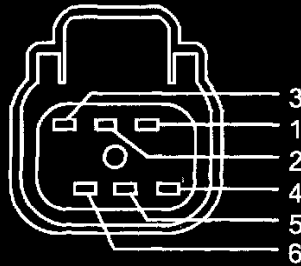
B

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Air Conditioning Pressure (ACP) Sensor Connector And Differential Pressure Feedback EGR (DPFEGR) Sensor Connector

Reference Voltage**C**

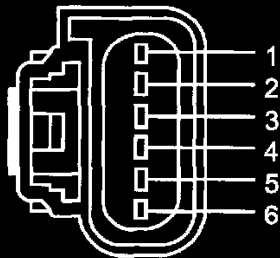
Vehicle	Connector	Circuit	Pin
Tube mount	A	VREF SIGRTN	1 2
All other vehicles	B	VREF SIGRTN	3 2

EGR System Module (ESM) Connector

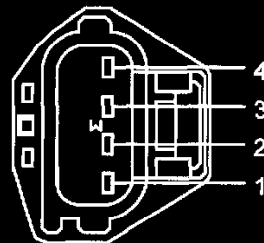
A0077577

Circuit	Pin
SIGRTN (Signal return)	6
VREF (Reference Voltage)	2

Differential Pressure Feedback EGR (DPFEGR) Sensor Connector And EGR System Module (ESM) Connector

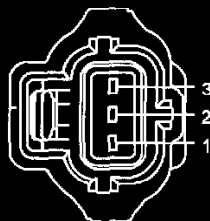
Reference Voltage**C****Electronic Throttle Body TPS (ETBTPS) Sensor Connector****A**

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B

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Vehicle	Connector	Circuit	Pin
F-150 4.2L, Five Hundred, Freestyle, Montego	A	ETCRTN ETCREF	4 5
All other vehicles	B	ETCRTN ETCREF	3 2

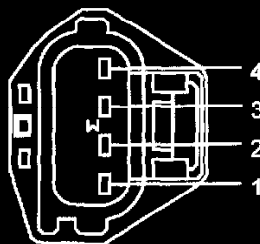
Fuel Rail Pressure (FRP) Sensor Connector

A0077554

Electronic Throttle Body TPS (ETBTPS) Sensor Connector And Fuel Rail Pressure (FRP) Sensor Connector

Reference Voltage**C**

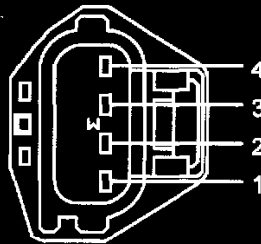
Circuit	Pin
SIGRTN (Signal return)	2
VREF (Reference Voltage)	1

Fuel Rail Pressure/Temperature (FRPT) Sensor Connector

A0077567

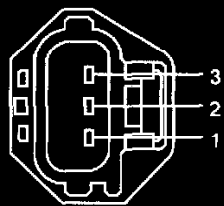
Circuit	Pin
VREF (Reference Voltage)	2
SIGRTN (Signal return)	4

Fuel Rail Pressure (FRP) Sensor Connector And Fuel Rail Pressure/Temperature (FRPT) Sensor Connector

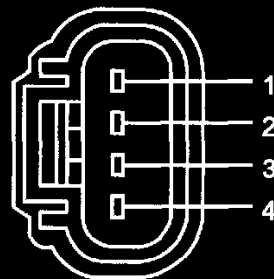
Reference Voltage**C****Fuel Tank Pressure Transducer (FTPT) Sensor Connector**

A0077567

Circuit	Pin
VREF (Reference Voltage)	1
SIGRTN (Signal return)	2

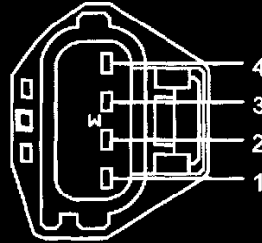
Manifold Absolute Pressure (MAP) Sensor Connector**A**

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B

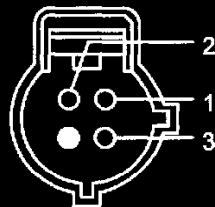
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Fuel Tank Pressure Transducer (FTPT) Sensor Connector And Manifold Absolute Pressure (MAP) Sensor Connector

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

A0077519

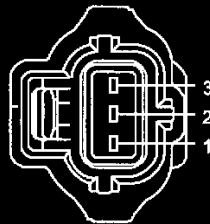
Vehicle	Connector	Circuit	Pin
Escape 3.0L	A	SIGRTN VREF	3 1
Ford GT	B	SIGRTN VREF	4 2
Ranger	C	SIGRTN VREF	1 3
All other vehicles	C	SIGRTN VREF	4 2

Power Steering Pressure (PSP) Sensor Connector

A0077539

Circuit	Pin
VREF (Reference Voltage)	2
SIGRTN (Signal return)	1

Manifold Absolute Pressure (MAP) Sensor Connector And Power Steering Pressure (PSP) Sensor Connector

Reference Voltage**C****Throttle Position (TP) Sensor Connector****A**

A0077554

B

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Vehicle	Connector	Circuit	Pin
Escape 2.3L, Focus, Mariner 2.3L, Ranger 2.3L	A	VREF SIGRTN	3 1
All other vehicles	B	VREF SIGRTN	1 3

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	VPWR SIGRTN VREF	B32, B33 B17, E17, T17 B20, E20
Crown Victoria, Grand Marquis, Town Car	150 (50-50-50) Pin	VPWR SIGRTN ETCRTN VREF ETCREF	B35, B36 B41, E41, T41 B41, B6, E7 B40, E40 B24, B4, E18
E-Series 4.6L, E-Series 5.4L 4R75E	170 Pin	VPWR SIGRTN ETCRTN VREF ETCREF	B35, B36 B41, E58, T41 B18, B6, E59 B40, E57 B16, B4, E66

(Continued)

Throttle Position (TP) Sensor Connector And Powertrain Control Module (PCM) Connector

Reference Voltage

C

Vehicle	Connector	Circuit	Pin
E-Series 6.8L, E-Series 5.4L 5R100, F-Super Duty	170 Pin	VPWR SIGRTN ETCRTN VREF ETCREF	B35, B36, T39 B41, E58, T41 B18, B6, E59 B40, E57 B16, B4, E66
Escape, Mariner	150 (50-50-50) Pin	VPWR SIGRTN VREF	B35, B36 B41, E41, T41 B40, E40
Expedition, F-150	190 Pin	VPWR SIGRTN ETCRTN VREF ETCREF	B51, B52, B53 B58, E58, T43 B58, B59, E59 B29, E57 B21, B28, E66
Explorer, Mountaineer	150 (50-50-50) Pin	VPWR SIGRTN ETCRTN VREF ETCREF	B35, B36 B41, E41, T41 B41, B6, E7 E40, T40 B4, B40, E18
Five Hundred, Freestyle, Montego	150 (50-50-50) Pin	VPWR SIGRTN ETCRTN VREF ETCREF	B35, B36 B41, E41 B41, B6, E7 B40, E40 B24, B4, E18
Focus	150 (50-50-50) Pin	VPWR SIGRTN VREF	B35, B36 B41, E41, T41 E40
LS, Thunderbird	150 (60-32-58) Pin	VPWR SIGRTN ETCRTN VREF ETCREF	B32, B33 B5, E17, T14 B17, E15 B55, E14 B20, B23, E24
Mustang	170 Pin	VPWR SIGRTN ETCRTN VREF ETCREF	B35, B36 B43, E33, T41 B43, B6, E59 B40, E24 B24, B4, E66
Navigator	190 Pin	VPWR SIGRTN ETCRTN VREF ETCREF	B51, B52, B53 B58, E58 B58, B59, E59 B29, E57 B21, B28, E66
All other vehicles	104 Pin	VPWR SIGRTN VREF	71, 97 91 90

Powertrain Control Module (PCM) Connector

Reference Voltage

C

SENSORS CONNECTED TO VREF/ETCREF

Applications	TP or ETC Note 2	APPS Note 2	DPFEGR or ESM	FTPT	ACPT	PSPT	FRP or FRPT	MAP
Aviator	TP		ESM	X			X	
Crown Victoria/Grand Marquis	ETC	X	ESM	X	X		X	
Escape/Mariner - 3.0L	TP		DPFEGR	X			X	X
Escape/Mariner - 2.3L	TP			X			X	X
E-Series - 4.6L	ETC	X	ESM	X			X	
E-Series - 5.4L	ETC	X	DPFEGR	X			X	
E-Series - 6.8L	ETC	X		X			X	
Excursion - 5.4L	TP		DPFEGR	Note 1				
Excursion - 6.8L	TP			Note 1				
Expedition/Navigator	ETC	X		X			X	
Explorer/Mountaineer	ETC	X	ESM	X			X	
Explorer Sport Trac	TP		DPFEGR	X			X	
F-150 - 4.2L	ETC	X	ESM	X			X	
F-150- 4.6L	ETC	X	ESM	X		X	X	
F-150 - 5.4L	ETC	X		X		X	X	
F-Super Duty	ETC	X		X			X	
Focus	TP					X	X	X
Ford GT	TP		ESM	X			X	X
Freestar/Monterey	TP		DPFEGR	X	X		X	
Freestyle/Five Hundred/Montego	ETC	X	ESM	X			X	
LS 3.0L	ETC	X		X	X		X	
LS 3.9L/Thunderbird	ETC	X	ESM	X	X		X	
Mustang	ETC	X	ESM	X	X		X	
Mustang GT	ETC	X		X			X	
Ranger - 2.3L	TP			X				X
Ranger - 3.0L	TP			X				
Ranger - 4.0L	TP		DPFEGR	X				
Taurus/Sable - 2V	TP		DPFEGR	X			X	
Taurus/Sable - 4V	TP		DPFEGR	X		X	X	
Town Car	ETC	X	ESM	X	X		X	

Note:

- (1) Green State emission regulations.
- (2) ETCREF and ETCRTN are internally bussed within the PCM and are dedicated circuits for the APP sensor and the electronic throttle body TP sensor only. Refer to Vehicle/Diagrams for specific vehicle application and pin locations.

Chart

Reference Voltage**C**

Test Step		Results / Action to Take								
C1	CHECK THE REFERENCE VOLTAGE TO SIGRTN/ETCRTN • Key in OFF position. • Disconnect the suspect sensor. • Key in ON position. • For ETCREF concerns. • Measure the voltage between:<table><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-) Suspect Sensor Connector, Harness Side</td></tr><tr><td>ETCREF</td><td>ETCRTN</td></tr></table> • For VREF concerns. • Measure the voltage between:<table><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-) Suspect Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> • Is the voltage between 4.5 volts - 5.5 volts?	(+) Suspect Sensor Connector, Harness Side	(-) Suspect Sensor Connector, Harness Side	ETCREF	ETCRTN	(+) Suspect Sensor Connector, Harness Side	(-) Suspect Sensor Connector, Harness Side	VREF	SIGRTN	Yes GO to C19. No GO to C2.
(+) Suspect Sensor Connector, Harness Side	(-) Suspect Sensor Connector, Harness Side									
ETCREF	ETCRTN									
(+) Suspect Sensor Connector, Harness Side	(-) Suspect Sensor Connector, Harness Side									
VREF	SIGRTN									
C2	CHECK THE REFERENCE VOLTAGE TO GROUND • For ETCREF concerns. • Measure the voltage between:<table><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>ETCREF</td><td>Ground</td></tr></table> • For VREF concerns. • Measure the voltage between:<table><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>VREF</td><td>Ground</td></tr></table> • Is the voltage between 4.5 volts - 5.5 volts?	(+) Suspect Sensor Connector, Harness Side	(-)	ETCREF	Ground	(+) Suspect Sensor Connector, Harness Side	(-)	VREF	Ground	Yes GO to C18. No GO to C3.
(+) Suspect Sensor Connector, Harness Side	(-)									
ETCREF	Ground									
(+) Suspect Sensor Connector, Harness Side	(-)									
VREF	Ground									

Reference Voltage

C

Test Step		Results / Action to Take								
C3	CHECK THE REFERENCE VOLTAGE WITH ALL SENSORS DISCONNECTED Note: Refer to the Sensors Connected to VREF/ETCREF Chart at the beginning of this pinpoint test and Vehicle/Diagrams to identify the sensors connected to VREF/ETCREF. • Key in OFF position. • Disconnect all of the sensors connected to the VREF/ETCREF circuit. • Key in ON position. • Measure the voltage at the sensor disconnected in C1. • For ETCREF concerns. • Measure the voltage between: <table border="1"><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>ETCREF</td><td>Ground</td></tr></table> • For VREF concerns. • Measure the voltage between: <table border="1"><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>VREF</td><td>Ground</td></tr></table> • Is the voltage between 4.5 volts - 5.5 volts?	(+) Suspect Sensor Connector, Harness Side	(-)	ETCREF	Ground	(+) Suspect Sensor Connector, Harness Side	(-)	VREF	Ground	Yes For electronic throttle control (ETC) concerns, GO to C8 . For all other VREF concerns, GO to C10 . No GO to C4 .
(+) Suspect Sensor Connector, Harness Side	(-)									
ETCREF	Ground									
(+) Suspect Sensor Connector, Harness Side	(-)									
VREF	Ground									
C4	CHECK THE REFERENCE VOLTAGE CIRCUIT FOR AN OPEN • Key in OFF position. • Disconnect the PCM. • For ETCREF concerns. • Measure the resistance between: <table border="1"><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>ETCREF</td><td>ETCREF</td></tr></table> • For VREF concerns. • Measure the resistance between: <table border="1"><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VREF</td><td>VREF</td></tr></table> • Is the resistance less than 5 ohms?	(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	ETCREF	ETCREF	(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	VREF	VREF	Yes GO to C5 . No REPAIR the open circuit.
(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side									
ETCREF	ETCREF									
(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side									
VREF	VREF									

Reference Voltage

C

Test Step		Results / Action to Take																
C5	CHECK THE REFERENCE VOLTAGE CIRCUIT FOR A SHORT TO GND - For ETCREF concerns. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>ETCREF</td><td>ETCRTN</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>ETCREF</td><td>Ground</td></tr></table> - For VREF concerns. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>VREF</td><td>Ground</td></tr></table> - Are the resistances greater than 10,000 ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	ETCREF	ETCRTN	(+) PCM Connector, Harness Side	(-)	ETCREF	Ground	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	VREF	SIGRTN	(+) PCM Connector, Harness Side	(-)	VREF	Ground	Yes GO to C6. No REPAIR the short circuit to GND.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side																	
ETCREF	ETCRTN																	
(+) PCM Connector, Harness Side	(-)																	
ETCREF	Ground																	
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side																	
VREF	SIGRTN																	
(+) PCM Connector, Harness Side	(-)																	
VREF	Ground																	
C6	CHECK THE REFERENCE VOLTAGE CIRCUIT FOR A SHORT TO VPWR - For ETCREF concerns. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>ETCREF</td><td>VPWR</td></tr></table> - For VREF concerns. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VREF</td><td>VPWR</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	ETCREF	VPWR	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	VREF	VPWR	Yes GO to C7. No REPAIR the short circuit to PWR.								
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side																	
ETCREF	VPWR																	
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side																	
VREF	VPWR																	

Reference Voltage

C

Test Step		Results / Action to Take								
C7	CHECK THE REFERENCE VOLTAGE FOR A SHORT TO POWER • Key in ON position. • For ETCREF concerns. • Measure the voltage between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>ETCREF</td><td>Ground</td></tr></table> • For VREF concerns. • Measure the voltage between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>VREF</td><td>Ground</td></tr></table> • Is any voltage indicated?	(+) PCM Connector, Harness Side	(-)	ETCREF	Ground	(+) PCM Connector, Harness Side	(-)	VREF	Ground	
(+) PCM Connector, Harness Side	(-)									
ETCREF	Ground									
(+) PCM Connector, Harness Side	(-)									
VREF	Ground									

Reference Voltage

C

Test Step		Results / Action to Take				
C10	CHECK THE REFERENCE VOLTAGE WITH THE TP SENSOR CONNECTED Note: If this sensor was used for the VREF measurement in C3, GO to C11. • Key in OFF position. • Connect the TP sensor. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>VREF</td><td>Ground</td></tr></table> • Is the voltage between 4.5 V - 5.5 V?	(+) Suspect Sensor Connector, Harness Side	(-)	VREF	Ground	Yes Key in OFF position. For additional sensors disconnected, GO to C11. For no additional sensors disconnected, GO to Pinpoint Test Z. No Key in OFF position. INSTALL a new TP sensor.
(+) Suspect Sensor Connector, Harness Side	(-)					
VREF	Ground					
C11	CHECK THE REFERENCE VOLTAGE WITH THE DPFEGR SENSOR CONNECTED Note: If vehicle is not equipped with a DPFEGR sensor or if this sensor was used for the VREF measurement in C3, GO to C12. • Key in OFF position. • Connect the DPFEGR sensor. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>VREF</td><td>Ground</td></tr></table> • Is the voltage between 4.5 V - 5.5 V?	(+) Suspect Sensor Connector, Harness Side	(-)	VREF	Ground	Yes Key in OFF position. For additional sensors disconnected, GO to C12. For no additional sensors disconnected, GO to Pinpoint Test Z. No INSTALL a new DPFEGR sensor.
(+) Suspect Sensor Connector, Harness Side	(-)					
VREF	Ground					
C12	CHECK THE REFERENCE VOLTAGE WITH THE ESM CONNECTED Note: If vehicle is not equipped with an ESM or if this sensor was used for the VREF measurement in C3 GO to C13. • Key in OFF position. • Connect the ESM. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>VREF</td><td>Ground</td></tr></table> • Is the voltage between 4.5 V - 5.5 V?	(+) Suspect Sensor Connector, Harness Side	(-)	VREF	Ground	Yes For additional sensors disconnected, GO to C13. For no additional sensors disconnected, GO to Pinpoint Test Z. No INSTALL a new ESM.
(+) Suspect Sensor Connector, Harness Side	(-)					
VREF	Ground					

Reference Voltage

C

Test Step		Results / Action to Take			
C13	CHECK THE REFERENCE VOLTAGE WITH THE MAP SENSOR CONNECTED	Yes For additional sensors disconnected, GO to C14 . For no additional sensors disconnected, GO to Pinpoint Test Z. No INSTALL a new MAP sensor.			
	Note: If vehicle is not equipped with a MAP sensor or if this sensor was used for the VREF measurement in C3, GO to C14. - Key in OFF position. - Connect the MAP sensor. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>VREF</td><td>Ground</td></tr></table> - Is the voltage between 4.5 V - 5.5 V?		(+) Suspect Sensor Connector, Harness Side	(-)	VREF
(+) Suspect Sensor Connector, Harness Side	(-)				
VREF	Ground				
C14	CHECK THE REFERENCE VOLTAGE WITH THE FRP/FRPT SENSOR CONNECTED	Yes For additional sensors disconnected, GO to C15 . For no additional sensors disconnected, GO to Pinpoint Test Z. No INSTALL a new FRP/FRPT sensor.			
	Note: If vehicle is not equipped with a FRP/FRPT sensor or if this sensor was used for the VREF measurement in C3, GO to C15. - Key in OFF position. - Connect the FRP/FRPT sensor. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>VREF</td><td>Ground</td></tr></table> - Is the voltage between 4.5 V - 5.5 V?		(+) Suspect Sensor Connector, Harness Side	(-)	VREF
(+) Suspect Sensor Connector, Harness Side	(-)				
VREF	Ground				
C15	CHECK THE REFERENCE VOLTAGE WITH THE FTPT CONNECTED	Yes For additional sensors disconnected, GO to C16 . For no additional sensors disconnected, GO to Pinpoint Test Z. No INSTALL a new FTPT sensor.			
	Note: If the vehicle is not equipped with a FTPT or if this sensor was used for the VREF measurement in C3, GO to C16. - Key in OFF position. - Connect the FTPT. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>VREF</td><td>Ground</td></tr></table> - Is the voltage between 4.5 V - 5.5 V?		(+) Suspect Sensor Connector, Harness Side	(-)	VREF
(+) Suspect Sensor Connector, Harness Side	(-)				
VREF	Ground				

Reference Voltage

C

Test Step		Results / Action to Take								
C16	CHECK THE REFERENCE VOLTAGE WITH THE ACPT CONNECTED	Yes For additional sensors disconnected, GO to C17. For no additional sensors disconnected, GO to Pinpoint Test Z. No INSTALL a new ACPT sensor.								
Note: If the vehicle is not equipped with a ACPT or if this sensor was used for the VREF measurement in C3, GO to C17. - Key in OFF position. - Connect the ACPT. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>VREF</td><td>Ground</td></tr></table> - Is the voltage between 4.5 V - 5.5 V?			(+) Suspect Sensor Connector, Harness Side	(-)	VREF	Ground				
(+) Suspect Sensor Connector, Harness Side	(-)									
VREF	Ground									
C17	CHECK THE REFERENCE VOLTAGE WITH THE PSP SENSOR CONNECTED									
- Key in OFF position. - Connect the PSP sensor. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>VREF</td><td>Ground</td></tr></table> - Is the voltage between 4.5 V - 5.5 V?		(+) Suspect Sensor Connector, Harness Side	(-)	VREF	Ground	Yes The concern is intermittent. GO to Pinpoint Test Z. No INSTALL a new PSP sensor.				
(+) Suspect Sensor Connector, Harness Side	(-)									
VREF	Ground									
C18	CHECK THE SIGRTN OR ETCRTN CIRCUIT(S) FOR AN OPEN	Yes GO to C20. No REPAIR the open circuit.								
Note: Refer to Vehicle/Diagrams for specific vehicle application and pin locations. - Key in OFF position. - Disconnect the PCM. - For ETCRTN concerns. - Measure the resistance between: <table><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>ETCRTN</td><td>ETCRTN</td></tr></table> - For SIGRTN concerns. - Measure the resistance between: <table><tr><td>(+) Suspect Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> - Is the resistance less than 5 ohms?			(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	ETCRTN	ETCRTN	(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	SIGRTN	SIGRTN
(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side									
ETCRTN	ETCRTN									
(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side									
SIGRTN	SIGRTN									

Reference Voltage**C**

Test Step		Results / Action to Take
C19	CHECK THE SUSPECT SENSOR FOR AN INTERNAL SHORT	
	• Clear the KOEO, KOER, and Continuous DTCs. • Key in OFF position. • Connect the suspect sensor. • Key in ON position. • Carry out the PCM self-test. • Is the concern still present?	Yes INSTALL a new sensor in question. No The concern is intermittent. GO to Pinpoint Test Z.
C20	CHECK FOR CORRECT PCM OPERATION	
	• Disconnect all the PCM connectors. • Visually inspect for: — pushed out pins. — corrosion. • Connect all the PCM connectors and make sure they seat correctly. • Carry out the PCM self-test and verify the concern is still present. • Is the concern still present?	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. GO to Pinpoint Test Z.

C19-C20

Test DA: Intake Air Temperature (IAT) Sensor
PINPOINT TEST DA: INTAKE AIR TEMPERATURE (IAT) SENSOR

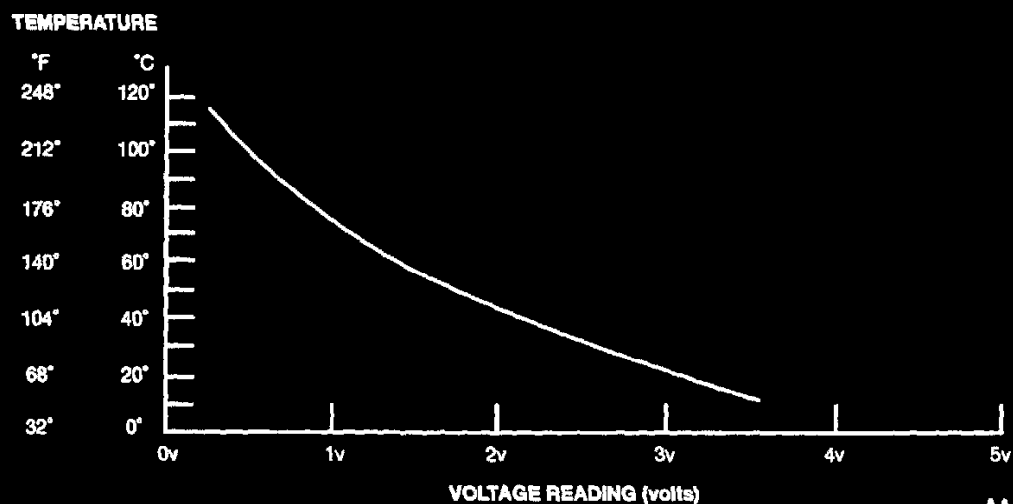
Intake Air Temperature (IAT) Sensor

DA

This pinpoint test is intended to diagnose the following:

- Intake air temperature (IAT) sensor .
- Integrated MAF/intake air temperature (IAT) sensor .
- Harness circuits: IAT, VREF and SIGRTN.
- Powertrain control module (PCM) .

Voltage values calculated for VREF = 5 volts. These values can vary by 15% due to sensor and VREF variations.



AA4387-A

TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS

Temperature		Temperature Sensor Values	
°C	°F	Voltage	Resistance (K ohms)
120	248	0.28	1.18
110	230	0.36	1.55
100	212	0.47	2.07
90	194	0.61	2.80
80	176	0.80	3.84
70	158	1.05	5.37
60	140	1.37	7.70
50	122	1.77	10.97
40	104	2.23	16.15
30	86	2.74	24.27
20	68	3.26	37.30

(Continued)

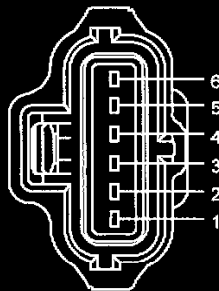
Note, Graph And Table

Intake Air Temperature (IAT) Sensor**DA****TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS**

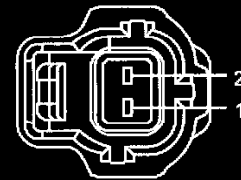
Temperature		Temperature Sensor Values	
°C	°F	Voltage	Resistance (K ohms)
10	50	3.73	58.75
0	32	4.14	95.85
-10	14	4.45	160.31

Intake Air Temperature (IAT) Connector

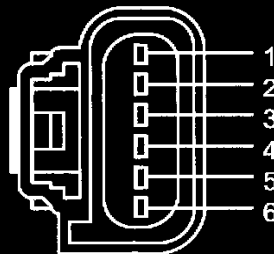
On some applications the IAT signal is integrated into the MAF sensor.

A

A0077549

B

A0077547

C

A0077520

Table, Connector

Intake Air Temperature (IAT) Sensor**DA**

Vehicle	Connector	Circuit	Pin
Aviator, Escape 3.0L, Explorer SportTrac, F-150 4.6L	A	MAF RTN SIGRTN IAT	4 1 6
F-150 4.2L	B	SIGRTN IAT	2 1
All other vehicles	C	MAF RTN SIGRTN IAT	3 2 1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	SIGRTN IAT	B17 B51
Crown Victoria, Five Hundred, Freestyle, Grand Marquis, Montego, Town Car	150 (50-50-50) Pin	SIGRTN IAT	E41 B26
E-Series, F-Super Duty	170 Pin	SIGRTN IAT	E58 E22
Escape, Focus, Mariner	150 (50-50-50) Pin	SIGRTN IAT	B41 B20
Expedition, F-150, Navigator	190 Pin	SIGRTN IAT	E58 B43
Explorer, Mountaineer	150 (50-50-50) Pin	SIGRTN IAT	B41 B16
LS, Thunderbird	150 (60-32-58) Pin	SIGRTN IAT	B5 B51
Mustang	170 Pin	SIGRTN IAT	E33 E22
All other vehicles	104 Pin	SIGRTN IAT	91 39

Table, Connectors

Intake Air Temperature (IAT) Sensor

DA

Test Step		Results / Action to Take						
DA1	DTC P0113: CHECK THE IAT SIGNAL CIRCUIT - The DTC indicates the sensor signal is greater than the self-test maximum. - IAT connector disconnected. Note: On some applications the IAT signal is integrated into the MAF sensor. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) IAT Connector, Har- ness Side</td><td>(-)</td></tr><tr><td>IAT</td><td>Ground</td></tr></table> - Is the voltage between 4.5 V - 5.5 V?	(+) IAT Connector, Har- ness Side	(-)	IAT	Ground	Yes GO to DA2 . No GO to DA3 .		
(+) IAT Connector, Har- ness Side	(-)							
IAT	Ground							
DA2	CHECK THE IAT SENSOR RESISTANCE - Key in OFF position. - Measure the resistance between: <table><tr><td>(+) IAT Connector, Component Side</td><td>(-) IAT Connector, Component Side</td></tr><tr><td>IAT</td><td>SIGRTN</td></tr></table> - Is the resistance between 1K ohms - 500K ohms?	(+) IAT Connector, Component Side	(-) IAT Connector, Component Side	IAT	SIGRTN	Yes GO to DA3 . No INSTALL a new IAT sensor.		
(+) IAT Connector, Component Side	(-) IAT Connector, Component Side							
IAT	SIGRTN							
DA3	CHECK THE SIGNAL AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between: <table><tr><td>(+) IAT Connector, Har- ness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>IAT</td><td>IAT</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> - Are the resistances less than 5 ohms?	(+) IAT Connector, Har- ness Side	(-) PCM Connector, Harness Side	IAT	IAT	SIGRTN	SIGRTN	Yes GO to DA4 . No REPAIR the open circuit.
(+) IAT Connector, Har- ness Side	(-) PCM Connector, Harness Side							
IAT	IAT							
SIGRTN	SIGRTN							
DA4	CHECK THE SIGNAL FOR A SHORT TO POWER IN HARNESS - Key in OFF position. - PCM connector disconnected. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) IAT Connector, Har- ness Side</td><td>(-)</td></tr><tr><td>IAT</td><td>Ground</td></tr></table> - Is the voltage greater than 1 V?	(+) IAT Connector, Har- ness Side	(-)	IAT	Ground	Yes REPAIR the short circuit. No Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).		
(+) IAT Connector, Har- ness Side	(-)							
IAT	Ground							

DA1-DA4

Intake Air Temperature (IAT) Sensor

DA

Test Step		Results / Action to Take								
DA5	DTC P0112: SIMULATE AN OPPOSITE SIGNAL TO THE PCM - The DTC indicates the sensor signal is less than the self-test minimum. - IAT connector disconnected. Note: On some applications the IAT signal is integrated into the MAF sensor. - Key in ON position. - Access the PCM and monitor the IAT V PID. - Is the voltage greater than 4.2 V?	Yes Key in OFF position. INSTALL a new IAT sensor.								
	No Key in OFF position. For vehicles with an integrated MAF/IAT, GO to DA6. For vehicles with stand alone IAT, GO to DA7.									
DA6	CHECK THE IAT CIRCUIT FOR A SHORT TO MAF RTN - PCM connector disconnected. - Measure the resistance between: <table><tr><td>(+) IAT Connector, Har- ness Side</td><td>(-) IAT Connector, Har- ness Side</td></tr><tr><td>IAT</td><td>MAF RTN</td></tr></table> - Is the resistance less than 5 ohms?	(+) IAT Connector, Har- ness Side	(-) IAT Connector, Har- ness Side	IAT	MAF RTN	Yes REPAIR the short circuit.				
(+) IAT Connector, Har- ness Side	(-) IAT Connector, Har- ness Side									
IAT	MAF RTN									
	No GO to DA7.									
DA7	CHECK THE IAT CIRCUIT FOR A SHORT TO GROUND - PCM connector disconnected. - Measure the resistance between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>IAT</td><td>SIGRTN</td></tr></table> - Measure the resistance between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) 12 Volt Vehicle Bat- tery</td></tr><tr><td>IAT</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	IAT	SIGRTN	(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Bat- tery	IAT	Negative terminal	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
IAT	SIGRTN									
(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Bat- tery									
IAT	Negative terminal									
	No REPAIR the short circuit.									
DA8	SELF-TEST DTCS P0112, P0113, P0114 OR P1112: INTERMITTENT CHECK - Key in ON position. - Access the PCM and monitor the IAT V PID. - While observing the PID, carry out the following: - Tap on the sensor to simulate road shock. - Wiggle the sensor connector. - Is there a large change in the voltage reading?	Yes DISCONNECT and INSPECT the connector. If OK, INSTALL a new IAT sensor.								
	No GO to DA9.									

Intake Air Temperature (IAT) Sensor**DA**

Test Step		Results / Action to Take
DA9	CHECK THE ELECTRONIC ENGINE CONTROL (EC) WIRING HARNESS	
	• Access the PCM and monitor the IAT V PID. • While observing the PID, carry out the following: — Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM. • Is there a large change in the voltage reading?	Yes ISOLATE the fault REPAIR as necessary. No Key in OFF position. GO to DA10 .
DA10	CHECK THE PCM AND VEHICLE HARNESS CONNECTORS	
	• PCM connector disconnected. • IAT connector disconnected. Note: On some applications the IAT signal is integrated into the MAF sensor. • Are the connectors and terminals OK?	Yes The fault is not present at this time. DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No REPAIR as necessary.

DA9-DA10

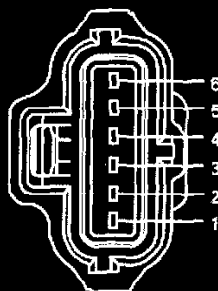
Test DC: Mass Air Flow (MAF) Sensor

PINPOINT TEST DC: MASS AIR FLOW (MAF) SENSOR

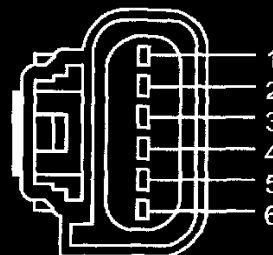
Mass Air Flow (MAF) Sensor**DC**

This pinpoint test is intended to diagnose the following:

- Mass Air Flow Sensor (12B579).
- Harness circuits: MAF SIG, MAF RTN, Vehicle Power (VPWR), Power Ground (PWRGND), IAT and SIGRTN.
- Powertrain control module (PCM) (12A650).

Mass Air Flow/Intake Air Temperature (MAF/IAT) Sensor Connector**A**

A0077549

B

A0077520

Vehicle	Connector	Circuit	Pin
Aviator, Escape 3.0L, Explorer SportTrac, F-150 4.6L	A	IAT SIGRTN MAF RTN MAF PWRGND VPWR	1 6 3 2 4 5
F-150 4.2L	A	MAF RTN MAF PWRGND VPWR	3 2 4 5
All other vehicles	B	IAT SIGRTN MAF RTN MAF PWRGND VPWR	1 2 4 3 5 6

Note, Connectors

Mass Air Flow (MAF) Sensor**DC****Powertrain Control Module (PCM) Connector**

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator, LS, Thunderbird	150 (60-32-58) Pin	MAF MAF RTN	B31 B38
E-Series, F-Super Duty, Mustang	170 Pin	MAF MAF RTN	E25 E26
Excursion, Explorer SportTrac, Freestar/Monterey, Ford GT, Ranger, Sable, Taurus	104 Pin	MAF MAF RTN	88 36
Expedition, F-150, Navigator	190 Pin	MAF MAF RTN	B41 B42
All other vehicles	150 (50-50-50) Pin	MAF MAF RTN	B32 B43

BAROMETRIC PRESSURE REFERENCE CHART

Barometric Pressure (in. Hg)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude Above Sea Level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

Mass Air Flow (MAF) Sensor

DC

Test Step		Results / Action to Take
DC1	DTC P1101: CHECK FOR MAF SENSOR CONTINUOUS MEMORY DTCS	
	- Retrieve CMDTCs. - Is a continuous memory MAF DTC present with the KOER DTC P1101?	Yes GO to DC2 . No Key in OFF position. GO to DC4 .
DC2	VERIFY CONTINUOUS MEMORY DTC P0102	
	Is a continuous memory DTC P0102 present with the KOER DTC P1101?	Yes GO to DC4 . No GO to DC3 .
DC3	VERIFY CONTINUOUS MEMORY DTC P0103	
	Is a continuous memory DTC P0103 present with the KOER DTC P1101?	Yes GO to DC20 . No All other continuous memory DTCS: DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions.
DC4	KOER AND CONTINUOUS MEMORY DTCS P0102, P0104 OR P1101: CHECK THE INTAKE AIR SYSTEM FOR LEAKS, OBSTRUCTIONS, AND DAMAGE	
	- Check the air inlet system (air cleaner, housing, ductwork) for obstructions or blockage. - Check for broken/loose air outlet tube clamps (throttle body and air cleaner assembly ends), cracks/holes in the air outlet tube, and worn gaskets between the MAF sensor and the air cleaner assembly. Verify the MAF sensor is connected. Repair as necessary. - Are there any concerns found during the visual inspection?	Yes Key in OFF position. REPAIR as necessary. No GO to DC5 .
DC5	CHECK THE MAF PID	
	- Run the engine up to 1,500 RPM for 5 seconds, then bring it back to idle. - Access the PCM and monitor the MAF V PID. - Is the voltage less than 0.23 V?	Yes Key in OFF position. GO to DC8 . No Key in OFF position. GO to DC6 .

DC1-DC5

Mass Air Flow (MAF) Sensor

DC

Test Step		Results / Action to Take				
DC6	CHECK THE MAF SIGNAL SENT TO THE PCM Note: DTC P1101 can be generated by a low charged vehicle battery or the garage exhaust ventilation system. Charge the battery as necessary, then remove the ventilation system and properly vent to the outside atmosphere. Check the air inlet system (air cleaner, housing, ductwork) for obstructions or blockage. Rerun the KOEO self-test. - MAF/IAT Sensor connector connected. - Key in ON position. - Access the PCM and monitor the MAF V PID. - Is the voltage less than 0.2 V?	Yes GO to DC7. No Key in OFF position. GO to DC8.				
DC7	CHECK THE MAF SIGNAL SENT TO THE PCM - Key on engine running. - Access the PCM and monitor the MAF V PID. - Is the voltage between 0.46 V - 2.44 V?	Yes Unable to identify the fault at this time. GO to Z1. No Key in OFF position. GO to DC8.				
DC8	CHECK THE VPWR TO THE MAF SENSOR - MAF/IAT Sensor connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) MAF/IAT Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VPWR</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 10.5 V?	(+) MAF/IAT Sensor Connector, Harness Side	(-) Vehicle Battery	VPWR	Negative terminal	Yes GO to DC9. No Key in OFF position. REPAIR the open circuit.
(+) MAF/IAT Sensor Connector, Harness Side	(-) Vehicle Battery					
VPWR	Negative terminal					
DC9	CHECK THE PWRGND CIRCUIT TO MAF SENSOR - Measure the voltage between:<table><tr><td>(+) Vehicle Battery</td><td>(-) MAF/IAT Sensor Connector, Harness Side</td></tr><tr><td>Positive terminal</td><td>PWRGND</td></tr></table> - Is the voltage greater than 10.5 V?	(+) Vehicle Battery	(-) MAF/IAT Sensor Connector, Harness Side	Positive terminal	PWRGND	Yes Key in OFF position. GO to DC10. No Key in OFF position. REPAIR the open circuit.
(+) Vehicle Battery	(-) MAF/IAT Sensor Connector, Harness Side					
Positive terminal	PWRGND					

Mass Air Flow (MAF) Sensor

DC

Test Step		Results / Action to Take										
DC10	CHECK FOR SHORTS BETWEEN CIRCUITS IN MAF HARNESS Note: For vehicles with a stand alone MAF sensor (IAT sensor not internal to the MAF sensor), disregard MAF circuit checks to IAT and SIGRTN. - MAF/IAT Sensor connector disconnected. - PCM connector disconnected. - Measure the resistance between: <table border="1"> <thead> <tr> <th>(+) MAF/IAT Sensor Connector, Harness Side</th> <th>(-) MAF/IAT Sensor Connector, Harness Side</th> </tr> </thead> <tbody> <tr> <td>MAF</td> <td>PWRGND</td> </tr> <tr> <td>MAF</td> <td>MAF RTN</td> </tr> <tr> <td>MAF</td> <td>SIGRTN</td> </tr> <tr> <td>MAF</td> <td>IAT</td> </tr> </tbody> </table> - Are the resistances greater than 10K ohms?	(+) MAF/IAT Sensor Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side	MAF	PWRGND	MAF	MAF RTN	MAF	SIGRTN	MAF	IAT	Yes GO to DC11 . No REPAIR the short circuit.
(+) MAF/IAT Sensor Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side											
MAF	PWRGND											
MAF	MAF RTN											
MAF	SIGRTN											
MAF	IAT											
DC11	CHECK THE MAF RTN CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between: <table border="1"> <thead> <tr> <th>(+) PCM Connector, Harness Side</th> <th>(-) MAF/IAT Sensor Connector, Harness Side</th> </tr> </thead> <tbody> <tr> <td>MAF RTN</td> <td>MAF RTN</td> </tr> </tbody> </table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side	MAF RTN	MAF RTN	Yes GO to DC12 . No REPAIR the open circuit.						
(+) PCM Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side											
MAF RTN	MAF RTN											
DC12	CHECK THE MAF RTN CIRCUIT FOR A SHORT TO PWRGND IN THE HARNESS - Measure the resistance between: <table border="1"> <thead> <tr> <th>(+) MAF/IAT Sensor Connector, Harness Side</th> <th>(-) MAF/IAT Sensor Connector, Harness Side</th> </tr> </thead> <tbody> <tr> <td>MAF RTN</td> <td>PWRGND</td> </tr> </tbody> </table> - Is the resistance greater than 10K ohms?	(+) MAF/IAT Sensor Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side	MAF RTN	PWRGND	Yes GO to DC13 . No REPAIR the short circuit to GND.						
(+) MAF/IAT Sensor Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side											
MAF RTN	PWRGND											
DC13	CHECK THE MAF CIRCUIT FOR A SHORT TO PWRGND IN THE PCM - PCM connector connected. - Measure the resistance between: <table border="1"> <thead> <tr> <th>(+) MAF/IAT Sensor Connector, Harness Side</th> <th>(-) MAF/IAT Sensor Connector, Harness Side</th> </tr> </thead> <tbody> <tr> <td>MAF</td> <td>PWRGND</td> </tr> </tbody> </table> - Is the resistance greater than 10K ohms?	(+) MAF/IAT Sensor Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side	MAF	PWRGND	Yes GO to DC14 . No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).						
(+) MAF/IAT Sensor Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side											
MAF	PWRGND											

Mass Air Flow (MAF) Sensor

DC

Test Step		Results / Action to Take						
DC14	CHECK THE MAF CIRCUIT VOLTAGE CYCLING INTEGRITY - Diagnostic tool connector connected. - Key in ON position. - Access the MAF V PID. - Connect a 5 amp fused jumper wire between the following: <table><tr><th>Point A MAF/IAT Sensor Connector, Harness Side</th><th>Point B MAF/IAT Sensor Connector, Harness Side</th></tr><tr><td>MAF RTN</td><td>PWRGND</td></tr><tr><td>MAF</td><td>VPWR</td></tr></table> - Take the PID reading while both jumpers are installed. - Remove the VPWR jumper while observing the MAF V PID. - Does the MAF V PID change from greater than 4.50 volts to less than 0.26 volt when the VPWR jumper is removed?	Point A MAF/IAT Sensor Connector, Harness Side	Point B MAF/IAT Sensor Connector, Harness Side	MAF RTN	PWRGND	MAF	VPWR	Yes Key in OFF position. REMOVE the jumper wire(s). If OK, INSTALL a new MAF sensor. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No Key in OFF position. REMOVE the jumper wire(s). GO to DC15.
Point A MAF/IAT Sensor Connector, Harness Side	Point B MAF/IAT Sensor Connector, Harness Side							
MAF RTN	PWRGND							
MAF	VPWR							
DC15	CHECK THE MAF CIRCUIT FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between: <table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) MAF/IAT Sensor Connector, Harness Side</th></tr><tr><td>MAF</td><td>MAF</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side	MAF	MAF	Yes GO to DC16. No REPAIR the open circuit.		
(+) PCM Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side							
MAF	MAF							
DC16	CHECK THE PWRGND CIRCUIT FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between: <table><tr><th>(+) MAF/IAT Sensor Connector, Harness Side</th><th>(-) Vehicle Battery</th></tr><tr><td>PWRGND</td><td>Negative terminal</td></tr></table> - Is the resistance less than 5 ohms?	(+) MAF/IAT Sensor Connector, Harness Side	(-) Vehicle Battery	PWRGND	Negative terminal	Yes GO to DC17. No REPAIR the open circuit.		
(+) MAF/IAT Sensor Connector, Harness Side	(-) Vehicle Battery							
PWRGND	Negative terminal							

Mass Air Flow (MAF) Sensor

DC

Test Step		Results / Action to Take				
DC17	CHECK THE MAF RTN CIRCUIT FOR AN OPEN IN THE HARNESS					
- Measure the resistance between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) MAF/IAT Sensor Connector, Harness Side</td></tr><tr><td>MAF RTN</td><td>MAF RTN</td></tr></table> - Is the resistance less than 5 ohms?		(+) PCM Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side	MAF RTN	MAF RTN	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side					
MAF RTN	MAF RTN					
DC18	DTC P1100: CHECK THE MAF CIRCUIT FOR INTERMITTENT VOLTAGE TO THE PCM					
- Check for broken/loose air outlet tube clamps (throttle body and air cleaner assembly ends), cracks/holes in the air outlet tube, and worn gaskets between the MAF sensor and the air cleaner assembly. Verify the MAF sensor is connected. - Key on engine running. - Access the PCM and monitor the MAF V PID. - If idle is not stable, refer to Symptom Charts. - Run the engine up to 1,500 RPM for 5 seconds, then bring it back to idle. Run the engine up to 1,500 RPM for 5 seconds, then bring it back to idle. - Access the PCM and monitor the MAF V PID. - Lightly tap on the MAF sensor and wiggle the harness connector to simulate road shock. - Does the MAF PID go below 0.23 volt or above 4.6 volts?		Yes Key in OFF position. INSPECT the MAF sensor connector. If OK, INSTALL a new MAF sensor. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No GO to DC19.				
DC19	CHECK THE MAF CIRCUIT FOR AN INTERMITTENT OPEN OR SHORTS					
- Key on engine running. - Access the PCM and monitor the MAF V PID. - Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM. - Does the MAF PID go below 0.23 volt or above 4.6 volts?		Yes Key in OFF position. REPAIR as necessary. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No Key in OFF position. Unable to duplicate or identify the fault at this time.				

Mass Air Flow (MAF) Sensor

DC

Test Step		Results / Action to Take			
DC20	DTC P0103: CHECK THE MAF SENSOR SCREEN FOR CONTAMINATION	Yes REPAIR as necessary. RERUN Self-Test. No GO to DC21.			
	Note: DTC P0103 can be generated by foreign material blocking the MAF sensor screen, causing an air flow restriction. - Check the MAF sensor screen for contamination or blockage. - Check the air cleaner element and air tubes for proper installation and sealing. Were any problems found?				
DC21	DTC P0103: CHECK THE MAF SENSOR SIGNAL HIGH INPUT TO THE PCM	Yes Key in OFF position. GO to DC22. No GO to DC24.			
	- Key in ON position. - Access the PCM and monitor the MAF V PID. Is the voltage greater than 2.44 V?				
DC22	CHECK THE MAF SENSOR SIGNAL SENT TO THE PCM	Yes Key in OFF position. REMOVE the jumper wire(s). CHECK the MAF sensor electrical connector for damage, corrosion, and water ingress. If OK, INSTALL a new MAF sensor. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No Key in OFF position. GO to DC23.			
	- MAF/IAT Sensor connector disconnected. - Connect a 5 amp fused jumper wire between the follow- ing:<table><tr><td>Point A MAF/IAT Sensor Connector, Harness Side</td><td>Point B MAF/IAT Sensor Connector, Harness Side</td></tr><tr><td>MAF RTN</td><td>PWRGND</td></tr></table> - Key in ON position. - Access the PCM and monitor the MAF V PID. Is the voltage less than 0.1 V?		Point A MAF/IAT Sensor Connector, Harness Side	Point B MAF/IAT Sensor Connector, Harness Side	MAF RTN
Point A MAF/IAT Sensor Connector, Harness Side	Point B MAF/IAT Sensor Connector, Harness Side				
MAF RTN	PWRGND				
DC23	CHECK THE MAF CIRCUIT FOR A SHORT TO POWER	Yes GO to DC25. No Key in OFF position. REPAIR the short circuit to PWR.			
	- PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>MAF</td><td>Ground</td></tr></table> Is the voltage less than 1 V?		(+) PCM Connector, Harness Side	(-)	MAF
(+) PCM Connector, Harness Side	(-)				
MAF	Ground				

Mass Air Flow (MAF) Sensor

DC

Test Step		Results / Action to Take
DC24	CHECK THE MAF SIGNAL SENT TO THE PCM	
	• Key on engine running. • Monitor the MAF signal voltage while increasing the engine RPM from idle to approximately 2,500 RPM, and then back to idle. • Access the PCM and monitor the MAF V PID. • Is the voltage between 0.23 V - 4.6 V?	Yes Key in OFF position. Intermittent concern. GO to Z1. No Key in OFF position. GO to DC22.
DC25	VERIFY THE IDLE CONCERN	
	• PCM connector connected. • MAF/IAT Sensor connector connected. • Key on engine running. • Is there an Idle concern present?	Yes DISREGARD DTC P0103 at this time. Concern is elsewhere. RETURN to Symptom Charts for further direction. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
DC26	DTC P0171, P0172, P0174, P0175, P1131, P1132, P1151, P1152, P1130, P1150, P2195, P2196, P2197, P2198: (OR LEAN DRIVEABILITY CONCERNS) CHECK THE CONDITIONS RELATED TO THE MAF SENSOR	
	• Check the air inlet system (air cleaner, housing, ductwork) for obstructions or blockage. • Check for broken/loose air outlet tube clamps (throttle body and air cleaner assembly ends), cracks/holes in the air outlet tube, and worn gaskets between the MAF sensor and the air cleaner assembly. Verify the MAF sensor is connected. • Are any problems found?	Yes REPAIR as necessary. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No GO to DC27.

Mass Air Flow (MAF) Sensor

DC

Test Step		Results / Action to Take
DC27	DTC P0171, P0172, P0174, P0175, P1131, P1132, P1151, P1152, P1130, P1150, P2195, P2196, P2197, P2198: (OR LEAN DRIVEABILITY CONCERNS) CHECK CONDITIONS RELATED TO THE MAF SENSOR	
	Note: Most weather reports include a local barometric pressure that has been corrected to sea level. However, the BARO PID reports the actual barometric pressure for the altitude where the vehicle is being diagnosed. Local weather conditions (high or low pressure areas) will change the local barometric pressure by several inches of mercury. • Key on engine running. • Access the PCM and monitor the LONGFT1, LONGFT2, MAF V and BARO PIDs. • 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. — The BARO PID values in Keep Alive Memory require updating at high throttle openings. If the vehicle is driven down from higher altitudes for diagnosis, carry out 3 or 4 heavy accelerations at greater than half-throttle to allow the BARO PID to update. — 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). — Make BARO PID comparisons to the Barometric Pressure Reference Chart or daily airport barometric pressure reports, if available. • Check that the LONGFT1 and LONGFT2 PIDs for all injector banks at idle are not more negative than -12%. • Check that the MAF V PID at idle and neutral is not greater than 30% of the normal MAF V listed in Reference Values (or not greater than 1.1 volts). • Are 2 of the 3 checks OK?	Yes GO to DC29. No Key in OFF position. GO to DC28.
DC28	CHECK TO ISOLATE MAF SENSOR FROM LEAN DRIVEABILITY OCCURRENCE	
	• Due to increasingly stringent emission/OBD requirements, a fuel system DTC on some vehicles can be generated without a noticeable driveability concern with or without the MAF sensor disconnected. Under these conditions, if the BARO_V, LONGFT1, LONGFT2, and MAF PIDs indicate a MAF sensor concern, install a new MAF sensor. • MAF/IAT Sensor connector disconnected. • Key on engine running. • Drive the vehicle on the road. • Is the lean driveability symptom (lack of power, spark knock/detonation, buck/jerk or hesitation/surge on acceleration) gone?	Yes If OK, INSTALL a new MAF/IAT sensor. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No GO to DC29.

Mass Air Flow (MAF) Sensor**DC**

Test Step		Results / Action to Take
DC29	VERIFY THE DTC	
Are any of the following DTCs present: P0171, P0172, P0174, P0175, P1130, P1131, P1132, P1150, P1151, P1152, P2195, P2196, P2197, or P2198?		Yes GO to H22. No Concern is elsewhere. RETURN to Symptom Charts for further direction.

DC29

**Test DD: Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure
Temperature (FRPT) Sensors**

**PINPOINT TEST DD: FUEL RAIL PRESSURE (FRP), FUEL RAIL TEMPERATURE (FRT) AND FUEL RAIL PRESSURE
TEMPERATURE (FRPT) SENSORS**

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors

DD

⚠ 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 to the fuel system information at the beginning of pinpoint HC.

This pinpoint test is intended to diagnose the following:

- Fuel rail pressure (FRP) sensor (6B288).
- Fuel rail temperature (FRT) sensor (4702).
- Fuel rail pressure temperature (FRPT) sensor (9G756).
- Harness circuits: FRP, FRT, and FRPT.
- Powertrain control module (PCM) (12A650).

Tables and Graphs

FRP SENSOR VOLTAGE AND PRESSURE SPECIFICATIONS

Voltage	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

FRT SENSOR TEMPERATURE, VOLTAGE, AND RESISTANCE SPECIFICATIONS

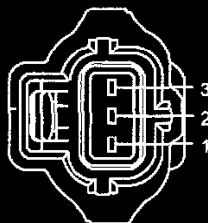
Temperature		Sensor	
°C	°F	Volts	K Ohms
100	212	0.47	2.073
95	203	0.54	2.405
90	194	0.61	2.800
85	185	0.70	3.273
80	176	0.80	3.840
75	167	0.92	4.524
70	158	1.06	5.351

(Continued)

Note, Tables And Graphs

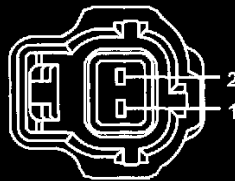
Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors**DD****FRT SENSOR TEMPERATURE, VOLTAGE, AND RESISTANCE SPECIFICATIONS**

Temperature		Sensor	
°C	°F	Volts	K Ohms
65	149	1.21	6.356
60	140	1.38	7.584
55	131	1.56	9.091
50	122	1.77	10.949
45	113	1.99	13.252
40	104	2.23	16.123
35	95	2.48	19.720
30	86	2.74	24.253
25	77	3.00	30.000
20	68	3.26	37.332
15	59	3.50	46.745
10	50	3.73	58.911
5	41	3.95	74.745
0	32	4.13	95.501

Fuel Rail Pressure (FRP) Sensor Connector

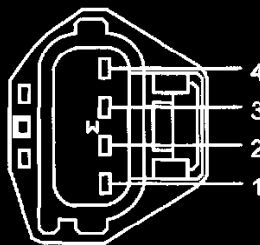
A0077554

Circuit	Pin
FRP (Fuel Rail Pressure)	3
SIGRTN (Signal return)	2
VREF (Reference Voltage)	1

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors**DD****Fuel Rail Temperature (FRT) Sensor Connector**

A0077553

Circuit	Pin
SIGRTN (Signal return)	2
FRT (Fuel Rail Temperature)	1

Fuel Rail Pressure/Temperature (FRPT) Sensor Connector

A0077567

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors

DD

Circuit	Pin
FRT (Fuel Rail Temperature)	3
FRP (Fuel Rail Pressure)	1
SIGRTN (Signal return)	4
VREF (Reference Voltage)	2

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	VREF SIGRTN FRP	B20, E20 E17 E49
Crown Victoria, Five Hundred, Freestyle, Grand Marquis, Montego	150 (50-50-50) Pin	FRT VREF SIGRTN FRP	E36 B40, E40 E41 E37
E-Series 4.6L	170 Pin	VREF SIGRTN FRP	B40, E57 E58 E32
Escape, Mariner	150 (50-50-50) Pin	FRT VREF SIGRTN FRP	E28 B40, E40 E41 E37
Expedition, F-150 5.4L, F-150 4.2L, Navigator	190 Pin	FRT VREF SIGRTN FRP	E19 B29, E57 E58 E32
Explorer SportTrac	104 Pin	FRT VREF SIGRTN FRP	66 90 91 8
Explorer 4.0L, Mountaineer 4.0L	150 (50-50-50) Pin	FRT VREF SIGRTN FRP	E36 E40, T40 E41 E37
Explorer 4.6L, Mountaineer 4.6L	150 (50-50-50) Pin	VREF SIGRTN FRP	E40, T40 E41 E37
F-150 4.6L	190 Pin	VREF SIGRTN FRP	B29, E57 E58 E32

(Continued)

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors

DD

Vehicle	Connector	Circuit	Pin
Focus	150 (50-50-50) Pin	FRT VREF SIGRTN FRP	E31 E40 E41 E37
Freestar/Monterey, Sable, Taurus	104 Pin	FRT VREF SIGRTN FRP	10 90 91 63
Ford GT	104 Pin	VREF SIGRTN FRP	90 91 63
LS, Thunderbird	150 (60-32-58) Pin	FRT VREF SIGRTN FRP	E4 B55, E14 E17 E49
Mustang	170 Pin	FRT VREF SIGRTN FRP	E19 B40, E24 E33 E32
Town Car	150 (50-50-50) Pin	FRT VREF SIGRTN FRP	E36 B40, E40 E41 B37
All other vehicles	170 Pin	FRT VREF SIGRTN FRP	E19 B40, E57 E58 E32

Note: With the engine running, the FRP PID value will be 48-70 kPa (7-10 psi) higher than a fuel pressure reading taken with a mechanical gauge.

Test Step		Results / Action to Take
DD1	CONTINUOUS MEMORY DTC P0190, KOEO AND KOER DTCS P0192 AND P0193: CHECK FRP SENSOR FOR FUEL LEAKS	
Note: Repair any fuel pump DTCs prior to this test. • Key on engine running. • Idle the engine for 2 minutes. • Inspect the FRP vacuum hose between the intake manifold and the FRP sensor for air leaks and correct connection. • Key in OFF position. • Remove the vacuum hose from the FRP. • Inspect the FRP and vacuum hose for traces of fuel. • Is fuel present?		Yes INSTALL a new FRP sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC. No GO to DD2 .

Connector And DD1

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors

DD

Test Step		Results / Action to Take								
DD2	CHECK THE VREF AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS - Connect the vacuum hose to the FRP. - FRP Sensor connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) FRP Sensor Connector, Harness Side</td><td>(-) FRP Sensor Connector, Harness Side</td></tr><tr><td>VREF - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> - Is the voltage between 4.5 V - 5.5 V?	(+) FRP Sensor Connector, Harness Side	(-) FRP Sensor Connector, Harness Side	VREF - Pin 1	SIGRTN - Pin 2	Yes For DTC P0190, GO to DD9 . For DTC P0192, GO to DD3 . For DTC P0193, GO to DD5 . No GO to C1 .				
(+) FRP Sensor Connector, Harness Side	(-) FRP Sensor Connector, Harness Side									
VREF - Pin 1	SIGRTN - Pin 2									
DD3	INDUCE A HIGH VOLTAGE ON THE FRP CIRCUIT - Key in OFF position. Note: If a diagnostic tool communication concern exists, immediately remove the jumper and follow the NO path in the RESULT/ACTION column. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A FRP Sensor Connector, Harness Side</td><td>Point B FRP Sensor Connector, Harness Side</td></tr><tr><td>VREF - Pin 1</td><td>FRP - Pin 3</td></tr></table> - Key in ON position. - Access the PCM and monitor the FRP V PID. - Is the voltage greater than 4.5 V?	Point A FRP Sensor Connector, Harness Side	Point B FRP Sensor Connector, Harness Side	VREF - Pin 1	FRP - Pin 3	Yes INSTALL a new FRP sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC. No GO to DD4 .				
Point A FRP Sensor Connector, Harness Side	Point B FRP Sensor Connector, Harness Side									
VREF - Pin 1	FRP - Pin 3									
DD4	CHECK THE FRP CIRCUIT(S) FOR A SHORT TO SIGRTN OR GND IN THE HARNESS - Key in OFF position. - Remove the jumper wire(s). - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FRP</td><td>SIGRTN</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FRP</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	FRP	SIGRTN	(+) PCM Connector, Harness Side	(-)	FRP	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
FRP	SIGRTN									
(+) PCM Connector, Harness Side	(-)									
FRP	Ground									

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors

DD

Test Step		Results / Action to Take				
DD5	CHECK THE FRP CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) FRP Sensor Connector, Harness Side</td></tr><tr><td>FRP</td><td>FRP - Pin 3</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) FRP Sensor Connector, Harness Side	FRP	FRP - Pin 3	Yes GO to DD6 . No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) FRP Sensor Connector, Harness Side					
FRP	FRP - Pin 3					
DD6	CHECK THE FRP CIRCUIT FOR A SHORT TO VREF - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VREF</td><td>FRP</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	VREF	FRP	Yes GO to DD7 . No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side					
VREF	FRP					
DD7	CHECK THE FRP CIRCUIT FOR A SHORT TO POWER - Key in ON position. - Measure the voltage between:<table><tr><td>(+) FRP Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>FRP - Pin 3</td><td>Ground</td></tr></table> - Is any voltage present?	(+) FRP Sensor Connector, Harness Side	(-)	FRP - Pin 3	Ground	Yes REPAIR the short circuit. No GO to DD8 .
(+) FRP Sensor Connector, Harness Side	(-)					
FRP - Pin 3	Ground					
DD8	INDUCE A LOW VOLTAGE ON THE FRP CIRCUIT - Key in OFF position. - PCM connector connected. Note: If a diagnostic tool communication concern exists, immediately remove the jumper and follow the NO path in the RESULT/ACTION column. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A FRP Sensor Connector, Harness Side</td><td>Point B FRP Sensor Connector, Harness Side</td></tr><tr><td>FRP - Pin 3</td><td>SIGRTN - Pin 2</td></tr></table> - Key in ON position. - Access the PCM and monitor the FRP V PID. - Is the voltage less than 0.1 V?	Point A FRP Sensor Connector, Harness Side	Point B FRP Sensor Connector, Harness Side	FRP - Pin 3	SIGRTN - Pin 2	Yes INSTALL a new FRP sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
Point A FRP Sensor Connector, Harness Side	Point B FRP Sensor Connector, Harness Side					
FRP - Pin 3	SIGRTN - Pin 2					

DD5-DD8

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors

DD

Test Step		Results / Action to Take								
DD9	DTC P0191: INSPECT ALL THE VACUUM HOSES CONNECTED TO THE INTAKE MANIFOLD FOR LEAKS	Yes ISOLATE the fault and REPAIR as necessary. No GO to DD10.								
	Note: Repair any fuel pump DTCs prior to this test. • Key in OFF position. • FRP Sensor connector connected. • Key on engine running. • Allow the engine idle to stabilize. • Inspect all the vacuum hoses connected to the intake manifold for leaks. • Are any vacuum hose concerns present?									
DD10	CHECK THE FRP VOLTAGE PID DURING FUEL RAIL PRESSURE RELIEF	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No INSTALL a new FRP sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC.								
	• Key in OFF position. • Disable the inertia switch. • Key in ON position. • Access the PCM and monitor the FRP V PID. • Monitor the FRP voltage while cranking the engine. FRP voltage decreases as the fuel rail pressure drops and stabilizes when the fuel rail pressure reaches atmospheric pressure. <table border="1"> <thead> <tr> <th>Vehicle</th><th>Low Limit</th><th>High Limit</th></tr> </thead> <tbody> <tr> <td>F-150</td><td>1.0V</td><td>1.5V</td></tr> <tr> <td>All others</td><td>0.2V</td><td>0.7V</td></tr> </tbody> </table> • Is the voltage value within specification?		Vehicle	Low Limit	High Limit	F-150	1.0V	1.5V	All others	0.2V
Vehicle	Low Limit	High Limit								
F-150	1.0V	1.5V								
All others	0.2V	0.7V								
DD11	CONTINUOUS MEMORY DTCS P0192 AND P0193: CHECK THE FRP CIRCUIT FOR AN INTERMITTENT CONCERN	Yes ISOLATE the fault and REPAIR as necessary. No GO to Z1.								
	Note: Repair any fuel pump DTCs prior to this test. • Key in ON position. • Access the PCM and monitor the FRP V PID. • While observing the PID, carry out the following: — Tap on the sensor to simulate road shock. — Wiggle the sensor connector. — Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM. • Check the FRP connector for damage or corrosion. • Is a fault present?									

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors

DD

Test Step		Results / Action to Take								
DD12	KOEO AND KOER DTCS P0182 OR P0183: CHECK THE RESISTANCE OF THE FRT SENSOR - Key in OFF position. - FRT Sensor connector disconnected. - Measure the resistance between:<table><tr><td>(+) FRT Sensor Connector, Component Side</td><td>(-) FRT Sensor Connector, Component Side</td></tr><tr><td>FRT - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> - Is the resistance between 2K ohms - 96K ohms?	(+) FRT Sensor Connector, Component Side	(-) FRT Sensor Connector, Component Side	FRT - Pin 1	SIGRTN - Pin 2	Yes GO to DD13. No INSTALL a new FRT sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC.				
(+) FRT Sensor Connector, Component Side	(-) FRT Sensor Connector, Component Side									
FRT - Pin 1	SIGRTN - Pin 2									
DD13	CHECK THE FRT FOR INTERNAL SHORTS - Measure the resistance between:<table><tr><td>(+) FRT Sensor Connector, Component Side</td><td>(-)</td></tr><tr><td>FRT - Pin 1</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) FRT Sensor Connector, Component Side	(-)	FRT - Pin 1	Ground	Yes For DTC P0182, GO to DD14. For DTC P0183, GO to DD16. No INSTALL a new FRT sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC.				
(+) FRT Sensor Connector, Component Side	(-)									
FRT - Pin 1	Ground									
DD14	CHECK THE FRT CIRCUIT(S) FOR A SHORT TO SIGRTN OR GND IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FRT</td><td>SIGRTN</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FRT</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	FRT	SIGRTN	(+) PCM Connector, Harness Side	(-)	FRT	Ground	Yes GO to DD15. No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
FRT	SIGRTN									
(+) PCM Connector, Harness Side	(-)									
FRT	Ground									
DD15	INDUCE A HIGH VOLTAGE ON THE FRT CIRCUIT - PCM connector connected. - Key in ON position. - Access the PCM and monitor the FRT V PID. - Is the voltage greater than 4.5 V?	Yes Unable to identify the fault at this time. GO to Z1. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).								

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors

DD

Test Step		Results / Action to Take						
DD16	CHECK THE FRT AND SIG RTN CIRCUIT(S) FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) FRT Sensor Connector, Harness Side</td></tr><tr><td>FRT</td><td>FRT - Pin 1</td></tr><tr><td>SIGRTN</td><td>SIGRTN - Pin 2</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) FRT Sensor Connector, Harness Side	FRT	FRT - Pin 1	SIGRTN	SIGRTN - Pin 2	Yes GO to DD17. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) FRT Sensor Connector, Harness Side							
FRT	FRT - Pin 1							
SIGRTN	SIGRTN - Pin 2							
DD17	CHECK THE SENSOR SIGNAL FOR A SHORT TO VREF - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FRT</td><td>VREF</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	FRT	VREF	Yes GO to DD18. No REPAIR the short circuit to VREF.		
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
FRT	VREF							
DD18	INDUCE A LOW VOLTAGE ON THE FRT CIRCUIT - PCM connector connected. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A FRT Sensor Connector, Harness Side</td><td>Point B FRT Sensor Connector, Harness Side</td></tr><tr><td>FRT - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> - Key in ON position. - Access the PCM and monitor the FRT V PID. - Is the voltage less than 0.2 V?	Point A FRT Sensor Connector, Harness Side	Point B FRT Sensor Connector, Harness Side	FRT - Pin 1	SIGRTN - Pin 2	Yes Unable to identify the fault at this time. GO to Z1. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).		
Point A FRT Sensor Connector, Harness Side	Point B FRT Sensor Connector, Harness Side							
FRT - Pin 1	SIGRTN - Pin 2							
DD19	DTC P0180: CHECK FOR THE PRESENCE OF DTC P0182 OR P0183 - Key in ON position. - Check for self-test DTCs: - Are DTCs P0182 or P0183 present?	Yes GO to DD12. No GO to DD20.						
DD20	CHECK THE FRT CIRCUIT FOR AN INTERMITTENT CONCERN - PCM connector connected. - Access the PCM and monitor the FRT V PID. - Carry out a thorough wiggle test on the FRT Sensor harness. - Is the FRT signal stable?	Yes GO to DD22. No ISOLATE the fault and REPAIR as necessary.						

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors

DD

Test Step		Results / Action to Take			
DD21	KOEO AND KOER DTC P0181: CHECK THE FRT_V PID	Yes GO to DD22. No DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions.			
	- Allow vehicle temperatures to stabilize prior to temperature sensor tests. - Key in ON position. - The normal test range is 0°C to 100°C (32°F to 212°F). - Access the PCM and monitor the FRT V PID. - Is the voltage between 0.4 V - 4.5 V?				
DD22	COMPARE THE PIDS AFTER STABILIZING THE VEHICLE TEMPERATURE	Yes The fault is not present at this time. Clear the DTCs. REPEAT the self-test. No GO to Z1.			
	- Access the PCM and monitor the FRT_TEMP, CHT and ECT PIDs. - Are the temperature PIDs nearly equal in value?				
DD23	KOER AND CONTINUOUS MEMORY DTC P0190, KOEO AND KOER DTCS P0192 AND P0193: CHECK FRPT SENSOR FOR FUEL LEAKS	Yes INSTALL a new FRPT sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC. No GO to DD24.			
	Note: Repair any fuel pump DTCs prior to this test. - Key on engine running. - Idle the engine for 2 minutes. - Inspect the FRP vacuum hose between the intake manifold and the FRP sensor for air leaks and correct connection. - Key in OFF position. - Remove the vacuum hose from the FRPT. - Inspect the FRPT and vacuum hose for traces of fuel. - Is fuel present?				
DD24	CHECK THE VREF AND SIGRTN CIRCUITS FOR OPEN IN HARNESS	Yes For DTC P0190, GO to DD31. For DTC P0192, GO to DD25. For DTC P0193, GO to DD27. No GO to C1.			
	- Connect the vacuum hose to the FRPT. - FRPT Sensor connector disconnected. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) FRPT Sensor Connector, Harness Side</td><td>(-) FRPT Sensor Connector, Harness Side</td></tr><tr><td>VREF - Pin 2</td><td>SIGRTN - Pin 4</td></tr></table> - Is the voltage between 4.5 V - 5.5 V?		(+) FRPT Sensor Connector, Harness Side	(-) FRPT Sensor Connector, Harness Side	VREF - Pin 2
(+) FRPT Sensor Connector, Harness Side	(-) FRPT Sensor Connector, Harness Side				
VREF - Pin 2	SIGRTN - Pin 4				

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors

DD

Test Step		Results / Action to Take										
DD25	INDUCE A HIGH VOLTAGE ON THE FRPT CIRCUIT - Key in OFF position. Note: If a diagnostic tool communication concern exists, immediately remove the jumper and follow the NO path in the RESULT/ACTION column. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A FRPT Sensor Connector, Harness Side</td><td>Point B FRPT Sensor Connector, Harness Side</td></tr><tr><td>VREF - Pin 2</td><td>FRP - Pin 1</td></tr></table> - Key in ON position. - Access the PCM and monitor the FRP V PID. Is the voltage greater than 4.5 V?	Point A FRPT Sensor Connector, Harness Side	Point B FRPT Sensor Connector, Harness Side	VREF - Pin 2	FRP - Pin 1	Yes INSTALL a new FRPT sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC. No GO to DD26 .						
Point A FRPT Sensor Connector, Harness Side	Point B FRPT Sensor Connector, Harness Side											
VREF - Pin 2	FRP - Pin 1											
DD26	CHECK FRP CIRCUIT FOR SHORT TO FRT, SIGRTN, AND GND IN HARNESS - Key in OFF position. - Remove the jumper wire(s). - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FRP</td><td>SIGRTN</td></tr><tr><td>FRP</td><td>FRT</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FRP</td><td>Ground</td></tr></table> Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	FRP	SIGRTN	FRP	FRT	(+) PCM Connector, Harness Side	(-)	FRP	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side											
FRP	SIGRTN											
FRP	FRT											
(+) PCM Connector, Harness Side	(-)											
FRP	Ground											
DD27	CHECK THE FRP CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) FRPT Sensor Connector, Harness Side</td></tr><tr><td>FRP</td><td>FRP - Pin 1</td></tr></table> Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) FRPT Sensor Connector, Harness Side	FRP	FRP - Pin 1	Yes GO to DD28 . No REPAIR the open circuit.						
(+) PCM Connector, Harness Side	(-) FRPT Sensor Connector, Harness Side											
FRP	FRP - Pin 1											

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors

DD

Test Step		Results / Action to Take						
DD28	CHECK FRP CIRCUIT FOR SHORT TO VREF AND FRT IN HARNESS - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>FRP</td><td>VREF</td></tr><tr><td>FRP</td><td>FRT</td></tr></table> - Are the resistances greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	FRP	VREF	FRP	FRT	Yes GO to DD29. No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
FRP	VREF							
FRP	FRT							
DD29	CHECK THE FRP CIRCUIT FOR A SHORT TO POWER - Key in ON position. - Measure the voltage between:<table><tr><th>(+) FRPT Sensor Connector, Harness Side</th><th>(-)</th></tr><tr><td>FRP - Pin 1</td><td>Ground</td></tr></table> - Is any voltage present?	(+) FRPT Sensor Connector, Harness Side	(-)	FRP - Pin 1	Ground	Yes REPAIR the short circuit. No GO to DD30.		
(+) FRPT Sensor Connector, Harness Side	(-)							
FRP - Pin 1	Ground							
DD30	INDUCE A LOW VOLTAGE ON THE FRPT CIRCUIT - Key in OFF position. - PCM connector connected. Note: If a diagnostic tool communication concern exists, immediately remove the jumper and follow the NO path in the RESULT/ACTION column. - Connect a 5 amp fused jumper wire between the following:<table><tr><th>Point A FRPT Sensor Connector, Harness Side</th><th>Point B FRPT Sensor Connector, Harness Side</th></tr><tr><td>FRP - Pin 1</td><td>SIGRTN - Pin 4</td></tr></table> - Key in ON position. - Access the PCM and monitor the FRP V PID. - Is the voltage less than 0.01 V?	Point A FRPT Sensor Connector, Harness Side	Point B FRPT Sensor Connector, Harness Side	FRP - Pin 1	SIGRTN - Pin 4	Yes INSTALL a new FRPT sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).		
Point A FRPT Sensor Connector, Harness Side	Point B FRPT Sensor Connector, Harness Side							
FRP - Pin 1	SIGRTN - Pin 4							
DD31	DTC P0191: INSPECT ALL THE VACUUM HOSES CONNECTED TO THE INTAKE MANIFOLD FOR LEAKS Note: Repair any fuel pump DTCs prior to this test. - Key in OFF position. - FRPT Sensor connector connected. - Key on engine running. - Allow the engine idle to stabilize. - Inspect all the vacuum hoses connected to the intake manifold for leaks. - Are any vacuum hose concerns present?	Yes ISOLATE the fault and REPAIR as necessary. No GO to DD32.						

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors

DD

Test Step		Results / Action to Take									
DD32	CHECK THE FRP VOLTAGE PID DURING FUEL RAIL PRESSURE RELIEF • Key in OFF position. • Disable the inertia switch. • Key in ON position. • Access the PCM and monitor the FRP V PID. • Monitor the FRP voltage while cranking the engine. FRP voltage decreases as the fuel rail pressure drops and stabilizes when the fuel rail pressure reaches atmospheric pressure. <table><tr><th>Vehicle</th><th>Low Limit</th><th>High Limit</th></tr><tr><td>F-150</td><td>1.0V</td><td>1.5V</td></tr><tr><td>All others</td><td>0.2V</td><td>0.7V</td></tr></table> • Is the voltage value within specification?	Vehicle	Low Limit	High Limit	F-150	1.0V	1.5V	All others	0.2V	0.7V	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No INSTALL a new FRPT sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC.
Vehicle	Low Limit	High Limit									
F-150	1.0V	1.5V									
All others	0.2V	0.7V									
DD33	CONTINUOUS MEMORY DTCS P0192 AND P0193: CHECK THE FRPT CIRCUIT FOR AN INTERMITTENT CONCERN Note: Repair any fuel pump DTCs prior to this test. • Key in ON position. • Access the PCM and monitor the FRP V PID. • While observing the PID, carry out the following: — Tap on the sensor to simulate road shock. — Wiggle the sensor connector. — Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM. • Check the FRPT connector for damage or corrosion. • Is a fault present?	Yes ISOLATE the fault and REPAIR as necessary. No GO to Z1.									
DD34	KOEO AND KOER DTCS P0182 OR P0183: CHECK THE RESISTANCE OF THE FRPT SENSOR • Key in OFF position. • FRPT Sensor connector disconnected. • Measure the resistance between: <table><tr><th>(+) FRPT Sensor Connector, Component Side</th><th>(-) FRPT Sensor Connector, Component Side</th></tr><tr><td>FRT - Pin 3</td><td>SIGRTN - Pin 4</td></tr></table> • Is the resistance between 2K ohms - 96K ohms?	(+) FRPT Sensor Connector, Component Side	(-) FRPT Sensor Connector, Component Side	FRT - Pin 3	SIGRTN - Pin 4	Yes GO to DD35. No INSTALL a new FRPT sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC.					
(+) FRPT Sensor Connector, Component Side	(-) FRPT Sensor Connector, Component Side										
FRT - Pin 3	SIGRTN - Pin 4										

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors**DD**

Test Step		Results / Action to Take										
DD35	CHECK THE FRPT FOR INTERNAL SHORTS - Measure the resistance between:<table><tr><td>(+) FRT Sensor Connector, Component Side</td><td>(-)</td></tr><tr><td>FRT - Pin 1</td><td>Ground</td></tr></table> - Measure the resistance between:<table><tr><td>(+) FRPT Sensor Connector, Component Side</td><td>(-) FRPT Sensor Connector, Component Side</td></tr><tr><td>FRT - Pin 3</td><td>FRP - Pin 1</td></tr><tr><td>FRT - Pin 3</td><td>VREF - Pin 2</td></tr></table> - Are the resistances greater than 10K ohms?	(+) FRT Sensor Connector, Component Side	(-)	FRT - Pin 1	Ground	(+) FRPT Sensor Connector, Component Side	(-) FRPT Sensor Connector, Component Side	FRT - Pin 3	FRP - Pin 1	FRT - Pin 3	VREF - Pin 2	Yes For DTC P0182, GO to DD36 . For DTC P0183, GO to DD38 . No INSTALL a new FRPT sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC.
(+) FRT Sensor Connector, Component Side	(-)											
FRT - Pin 1	Ground											
(+) FRPT Sensor Connector, Component Side	(-) FRPT Sensor Connector, Component Side											
FRT - Pin 3	FRP - Pin 1											
FRT - Pin 3	VREF - Pin 2											
DD36	CHECK THE FRT CIRCUIT(S) FOR A SHORT TO SIGRTN OR GND IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FRT</td><td>SIGRTN</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FRT</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	FRT	SIGRTN	(+) PCM Connector, Harness Side	(-)	FRT	Ground	Yes GO to DD37 . No REPAIR the short circuit.		
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side											
FRT	SIGRTN											
(+) PCM Connector, Harness Side	(-)											
FRT	Ground											
DD37	FOR THE FRPT SENSOR INDUCE A HIGH VOLTAGE ON THE FRT CIRCUIT - PCM connector connected. - Key in ON position. - Access the PCM and monitor the FRT V PID. - Is the voltage greater than 4.5 V?	Yes Unable to identify the fault at this time. GO to Z1 . No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).										

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors

DD

Test Step		Results / Action to Take						
DD38	CHECK THE FRT AND SIG RTN CIRCUIT(S) FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) FRPT Sensor Connector, Harness Side</td></tr><tr><td>FRT</td><td>FRT - Pin 3</td></tr><tr><td>SIGRTN</td><td>SIGRTN - Pin 4</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) FRPT Sensor Connector, Harness Side	FRT	FRT - Pin 3	SIGRTN	SIGRTN - Pin 4	Yes GO to DD39. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) FRPT Sensor Connector, Harness Side							
FRT	FRT - Pin 3							
SIGRTN	SIGRTN - Pin 4							
DD39	CHECK FRT SIGNAL FOR SHORT TO VREF AND FRP - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FRT</td><td>VREF</td></tr><tr><td>FRT</td><td>FRP</td></tr></table> - Are the resistances greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	FRT	VREF	FRT	FRP	Yes GO to DD40. No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
FRT	VREF							
FRT	FRP							
DD40	FOR THE FRPT SENSOR INDUCE A LOW VOLTAGE ON THE FRT CIRCUIT - PCM connector connected. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A FRPT Sensor Connector, Harness Side</td><td>Point B FRPT Sensor Connector, Harness Side</td></tr><tr><td>FRT - Pin 3</td><td>SIGRTN - Pin 4</td></tr></table> - Key in ON position. - Access the PCM and monitor the FRT V PID. - Is the voltage less than 0.2 V?	Point A FRPT Sensor Connector, Harness Side	Point B FRPT Sensor Connector, Harness Side	FRT - Pin 3	SIGRTN - Pin 4	Yes Unable to identify the fault at this time. GO to Z1. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).		
Point A FRPT Sensor Connector, Harness Side	Point B FRPT Sensor Connector, Harness Side							
FRT - Pin 3	SIGRTN - Pin 4							
DD41	DTC P0180: CHECK FOR THE PRESENCE OF DTC P0182 OR P0183 - Key in ON position. - Check for self-test DTCs: - Are DTCs P0182 or P0183 present?	Yes GO to DD34. No GO to DD42.						
DD42	CHECK THE FRT CIRCUIT FOR AN INTERMITTENT CONCERN - PCM connector connected. - Access the PCM and monitor the FRT V PID. - Carry out a thorough wiggle test on the FRT Sensor harness. - Is the FRT signal stable?	Yes GO to DD44. No ISOLATE the fault and REPAIR as necessary.						

Fuel Rail Pressure (FRP), Fuel Rail Temperature (FRT) and Fuel Rail Pressure Temperature (FRPT) Sensors

DD

Test Step		Results / Action to Take
DD43	KOEO AND KOER DTC P0181: CHECK THE FRT_V PID	Yes GO to DD44 . No DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions.
	- Allow vehicle temperatures to stabilize prior to temperature sensor tests. - Key in ON position. - The normal test range is 0°C to 100°C (32°F to 212°F). - Access the PCM and monitor the FRT V PID. - Is the voltage between 0.4 V - 4.5 V?	
DD44	COMPARE THE PIDS AFTER STABILIZING THE VEHICLE TEMPERATURE	Yes The fault is not present at this time. Clear the DTCs. REPEAT the self-test. No GO to Z1 .
	- Access the PCM and monitor the FRT_TEMP, CHT and ECT PIDs. - Are the temperature PIDs nearly equal in value?	
DD45	CONTINUOUS MEMORY DTCS P0182 OR P0183: INTERMITTENT CHECK	Yes ISOLATE the fault and REPAIR as necessary. No DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions.
	- Key in ON position. Note: The PID referred to below may read as EFT on some diagnostic tools. - Access the PCM and monitor the FRT V PID. - While observing the PID, carry out the following: - Tap on the sensor to simulate road shock. - Wiggle the sensor connector. - Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM. - Check the FRT or FRPT and PCM connectors for damage and corrosion. - Is a fault present?	

DD43-DD45

Test DF: Vehicle Speed Circuit (VSC) Check
PINPOINT TEST DF: VEHICLE SPEED CIRCUIT (VSC) CHECK

Vehicle Speed Circuit (VSC) Check

DF

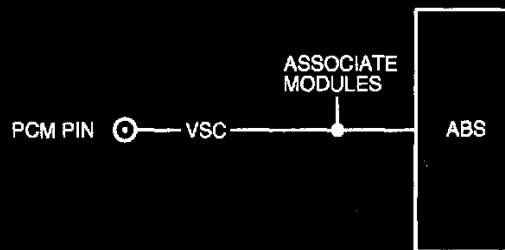
 **WARNING:** Strict observance of posted speed limits and driving conditions is mandatory when proceeding through the following drive cycles.

This pinpoint test is intended to diagnose the following:

- Harness circuits: VSC.
- Powertrain control module (PCM) (12A650).

Typical Circuit Schematic

Typical wiring diagram with a VSC output signal from an ABS module and VSC input signals to the PCM and related user modules.



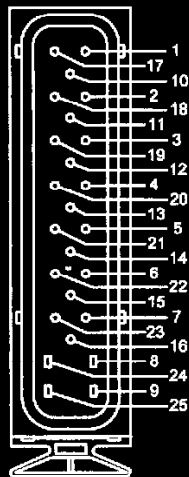
A0091978

Powertrain Control Module (PCM) Connector

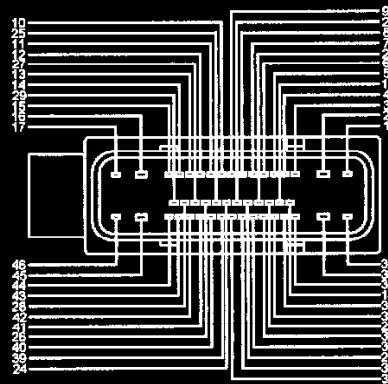
For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Excursion	104 Pin	VSC	58
F-Super Duty	170 Pin	VSC	B29

Warning, Schematic And Connector

Vehicle Speed Circuit (VSC) Check**DF****Anti-lock Brake System (ABS) Module Connector****A**

A0077526

B

A0077542

Vehicle	Connector	Circuit	Pin
Excursion	A	VSC	11
F-Super Duty	B	VSC	21

Test Step		Results / Action to Take
DF1	DTCS P0500, P0503, P1501 AND P1502: CHECK THE VEHICLE SPEED CIRCUIT FOR INTERMITTENT CONCERNS	
Note: The PCM detected an error in the vehicle speed information received from the ABS control module. This test step checks for the recurrence of this vehicle speed error. • Key in ON position. • Diagnostic tool connector connected. • Clear the DTCs. • Gradually increase the vehicle speed to 80 km/h (50 mph). • Coast to an idle and stop the vehicle. • Key in OFF position. • Key in ON position. • Check for continuous memory DTCs: • Are DTCs P0500, P0503, P1501 or P1502 present?		Yes Key in OFF position. The vehicle speed input is incorrect. GO to DF2. No Key in OFF position. The vehicle speed input is correct. The fault that produced the original DTC may be intermittent. GO to DF5.

Connector, DF1

Vehicle Speed Circuit (VSC) Check

DF

Test Step		Results / Action to Take				
DF2	CHECK THE VSC CIRCUIT FOR A SHORT TO PWR IN THE HARNESS	Yes GO to DF3. No Key in OFF position. GO to DF6.				
- PCM connector disconnected. - Anti-lock Brake System (ABS) Module connector disconnected. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>VSC</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?			(+) PCM Connector, Harness Side	(-)	VSC	Ground
(+) PCM Connector, Harness Side	(-)					
VSC	Ground					
DF3	CHECK FOR AN OPEN VSC BETWEEN THE PCM AND THE ABS CONTROL MODULE					
- Measure the resistance between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Anti-lock Brake System (ABS) Module Connector, Harness Side</td></tr><tr><td>VSC</td><td>VSC</td></tr></table> - Is the resistance less than 5 ohms?		(+) PCM Connector, Harness Side	(-) Anti-lock Brake System (ABS) Module Connector, Harness Side	VSC	VSC	Yes GO to DF4. No REPAIR the open circuit. GO to DF7.
(+) PCM Connector, Harness Side	(-) Anti-lock Brake System (ABS) Module Connector, Harness Side					
VSC	VSC					
DF4	CHECK THE VSC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS	Yes REFER to Antilock Brakes / Traction Control Systems to continue diagnosis of the ABS control module, its speed sensors and its wheel speed sensor harness circuits. If these components are working properly, INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). GO to DF7. No GO to DF6.				
- Diagnostic tool connector disconnected. - Measure the resistance between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>VSC</td><td>Ground</td></tr></table> - Is the resistance greater than 10,000 ohms?			(+) PCM Connector, Harness Side	(-)	VSC	Ground
(+) PCM Connector, Harness Side	(-)					
VSC	Ground					

DF2-DF4

Vehicle Speed Circuit (VSC) Check

DF

Test Step		Results / Action to Take
DF5	VISUAL INSPECTION	
	- Visually inspect the VSC circuit harness and connectors at the PCM, ABS, and other VSC user modules for damage, loose connections, loose grounds, or incorrect routing. Note: Refer to Vehicle/Diagrams for harness, module, and connector locations. Did the visual inspection reveal a potential failure?	Yes REPAIR as necessary. GO to DF7. No Unable to duplicate or identify the fault at this time. REFER to Antilock Brakes / Traction Control Systems to continue diagnosis of the ABS control module, its speed sensors and its wheel speed sensor harness circuits.
DF6	VERIFY IF THE VSC IS SHORTED IN THE HARNESS OR ANOTHER MODULE	
	- Determine which, if any, modules are connected to the VSC. Refer to Vehicle/Diagrams. If no other modules are connected to the VSC, GO to the "YES" Action To Take. - One at a time, disconnect the modules associated with the VSC. After disconnecting each module, test again for a short circuit. (Refer to test step that sent you here). Repeat until each associated module is disconnected or the short circuit is eliminated. Did the short circuit remain after all associated modules were disconnected?	Yes REPAIR the short circuit. GO to DF7. No REFER to Vehicle System for further diagnosis of the appropriate module. GO to DF7.
DF7	VSC REPAIR VERIFICATION DRIVE CYCLE	
	Note: Warm the engine to a normal operating temperature before continuing. Note: Carry out the VSC drive cycle at least 3 times as described below. - Automatic Transmission Drive Cycle: - Place the transmission range selector lever in DRIVE range. - Accelerate heavily to 56 km/h (35 mph). - Coast down to an idle and stop the vehicle. - Cycle the key OFF and ON. - Manual Transmission Drive Cycle: - Accelerate moderately to 64 km/h (40 mph), while shifting from first to second gear. - Coast down to an idle and stop the vehicle. - Cycle the key OFF and ON. - Key in OFF position. - Key in ON position. - Check for continuous memory DTCs: Are DTCs P0500, P0503, P1501 or P1502 present?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions . No The repair has been verified.

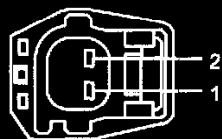
DF5-DF7

Test DG: Knock Sensor
PINPOINT TEST DG: KNOCK SENSOR

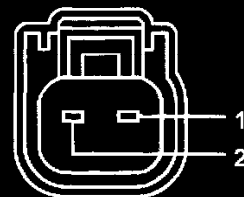
Knock Sensor**DG**

This pinpoint test is intended to diagnose the following:

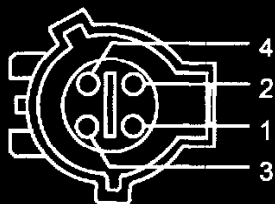
- Knock sensors KS1, KS2 (12A699).
- Harness circuits: KS1+, KS1-, KS2+, and KS2-.
- Powertrain control module (PCM) (12A650).

Knock Sensor (KS) Connector**A**

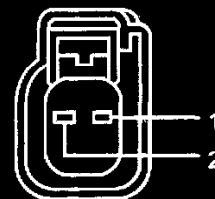
A0077571

B

A0077552

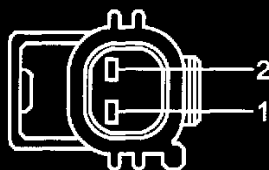
C

A0077507

D

N0002112

Note, Connector

Knock Sensor**DG****E**

A0077524

Vehicle	Connector	Circuit	Pin
Escape	A	KS1+ KS1-	1 2
Expedition 5.4L, F-Super Duty, Navigator	B	KS2+ KS2- KS1+ KS1-	2 1 2 1
Explorer 4.6L	C	KS2+ KS2- KS1+ KS1-	1 2 3 4
F-150 4.2L, Five Hundred, Freestyle, Montego, Ranger 3.0L	D	KS1+ KS1-	1 2
LS 3.0L	E	KS1+ KS1-	1 2
LS	E	KS2+ KS2- KS1+ KS1-	1 2 1 2
Mustang 4.6L	E	KS2+ KS2- KS1+ KS1-	2 1 2 1
Thunderbird	E	KS2+ KS2- KS1+ KS1-	1 2 2 1
All other vehicles	E	KS1+ KS1-	2 1

Connector

Knock Sensor**DG****Powertrain Control Module (PCM) Connector**

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	VREF VPWR KS2- KS1- KS2+ KS1+	E20 B32 E43 E42 E52 E51
E-Series 4.6L, E-Series 6.8L, E-Series 5.4L 4R75E, E-Series 5.4L 5R100	170 Pin	VREF VPWR KS1- KS1+	E57 B35 E48 E49
Excursion, Explorer SportTrac, Ranger, Sable, Taurus	104 Pin	VREF VPWR KS1- KS1+	90 71 32 57
Expedition, F-150 5.4L, Navigator	190 Pin	VREF VPWR KS2- KS1- KS2+ KS1+	E57 B51 E30 E48 E31 E49
Explorer 4.6L, Mountaineer 4.6L	150 (50-50-50) Pin	VREF VPWR KS2- KS1- KS2+ KS1+	E40 B35 E22 E20 E21 E32
F-150 4.6L, F-150 4.2L	190 Pin	VREF VPWR KS1- KS1+	E57 B51 E48 E49
F-Super Duty	170 Pin	VREF VPWR KS2- KS1- KS2+ KS1+	E57 B35 E30 E48 E31 E49
LS 3.0L	150 (60-32-58) Pin	VREF VPWR KS1- KS1+	E14 B32 E42 E51

(Continued)

Connector

Knock Sensor

DG

Vehicle	Connector	Circuit	Pin
LS 3.9L, Thunderbird	150 (60-32-58) Pin	VREF VPWR KS2- KS1- KS2+ KS1+	E14 B32 E43 E42 E52 E51
Mustang 4.0L	170 Pin	VREF VPWR KS1- KS1+	E24 B35 E48 E49
Mustang 4.6L	170 Pin	VREF VPWR KS2- KS1- KS2+ KS1+	E24 B35 E30 E48 E31 E49
All other vehicles	150 (50-50-50) Pin	VREF VPWR KS1- KS1+	E40 B35 E20 E32

Test Step		Results / Action to Take			
DG1	KOER AND CONTINUOUS MEMORY DTCS P0325 AND P0326: CHECK THE RESISTANCE OF KS1	Yes Key in OFF position. GO to DG3. No INSTALL a new KS.			
• Verify the KS is connected and properly installed. • KS connector disconnected. • Measure the resistance between:<table><tr><td>(+) KS Connector, Component Side</td><td>(-) KS Connector, Component Side</td></tr><tr><td>KS1-</td><td>KS1+</td></tr></table> • Is the resistance between 4.39M ohms - 5.35M ohms?			(+) KS Connector, Component Side	(-) KS Connector, Component Side	KS1-
(+) KS Connector, Component Side	(-) KS Connector, Component Side				
KS1-	KS1+				
DG2	KOER AND CONTINUOUS MEMORY DTCS P0330 AND P0331: CHECK THE RESISTANCE OF KS2	Yes Key in OFF position. GO to DG4. No INSTALL a new KS2.			
• Verify the KS is connected and properly installed. • KS connector disconnected. • Measure the resistance between:<table><tr><td>(+) KS2 Sensor Connector, Component Side</td><td>(-) KS2 Sensor Connector, Component Side</td></tr><tr><td>KS2-</td><td>KS2+</td></tr></table> • Is the resistance between 4.39M ohms - 5.35M ohms?			(+) KS2 Sensor Connector, Component Side	(-) KS2 Sensor Connector, Component Side	KS2-
(+) KS2 Sensor Connector, Component Side	(-) KS2 Sensor Connector, Component Side				
KS2-	KS2+				

Connector, DG1-DG2

Knock Sensor

DG

Test Step		Results / Action to Take				
DG3	CHECK THE KS1+ CIRCUIT FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) KS Connector, Har- ness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>KS1+</td><td>KS1+</td></tr></table> - Is the resistance less than 5 ohms?	(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side	KS1+	KS1+	Yes GO to DG5 . No REPAIR the open circuit.
(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side					
KS1+	KS1+					
DG4	CHECK THE KS2+ CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) KS2 Sensor Con- nector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>KS2+</td><td>KS2+</td></tr></table> - Is the resistance less than 5 ohms?	(+) KS2 Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side	KS2+	KS2+	Yes GO to DG6 . No REPAIR the open circuit.
(+) KS2 Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side					
KS2+	KS2+					
DG5	CHECK THE KS1- CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) KS Connector, Har- ness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>KS1-</td><td>KS1-</td></tr></table> - Is the resistance less than 5 ohms?	(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side	KS1-	KS1-	Yes GO to DG7 . No REPAIR the open circuit.
(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side					
KS1-	KS1-					
DG6	CHECK THE KS2- CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) KS2 Sensor Con- nector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>KS2-</td><td>KS2-</td></tr></table> - Is the resistance less than 5 ohms?	(+) KS2 Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side	KS2-	KS2-	Yes GO to DG8 . No REPAIR the open circuit.
(+) KS2 Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side					
KS2-	KS2-					
DG7	CHECK THE KS1+ CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) KS Connector, Component Side</td><td>(-) Vehicle Battery</td></tr><tr><td>KS1+</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) KS Connector, Component Side	(-) Vehicle Battery	KS1+	Negative terminal	Yes GO to DG9 . No REPAIR the short circuit to GND.
(+) KS Connector, Component Side	(-) Vehicle Battery					
KS1+	Negative terminal					

Knock Sensor

DG

Test Step		Results / Action to Take						
DG8	CHECK THE KS2+ CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS	Yes GO to DG10. No REPAIR the short circuit to GND.						
• Measure the resistance between: <table><tr><td>(+) KS2 Sensor Connector, Component Side</td><td>(-) Vehicle Battery</td></tr><tr><td>KS2+</td><td>Negative terminal</td></tr></table> • Is the resistance greater than 10K ohms?			(+) KS2 Sensor Connector, Component Side	(-) Vehicle Battery	KS2+	Negative terminal		
(+) KS2 Sensor Connector, Component Side	(-) Vehicle Battery							
KS2+	Negative terminal							
DG9	CHECK THE KS1- CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS							
• Measure the resistance between: <table><tr><td>(+) KS Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>KS1-</td><td>Negative terminal</td></tr></table> • Is the resistance greater than 10K ohms?		(+) KS Connector, Harness Side	(-) Vehicle Battery	KS1-	Negative terminal	Yes GO to DG11. No REPAIR the short circuit to GND.		
(+) KS Connector, Harness Side	(-) Vehicle Battery							
KS1-	Negative terminal							
DG10	CHECK THE KS2- CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS	Yes GO to DG12. No REPAIR the short circuit to GND.						
• Measure the resistance between: <table><tr><td>(+) KS2 Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>KS2-</td><td>Negative terminal</td></tr></table> • Is the resistance greater than 10K ohms?			(+) KS2 Sensor Connector, Harness Side	(-) Vehicle Battery	KS2-	Negative terminal		
(+) KS2 Sensor Connector, Harness Side	(-) Vehicle Battery							
KS2-	Negative terminal							
DG11	CHECK THE KS1+ CIRCUIT FOR A SHORT TO POWER IN THE HARNESS							
• Measure the resistance between: <table><tr><td>(+) KS Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>KS1+</td><td>VPWR</td></tr><tr><td>KS1+</td><td>VREF</td></tr></table> • Are the resistances greater than 10K ohms?		(+) KS Connector, Harness Side	(-) PCM Connector, Harness Side	KS1+	VPWR	KS1+	VREF	Yes GO to DG13. No REPAIR the short circuit to PWR.
(+) KS Connector, Harness Side	(-) PCM Connector, Harness Side							
KS1+	VPWR							
KS1+	VREF							
DG12	CHECK THE KS2+ CIRCUIT FOR A SHORT TO POWER IN THE HARNESS	Yes GO to DG14. No REPAIR the short circuit to PWR.						
• Measure the resistance between: <table><tr><td>(+) KS2 Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>KS2+</td><td>VREF</td></tr><tr><td>KS2+</td><td>VPWR</td></tr></table> • Are the resistances greater than 10K ohms?			(+) KS2 Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	KS2+	VREF	KS2+	VPWR
(+) KS2 Sensor Connector, Harness Side	(-) PCM Connector, Harness Side							
KS2+	VREF							
KS2+	VPWR							

Knock Sensor

DG

Test Step		Results / Action to Take						
DG13	CHECK THE KS1- CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) KS Connector, Har- ness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>KS1-</td><td>VREF</td></tr><tr><td>KS1-</td><td>VPWR</td></tr></table> - Are the resistances greater than 10K ohms?	(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side	KS1-	VREF	KS1-	VPWR	Yes GO to DG15 . No REPAIR the short circuit to PWR.
(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side							
KS1-	VREF							
KS1-	VPWR							
DG14	CHECK THE KS2- CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) KS2 Sensor Con- nector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>KS2-</td><td>VREF</td></tr><tr><td>KS2-</td><td>VPWR</td></tr></table> - Are the resistances greater than 10K ohms?	(+) KS2 Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side	KS2-	VREF	KS2-	VPWR	Yes GO to DG16 . No REPAIR the short circuit to PWR.
(+) KS2 Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side							
KS2-	VREF							
KS2-	VPWR							
DG15	CHECK THE KS1- CIRCUIT FOR INTERMITTENT FAULTS Note: Carefully wiggle all accessible wiring and connectors associated with the KS circuit. - Measure the resistance between:<table><tr><th>(+) KS Connector, Har- ness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>KS1-</td><td>KS1-</td></tr></table> - Is the resistance less than 5 ohms?	(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side	KS1-	KS1-	Yes GO to DG17 . No REPAIR the open circuit.		
(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side							
KS1-	KS1-							
DG16	CHECK THE KS2- CIRCUIT FOR INTERMITTENT FAULTS Note: Carefully wiggle all accessible wiring and connectors associated with the KS circuit. - Measure the resistance between:<table><tr><th>(+) KS2 Sensor Con- nector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>KS2-</td><td>KS2-</td></tr></table> - Is the resistance less than 5 ohms?	(+) KS2 Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side	KS2-	KS2-	Yes GO to DG18 . No REPAIR the open circuit.		
(+) KS2 Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side							
KS2-	KS2-							
DG17	CHECK THE KS1+ CIRCUIT FOR INTERMITTENT FAULTS Note: Carefully wiggle all accessible wiring and connectors associated with the KS circuit. - Measure the resistance between:<table><tr><th>(+) KS Connector, Har- ness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>KS1+</td><td>KS1+</td></tr></table> - Is the resistance less than 5 ohms?	(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side	KS1+	KS1+	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.		
(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side							
KS1+	KS1+							

DG13-DG17

Knock Sensor**DG**

Test Step		Results / Action to Take				
DG18	CHECK THE KS2+ CIRCUIT FOR INTERMITTENT FAULTS	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.				
Note: Carefully wiggle all accessible wiring and connectors associated with the KS circuit.						
• Measure the resistance between:						
<table><tr><td>(+) KS2 Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>KS2+</td><td>KS2+</td></tr></table>	(+) KS2 Sensor Connector, Harness Side		(-) PCM Connector, Harness Side	KS2+	KS2+	
(+) KS2 Sensor Connector, Harness Side	(-) PCM Connector, Harness Side					
KS2+	KS2+					
• Is the resistance less than 5 ohms?						

DG18

Test DH: Throttle Position (TP) Sensor
PINPOINT TEST DH: THROTTLE POSITION (TP) SENSOR

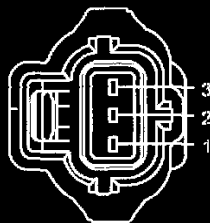
Throttle Position (TP) Sensor

DH

This pinpoint test is intended to diagnose the following:

- TP sensor (9B989).
- Binding or sticking throttle linkage.
- Harness circuits: TP, SIGRTN, VREF, VPWR, and PWRGND.
- Powertrain control module (PCM) (12A650).

Throttle Position (TP) Sensor Connector

A

A0077554

B

A0077555

Vehicle	Connector	Circuit	Pin
Escape 2.3L, Focus, Mariner 2.3L, Ranger 2.3L	A	TP SIGRTN VREF	2 1 3
All other vehicles	B	TP SIGRTN VREF	2 3 1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Note, Connectors

Throttle Position (TP) Sensor**DH**

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	SIGRTN PWRGND VREF VPWR TP	E17 B24, B25, B26, B27 E20 B32 E57
Escape, Focus, Mariner	150 (50-50-50) Pin	SIGRTN PWRGND VREF VPWR TP	E41 B47, B48, B49 E40 B35 E19
Excursion 5.4L	104 Pin	SIGRTN PWRGND VREF VPWR TP	91 3, 24, 51, 76, 77, 103 90 71 89
Excursion 6.8L	104 Pin	SIGRTN PWRGND VREF VPWR TP	91 3, 23, 24, 51, 76, 77, 103 90 71 89
Freestar/Monterey	104 Pin	SIGRTN PWRGND VREF VPWR TP	91 103, 24, 51, 76 90 71 89
Ford GT	104 Pin	SIGRTN PWRGND VREF VPWR TP	91 103, 3, 51, 76 90 71 89
All other vehicles	104 Pin	SIGRTN PWRGND VREF VPWR TP	91 103, 24, 51, 76, 77 90 71 89

Test Step		Results / Action to Take
DH1	KOEO AND KOER DTC P1124: CHECK FOR ANY OTHER DTCS	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No Key in OFF position. GO to DH2 .
	- Key in ON position. - Check for KOEO and KOER DTCs: Are DTCs P1400 or P0405 present?	

Chart, DH1

Throttle Position (TP) Sensor

DH

Test Step		Results / Action to Take				
DH2	CHECK FOR A 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 a closed throttle position?	Yes The throttle plate and linkage are OK. GO to DH8. No REPAIR as necessary.				
DH3	DTC P1120: CHECK THE TP CIRCUIT FOR FRAYED WIRES OR CORROSION ON THE CONNECTORS					
	- Key in OFF position. - Carry out a visual inspection of the pins on the harness connector at the TP sensor for corrosion. - Carry out a visual inspection of the harness wires between the TP sensor and the PCM for insulation fraying and corrosion. - Is a fault present?	Yes REPAIR as necessary. No GO to DH4.				
DH4	CHECK FOR A STUCK TP SENSOR					
	- Key in ON position. - Slowly move the throttle from the closed throttle position to the wide open throttle position and observe the TP V PID. - Access the PCM and monitor the TP V PID. - Is the voltage greater than 4.5 V?	Yes Key in OFF position. GO to DH20. No GO to DH5.				
DH5	CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN CIRCUITS AT THE TP SENSOR VEHICLE HARNESS CONNECTOR					
	- TP Sensor connector disconnected. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) TP Sensor Connector, Harness Side</td><td>(-) TP Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> - Is the voltage between 4.5 V - 5.5 V?	(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side	VREF	SIGRTN	Yes Key in OFF position. GO to DH6. No GO to C1.
(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side					
VREF	SIGRTN					
DH6	CHECK THE TP CIRCUIT FOR AN OPEN IN THE HARNESS					
	- PCM connector disconnected. - Measure the resistance between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) TP Sensor Connector, Harness Side</td></tr><tr><td>TP</td><td>TP</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) TP Sensor Connector, Harness Side	TP	TP	Yes GO to DH7. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) TP Sensor Connector, Harness Side					
TP	TP					

DH2-DH6

Throttle Position (TP) Sensor

DH

Test Step		Results / Action to Take						
DH7	CHECK THE TP SENSOR VOLTAGE TO THE PCM • PCM connector connected. • TP Sensor connector connected. • Key on engine running. • Idle the engine for 2 minutes. • Key in ON position. • Access the PCM and monitor the TP V PID. • Slowly move the throttle from the closed throttle position to the wide open throttle position and observe the TP V PID. • Is the voltage between 0.17 V - 0.49 V?	Yes INSTALL a new TP sensor. No If DTC P1120 is still present, GO to DH20.						
DH8	DTC P0123 OR DTC P1124: INDUCE THE OPPOSITE TP SENSOR VOLTAGE • TP Sensor connector disconnected. • Key in ON position. • Access the PCM and monitor the TP V PID. • Is the voltage less than 0.17 V?	Yes GO to DH9. No Key in OFF position. GO to DH10.						
DH9	CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN CIRCUITS AT THE TP SENSOR VEHICLE HARNESS CONNECTOR • Key in ON position. • Measure the voltage between:<table border="1"><tr><td>(+) TP Sensor Connector, Harness Side</td><td>(-) TP Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> • Is the voltage between 4.5 V - 5.5 V?	(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side	VREF	SIGRTN	Yes INSTALL a new TP sensor. No GO to C1.		
(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side							
VREF	SIGRTN							
DH10	CHECK THE CIRCUIT FOR A SHORT TO VREF AND VPWR IN THE HARNESS • PCM connector disconnected. • Measure the resistance between:<table border="1"><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VPWR</td><td>TP</td></tr><tr><td>VREF</td><td>TP</td></tr></table> • Are the resistances greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	VPWR	TP	VREF	TP	Yes INSTALL a new PCM. REFER to Diagnostic Methods,Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
VPWR	TP							
VREF	TP							
DH11	CONTINUOUS MEMORY DTC P0122: CHECK THE TP CIRCUIT FOR AN INTERMITTENT CONCERN • Key in ON position. • Clear the PCM DTCs. • Check for continuous memory DTCs: • Is DTC P0122 present?	Yes GO to DH12. No GO to Z1.						

DH7-DH11

Throttle Position (TP) Sensor

DH

Test Step		Results / Action to Take						
DH12	KOEO AND KOER DTC P0122: CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN CIRCUITS AT THE TP SENSOR VEHICLE HARNESS CONNECTOR - Key in OFF position. - TP Sensor connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) TP Sensor Connector, Harness Side</td><td>(-) TP Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> - Is the voltage between 4.5 V - 5.5 V?	(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side	VREF	SIGRTN	Yes GO to DH13. No GO to C1.		
(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side							
VREF	SIGRTN							
DH13	CHECK THE TP CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) TP Sensor Connector, Harness Side</td></tr><tr><td>TP</td><td>TP</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) TP Sensor Connector, Harness Side	TP	TP	Yes GO to DH14. No REPAIR the open circuit.		
(+) PCM Connector, Harness Side	(-) TP Sensor Connector, Harness Side							
TP	TP							
DH14	CHECK THE TP CIRCUIT FOR A SHORT TO PWRGND OR SIGRTN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>TP</td><td>PWRGND</td></tr><tr><td>TP</td><td>SIGRTN</td></tr></table> - Are the resistances greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	TP	PWRGND	TP	SIGRTN	Yes GO to DH15. No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
TP	PWRGND							
TP	SIGRTN							
DH15	INDUCE THE OPPOSITE TP SENSOR VOLTAGE - PCM connector connected. Note: If a diagnostic tool communication concern exists, immediately remove the jumper and follow the NO path in the RESULT/ACTION column. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A TP Sensor Connector, Harness Side</td><td>Point B TP Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>TP</td></tr></table> - Key in ON position. - Access the PCM and monitor the TP V PID. - Is the voltage greater than 4.65 V?	Point A TP Sensor Connector, Harness Side	Point B TP Sensor Connector, Harness Side	VREF	TP	Yes INSTALL a new TP sensor. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).		
Point A TP Sensor Connector, Harness Side	Point B TP Sensor Connector, Harness Side							
VREF	TP							

DH12-DH15

Throttle Position (TP) Sensor

DH

Test Step		Results / Action to Take
DH16	DTC P1121 OR P0068: CHECK THE RATIONALITY OPERATION BETWEEN THE TP AND MAF SENSORS	
	- Attempt to start the engine. - Does the engine start?	Yes GO to DH17 . No CHECK for major leaks, cracks and openings between the MAF sensor and the throttle body. If OK, GO to A1 .
DH17	CHECK THE TP SENSOR FOR MECHANICAL OPERATION	
	- Key in ON position. - Slowly move the throttle from the closed throttle position to the wide open throttle position and observe the TP V PID. - Access the PCM and monitor the TP V PID. - Is the voltage between 0.49 V - 4.65 V?	Yes GO to DH18 . No INSTALL a new TP sensor.
DH18	CHECK THE TP SENSOR SIGNAL HIGH VERSUS THE ENGINE LOAD WHILE DRIVING THE VEHICLE	
	- Key on engine running. - Drive the vehicle, exercising the throttle and TP sensor while accessing the PIDs. - Access the PCM and monitor the TP V and LOAD PIDs. - Is the TP V PID greater than 2.44 volts and the LOAD PID less than 30%?	Yes LISTEN for air noise around the MAF sensor and throttle body while the engine is running. If OK, INSTALL a new TP sensor. GO to HU1 . No GO to DH19 .
DH19	CHECK THE TP SENSOR SIGNAL LOW VERSUS THE ENGINE LOAD WHILE DRIVING THE VEHICLE	
	- Key on engine running. - Drive vehicle while exercising the throttle and TP sensor near higher gears (preferably overdrive) while accessing the PIDs. - Access the PCM and monitor the TP V and LOAD PIDs. - Is the TP V PID less than 0.24 volt and the LOAD PID greater than 55%?	Yes If Continuous Memory P1121 or P0068 is present, INSTALL a new MAF sensor. No Unable to identify the fault at this time. GO to Z1 .
DH20	CMDTCS P1120 OR P1125: CHECK FOR TP CIRCUIT INTERMITTENT SIGNAL	
	- Start engine and allow to idle. - Run the throttle up to 1,500 RPM for 5 seconds. - Access the PCM and monitor the TP V PID. - Lightly tap on the TP sensor and wiggle the harness connector to simulate road shock. - Is the voltage between 0.49 V - 4.65 V?	Yes Key in OFF position. GO to DH21 . No INSPECT the TP sensor connector. If OK, INSTALL a new TP sensor.

DH16-DH20

Throttle Position (TP) Sensor

DH

Test Step		Results / Action to Take
DH21	CHECK THE TP SENSOR HARNESS FOR INTERMITTENT OPENS OR SHORTS	Yes Key in OFF position. Unable to identify the fault at this time. GO to Z1. No ISOLATE the fault and REPAIR as necessary.
	- Key in ON position. - Access the PCM and monitor the TP V PID. - Grasp the vehicle harness closest to the TP sensor connector. Shake and bend a small section of the harness all the way to the bulkhead. Wiggle, shake, and bend the harness from the bulkhead to the PCM. - Is the voltage between 0.49 V - 4.65 V?	
DH22	DTC P0121: CHECK FOR OBSTRUCTION OR STICKING CONCERNS	Yes INSPECT the cable(s). REPAIR as necessary. RERUN the Quick Test. If DTC P0121 is still present, GO to DH23. No INSTALL a new throttle body assembly.
	 CAUTION: Do not attempt to clean the throttle bore and plate area. Cleaning will damage the throttle body assembly. Note: Conditions of sticking or obstruction can either be within the cables or throttle body assembly. - Disconnect the accelerator cable and speed control cable from the throttle body linkage. - Rotate the throttle body linkage. - Does the throttle body rotate freely without a sticking, binding, or grabbing condition?	
DH23	CHECK THE FUNCTIONALITY OF THE THROTTLE POSITION SENSOR	Yes VERIFY a symptom no longer exists. No INSTALL a new TP sensor.
	- Key in ON position. - While slowly pressing the accelerator from the closed throttle position to the wide open throttle position, observe the TP V PID. - Did the TP V PID display a smooth reading during accelerator movement?	

DH21-DH23

Test DJ: Air Conditioner Evaporator Temperature (ACET) Sensor
PINPOINT TEST DJ: AIR CONDITIONER EVAPORATOR TEMPERATURE (ACET) SENSOR

**Air Conditioner Evaporator
Temperature (ACET) Sensor****DJ**

This pinpoint test is intended to diagnose the following:

- ACET Sensor (19C734).
- Harness circuits: ACET and SIGRTN.
- Powertrain control module (PCM) (12A650).

Air Conditioner Evaporator Temperature (ACET) Sensor

°C	°F	Voltage	Resistance (K ohms)
100	212	0.47	2.08
90	194	0.61	2.8
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

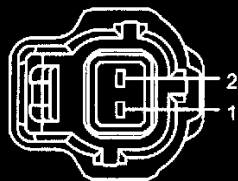
These values can vary by 15% due to sensor and VREF variations. Voltage values calculated for VREF equal to 5 volts.

Note And Chart

Air Conditioner Evaporator Temperature (ACET) Sensor

DJ

Air Conditioner Evaporator Temperature (ACET) Sensor Connector

A
B


A0077544



A0077523

Vehicle	Connector	Circuit	Pin
Crown Victoria, Grand Marquis, Town Car	A	SIGRTN ACET	2 1
All other vehicles	B	SIGRTN ACET	2 1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	VREF VPWR SIGRTN	B20, E20 B32, B33 B17
Crown Victoria, Five Hundred, Freestyle, Grand Marquis, Montego, Town Car	150 (50-50-50) Pin	VREF VPWR SIGRTN ACET	B40, E40 B35, B36 B41 B15
E-Series 4.6L, E-Series 5.4L 4R75E	170 Pin	VREF VPWR SIGRTN	B40, E57 B35, B36 B41

(Continued)

Air Conditioner Evaporator Temperature (ACET) Sensor

DJ

Vehicle	Connector	Circuit	Pin
E-Series 6.8L, E-Series 5.4L 5R100, F-Super Duty	170 Pin	VREF VPWR SIGRTN	B40, E57 B35, B36, T39 B41
Escape, Mariner	150 (50-50-50) Pin	VREF VPWR SIGRTN	B40, E40 B35, B36 B41
Expedition, F-150, Navigator	190 Pin	VREF VPWR SIGRTN	B29, E57 B51, B52, B53 B58
Explorer, Mountaineer	150 (50-50-50) Pin	VREF VPWR SIGRTN	E40, T40 B35, B36 B41
Focus	150 (50-50-50) Pin	VREF VPWR SIGRTN	E40 B35, B36 B41
LS, Thunderbird	150 (60-32-58) Pin	VREF VPWR SIGRTN	B55, E14 B32, B33 B5
Mustang	170 Pin	VREF VPWR SIGRTN	B40, E24 B35, B36 B43
Sable, Taurus	104 Pin	VREF VPWR SIGRTN ACET	90 71, 97 91 66
All other vehicles	104 Pin	VREF VPWR SIGRTN	90 71, 97 91

Test Step		Results / Action to Take				
DJ1	DTCS P0538 OR P1437: SIMULATE AN OPPOSITE SIGNAL TO THE PCM	Yes Key in OFF position. REMOVE the jumper wire(s) GO to DJ5. No GO to DJ2.				
- ACET Sensor connector disconnected. - Connect a 5 amp fused jumper wire between the following: <table><tr><td>Point A ACET Sensor Connector, Harness Side</td><td>Point B ACET Sensor Connector, Harness Side</td></tr><tr><td>ACET</td><td>SIGRTN</td></tr></table> - Does a diagnostic tool communication concern exist?			Point A ACET Sensor Connector, Harness Side	Point B ACET Sensor Connector, Harness Side	ACET	SIGRTN
Point A ACET Sensor Connector, Harness Side	Point B ACET Sensor Connector, Harness Side					
ACET	SIGRTN					
DJ2	SIMULATE AN OPPOSITE SIGNAL TO THE PCM					
- Check for self-test DTCs: - Are DTCs P0537 or P1436 present?		Yes INSTALL a new ACET sensor. No Key in OFF position. GO to DJ3.				

Chart, DJ1-DJ2

Air Conditioner Evaporator Temperature (ACET) Sensor

DJ

Test Step		Results / Action to Take						
DJ3	CHECK THE ACET AND SIGRTN CIRCUIT FOR AN OPEN IN THE HARNESS - Remove the jumper wire(s) - PCM connector disconnected. - Measure the resistance between: <table border="1"> <tr> <td>(+) ACET Sensor Connector, Harness Side</td> <td>(-) PCM Connector, Harness Side</td> </tr> <tr> <td>ACET</td> <td>ACET</td> </tr> <tr> <td>SIGRTN</td> <td>SIGRTN</td> </tr> </table> - Are the resistances less than 5 ohms?	(+) ACET Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	ACET	ACET	SIGRTN	SIGRTN	Yes GO to DJ5. No REPAIR the open circuit.
(+) ACET Sensor Connector, Harness Side	(-) PCM Connector, Harness Side							
ACET	ACET							
SIGRTN	SIGRTN							
DJ4	CHECK THE ACET CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS - PCM connector disconnected. - Measure the resistance between: <table border="1"> <tr> <td>(+) PCM Connector, Harness Side</td> <td>(-) PCM Connector, Harness Side</td> </tr> <tr> <td>ACET</td> <td>VPWR</td> </tr> </table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	ACET	VPWR	Yes GO to DJ5. No REPAIR the short circuit to VPWR.		
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
ACET	VPWR							
DJ5	CHECK THE ACET CIRCUIT FOR A SHORT TO VREF IN THE HARNESS - PCM connector disconnected. - Measure the resistance between: <table border="1"> <tr> <td>(+) PCM Connector, Harness Side</td> <td>(-) PCM Connector, Harness Side</td> </tr> <tr> <td>ACET</td> <td>VREF</td> </tr> </table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	ACET	VREF	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit to VREF.		
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
ACET	VREF							
DJ6	DTCS P0537 OR P1436: SIMULATE AN OPPOSITE SIGNAL TO THE PCM - ACET Sensor connector disconnected. - Check for KOEO DTCs: - Are DTCs P1437 or P0538 present?	Yes INSTALL a new ACET sensor. No Key in OFF position. GO to DJ7.						
DJ7	CHECK THE ACET CIRCUIT(S) FOR A SHORT TO SIGRTN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between: <table border="1"> <tr> <td>(+) ACET Sensor Connector, Harness Side</td> <td>(-) ACET Sensor Connector, Harness Side</td> </tr> <tr> <td>ACET</td> <td>SIGRTN</td> </tr> </table> - Is the resistance greater than 10K ohms?	(+) ACET Sensor Connector, Harness Side	(-) ACET Sensor Connector, Harness Side	ACET	SIGRTN	Yes GO to DJ8. No REPAIR the short circuit.		
(+) ACET Sensor Connector, Harness Side	(-) ACET Sensor Connector, Harness Side							
ACET	SIGRTN							

DJ3-DJ7

Air Conditioner Evaporator Temperature (ACET) Sensor

DJ

Test Step		Results / Action to Take				
DJ8	CHECK THE ACET CIRCUIT(S) FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) ACET Sensor Con- nector, Harness Side</td><td>(-)</td></tr><tr><td>ACET</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) ACET Sensor Con- nector, Harness Side	(-)	ACET	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) ACET Sensor Con- nector, Harness Side	(-)					
ACET	Ground					
DJ9	CONTINUOUS MEMORY DTCS P0537, P0538, P1436 OR P1437: CHECK THE ACET AND SIGRTN CIRCUIT FOR AN INTERMITTENT CONCERN - ACET Sensor connector disconnected. - Measure the voltage between:<table><tr><td>(+) ACET Sensor Con- nector, Harness Side</td><td>(-) ACET Sensor Con- nector, Harness Side</td></tr><tr><td>ACET</td><td>SIGRTN</td></tr></table> - Key in ON position. - While monitoring the voltage reading on the DMM, carry out 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 SIGRTN circuit.): - Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM. - Key in OFF position. - Inspect the connectors for signs of damage, water ingress, or corrosion. - Is there any change in the voltage reading, or is a concern found?	(+) ACET Sensor Con- nector, Harness Side	(-) ACET Sensor Con- nector, Harness Side	ACET	SIGRTN	Yes ISOLATE the fault REPAIR as necessary. No Unable to duplicate or identify the fault at this time. GO to Z1.
(+) ACET Sensor Con- nector, Harness Side	(-) ACET Sensor Con- nector, Harness Side					
ACET	SIGRTN					

DJ8-DJ9

Test DK: Accelerator Pedal Position (APP) Sensor
PINPOINT TEST DK: ACCELERATOR PEDAL POSITION SENSOR

Accelerator Pedal Position Sensor

DK

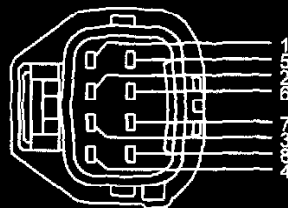
Note: The following DTCs should be repaired through Section 4 and the Workshop Manual respectively before entering pinpoint tests DK or DV:

- P0715.
- P0720.
- P0731-P0735.
- P0102-P0104.
- P0321.
- C1165.
- U1027.

This pinpoint test is intended to diagnose the following:

- Accelerator pedal position (APP) sensor (9F836).
- Harness circuits: ETCRTN, SIGRTN, ETCREF, APP1, APP2, and APP3.
- Powertrain control module (PCM) (12A650).

Accelerator Pedal Position (APP) Sensor Connector



A0077570

Circuit	Pin
APPS3 (Accelerator Pedal Position sensor 3)	8
APPS2 (Accelerator Pedal Position sensor 2)	5

(Continued)

Note, Connector

Accelerator Pedal Position Sensor**DK**

Circuit	Pin
APPS1 (Accelerator Pedal Position sensor 1)	2
ETCRTN (Electronic Throttle Control Return)	1, 3
ETCREF (Electronic Throttle Control Reference Voltage to TP)	6, 7

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
E-Series 4.6L, E-Series 5.4L 4R75E	170 Pin	ETCRTN ETCREF VPWR APPS3 APPS2 APPS1	B18, B6, E59 B16, B4, E66 B35, B36 B28 B17 B5
E-Series 6.8L, E-Series 5.4L 5R100, F-Super Duty	170 Pin	ETCRTN ETCREF VPWR APPS3 APPS2 APPS1	B18, B6, E59 B16, B4, E66 B35, B36, T39 B28 B17 B5
Expedition, F-150, Navigator	190 Pin	ETCRTN ETCREF VPWR APPS3 APPS2 APPS1	B58, B59, E59 B21, B28, E66 B51, B52, B53 B27 B26 B25
Explorer, Mountaineer	150 (50-50-50) Pin	ETCRTN ETCREF VPWR APPS3 APPS2 APPS1	B41, B6, E7 B4, B40, E18 B35, B36 B28 B17 B5
LS, Thunderbird	150 (60-32-58) Pin	ETCRTN ETCREF VPWR APPS3 APPS2 APPS1	B17, E15 B20, B23, E24 B32, B33 B16 B1 B15
Mustang	170 Pin	ETCRTN ETCREF VPWR APPS3 APPS2 APPS1	B43, B6, E59 B24, B4, E66 B35, B36 B28 B17 B5

(Continued)

Connectors

Accelerator Pedal Position Sensor**DK**

Vehicle	Connector	Circuit	Pin
All other vehicles	150 (50-50-50) Pin	ETCRTN ETCREF VPWR APPS3 APPS2 APPS1	B41, B6, E7 B24, B4, E18 B35, B36 B28 B17 B5

Test Step		Results / Action to Take
DK1	DTCS P2121, P2122, P2123, P2126, P2127, P2128, P2131, P2132 AND P2133: CHECK THE APPS FOR OBSTRUCTION	
• Key in ON position. • Press the accelerator pedal fully to the floor and release. • Does the pedal move freely to the floor and back?		Yes For DTCs P2111 or P2112, GO to DV1. For all others, GO to DK2 . No ISOLATE and REPAIR the obstruction.

Chart, DK1

Accelerator Pedal Position Sensor

DK

Test Step		Results / Action to Take																																																				
DK2	CHECK THE APPS SIGNAL VOLTAGE RANGES FOR THE ACCELERATOR PEDAL FULLY APPLIED AND RELEASED POSITIONS APPS - Access the PCM and monitor the APPS1, APPS2 and APPS3 PIDs. - Press the accelerator pedal fully to the floor and release. Accelerator Pedal Fully Applied Voltage Values <table><tr><th>VEHICLE</th><th>APPS1</th><th>APPS2</th><th>APPS3</th></tr><tr><td>LS</td><td>0.50 - 1.44</td><td>3.15 - 4.60</td><td>2.66 - 3.99</td></tr><tr><td>Thunderbird</td><td>0.50 - 1.44</td><td>3.15 - 4.60</td><td>2.66 - 3.99</td></tr><tr><td>E-Series</td><td>0.57 - 1.52</td><td>3.11 - 4.54</td><td>2.61 - 3.94</td></tr><tr><td>F-Super Duty</td><td>0.39 - 0.97</td><td>3.45 - 4.71</td><td>2.95 - 4.10</td></tr><tr><td>Explorer</td><td>0.60 - 1.57</td><td>3.07 - 4.50</td><td>2.57 - 3.89</td></tr><tr><td>Mountaineer</td><td>0.60 - 1.57</td><td>3.07 - 4.50</td><td>2.57 - 3.89</td></tr><tr><td>F-150</td><td>0.60 - 1.57</td><td>3.07 - 4.50</td><td>2.57 - 3.89</td></tr><tr><td>Expedition</td><td>0.79 - 2.09</td><td>2.75 - 4.33</td><td>2.26 - 3.73</td></tr><tr><td>Navigator</td><td>0.79 - 2.09</td><td>2.75 - 4.33</td><td>2.26 - 3.73</td></tr><tr><td>All others</td><td>0.48 - 1.76</td><td>2.95 - 4.62</td><td>2.43 - 4.02</td></tr></table> Accelerator Pedal Fully Released Voltage Values <table><tr><th>VEHICLE</th><th>APPS1</th><th>APPS2</th><th>APPS3</th></tr><tr><td>All others</td><td>3.43 - 4.69</td><td>1.13 - 1.88</td><td>0.64 - 1.28</td></tr></table> - Are all 3 APPS signals out of range for the pedal fully applied and released positions?	VEHICLE	APPS1	APPS2	APPS3	LS	0.50 - 1.44	3.15 - 4.60	2.66 - 3.99	Thunderbird	0.50 - 1.44	3.15 - 4.60	2.66 - 3.99	E-Series	0.57 - 1.52	3.11 - 4.54	2.61 - 3.94	F-Super Duty	0.39 - 0.97	3.45 - 4.71	2.95 - 4.10	Explorer	0.60 - 1.57	3.07 - 4.50	2.57 - 3.89	Mountaineer	0.60 - 1.57	3.07 - 4.50	2.57 - 3.89	F-150	0.60 - 1.57	3.07 - 4.50	2.57 - 3.89	Expedition	0.79 - 2.09	2.75 - 4.33	2.26 - 3.73	Navigator	0.79 - 2.09	2.75 - 4.33	2.26 - 3.73	All others	0.48 - 1.76	2.95 - 4.62	2.43 - 4.02	VEHICLE	APPS1	APPS2	APPS3	All others	3.43 - 4.69	1.13 - 1.88	0.64 - 1.28	Yes GO to DK3. No For DTCs P2121, P2122, P2123, P2126, P2127, P2128, P2131, P2132 or P2133 alone, GO to DK7. For any combination of ETC related DTCs, GO to DK3. For continuous memory DTCs P2121 and P2126 with P2131, GO to DK21.
VEHICLE	APPS1	APPS2	APPS3																																																			
LS	0.50 - 1.44	3.15 - 4.60	2.66 - 3.99																																																			
Thunderbird	0.50 - 1.44	3.15 - 4.60	2.66 - 3.99																																																			
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VEHICLE	APPS1	APPS2	APPS3																																																			
All others	3.43 - 4.69	1.13 - 1.88	0.64 - 1.28																																																			
DK3	CHECK THE VREF VOLTAGE TO APPS - Key in OFF position. - APP Sensor connector disconnected. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) APP Sensor Connector, Harness Side</td><td>(-) APP Sensor Connector, Harness Side</td></tr><tr><td>ETCREF - Pin 6, 7</td><td>ETCRTN - Pin 1, 3</td></tr></table> - Is the voltage between 4 V - 6 V?	(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side	ETCREF - Pin 6, 7	ETCRTN - Pin 1, 3	Yes GO to DK4. No GO to C1.																																																
(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side																																																					
ETCREF - Pin 6, 7	ETCRTN - Pin 1, 3																																																					

DK2-DK3

Accelerator Pedal Position Sensor**DK**

Test Step		Results / Action to Take
DK4	CHECK THE FUNCTIONALITY OF THE APPS1 CIRCUIT	Yes GO to DK7. No GO to DK5.
Note: Use the voltage measurements from DK2. • Was APPS1 out of range?		
DK5	CHECK THE FUNCTIONALITY OF APPS2	Yes GO to DK7. No GO to DK6.
Note: Use the voltage measurements from DK2. • Was APPS2 out of range?		
DK6	CHECK THE FUNCTIONALITY OF APPS3	Yes GO to DK7. No GO to DK21.
Note: Use the voltage measurements from DK2. • Was APPS3 out of range?		

DK4-DK6

Accelerator Pedal Position Sensor

DK

Test Step		Results / Action to Take																																													
DK7	CHECK THE FUNCTIONALITY OF APPS																																														
• Key in OFF position. • APP Sensor connector disconnected. • Measure the resistance between: • For E-Series, Explorer, F-150, F-Super Duty, LS, Mountaineer, Thunderbird:																																															
<table><tr><th>(+) APP Sensor Connector, Component Side</th><th>(-) APP Sensor Connector, Component Side</th><th>Minimum Resistance (ohms)</th><th>Maximum Resistance (ohms)</th></tr><tr><td>APPS1</td><td>ETCREF</td><td>400</td><td>1,200</td></tr><tr><td>APPS1</td><td>ETCRTN</td><td>900</td><td>2,200</td></tr><tr><td>APPS1</td><td>APPS2</td><td>2,000</td><td>4,800</td></tr><tr><td>APPS1</td><td>APPS3</td><td>2,000</td><td>4,800</td></tr><tr><td>APPS2</td><td>ETCREF</td><td>1,700</td><td>4,100</td></tr><tr><td>APPS2</td><td>ETCRTN</td><td>1,400</td><td>3,500</td></tr><tr><td>APPS2</td><td>APPS3</td><td>2,700</td><td>6,500</td></tr><tr><td>APPS3</td><td>ETCREF</td><td>1,700</td><td>4,100</td></tr><tr><td>APPS3</td><td>ETCRTN</td><td>1,300</td><td>3,200</td></tr><tr><td>ETCREF</td><td>ETCRTN</td><td>700</td><td>1,700</td></tr></table>		(+) APP Sensor Connector, Component Side	(-) APP Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)	APPS1	ETCREF	400	1,200	APPS1	ETCRTN	900	2,200	APPS1	APPS2	2,000	4,800	APPS1	APPS3	2,000	4,800	APPS2	ETCREF	1,700	4,100	APPS2	ETCRTN	1,400	3,500	APPS2	APPS3	2,700	6,500	APPS3	ETCREF	1,700	4,100	APPS3	ETCRTN	1,300	3,200	ETCREF	ETCRTN	700	1,700		
(+) APP Sensor Connector, Component Side	(-) APP Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)																																												
APPS1	ETCREF	400	1,200																																												
APPS1	ETCRTN	900	2,200																																												
APPS1	APPS2	2,000	4,800																																												
APPS1	APPS3	2,000	4,800																																												
APPS2	ETCREF	1,700	4,100																																												
APPS2	ETCRTN	1,400	3,500																																												
APPS2	APPS3	2,700	6,500																																												
APPS3	ETCREF	1,700	4,100																																												
APPS3	ETCRTN	1,300	3,200																																												
ETCREF	ETCRTN	700	1,700																																												
• For all other vehicles:																																															
<table><tr><th>(+) APP Sensor Connector, Component Side</th><th>(-) APP Sensor Connector, Component Side</th><th>Minimum Resistance (ohms)</th><th>Maximum Resistance (ohms)</th></tr><tr><td>APPS1</td><td>ETCREF</td><td>150</td><td>350</td></tr><tr><td>APPS1</td><td>ETCRTN</td><td>290</td><td>650</td></tr><tr><td>APPS1</td><td>APPS2</td><td>900</td><td>2,010</td></tr><tr><td>APPS1</td><td>APPS3</td><td>820</td><td>1,840</td></tr><tr><td>APPS2</td><td>ETCREF</td><td>800</td><td>1,790</td></tr><tr><td>APPS2</td><td>ETCRTN</td><td>700</td><td>1,580</td></tr><tr><td>APPS2</td><td>APPS3</td><td>1,270</td><td>2,860</td></tr><tr><td>APPS3</td><td>ETCREF</td><td>720</td><td>1,630</td></tr><tr><td>APPS3</td><td>ETCRTN</td><td>580</td><td>1,330</td></tr><tr><td>ETCREF</td><td>ETCRTN</td><td>210</td><td>470</td></tr></table>		(+) APP Sensor Connector, Component Side	(-) APP Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)	APPS1	ETCREF	150	350	APPS1	ETCRTN	290	650	APPS1	APPS2	900	2,010	APPS1	APPS3	820	1,840	APPS2	ETCREF	800	1,790	APPS2	ETCRTN	700	1,580	APPS2	APPS3	1,270	2,860	APPS3	ETCREF	720	1,630	APPS3	ETCRTN	580	1,330	ETCREF	ETCRTN	210	470		
(+) APP Sensor Connector, Component Side	(-) APP Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)																																												
APPS1	ETCREF	150	350																																												
APPS1	ETCRTN	290	650																																												
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APPS2	ETCRTN	700	1,580																																												
APPS2	APPS3	1,270	2,860																																												
APPS3	ETCREF	720	1,630																																												
APPS3	ETCRTN	580	1,330																																												
ETCREF	ETCRTN	210	470																																												
• Are all the resistances within specifications?		Yes For DTCs P2121, P2122 or P2123 alone or in combination, GO to DK9. For DTCs P2126, P2127 or P2128 alone or in combination, GO to DK13. For DTCs P2131, P2132 or P2133 alone or in combination, GO to DK17. For all others, GO to DK21. No INSTALL a new APP sensor. Clear the DTCs. PRESS the accelerator pedal several times and REPEAT the self-test. If DTCs are present: GO to DK8.																																													

Accelerator Pedal Position Sensor

DK

Test Step		Results / Action to Take				
DK8	CHECK THE APPS CIRCUIT INTEGRITY - Key in OFF position. - APP Sensor connector disconnected. - Measure the resistance between:<table><tr><td>(+) APP Sensor Con- nector, Component Side</td><td>(-) APP Sensor Con- nector, Component Side</td></tr><tr><td>ETCREF - Pin 6, 7</td><td>ETCRTN - Pin 1, 3</td></tr></table> - Is the resistance between 700 ohms - 1,700 ohms (E-Series, Explorer, F-150, F-Super Duty, LS, Mountaineer, Thunderbird) or 210 - 470 ohms (all other vehicles)?	(+) APP Sensor Con- nector, Component Side	(-) APP Sensor Con- nector, Component Side	ETCREF - Pin 6, 7	ETCRTN - Pin 1, 3	Yes For continuous memory DTCs P2121 with P2122 or P2123, or with P2126 and P2131, GO to DK9 . For continuous memory DTCs P2126 with P2127 or P2128, or with P2121 and P2131, GO to DK13 . For continuous memory DTCs P2121 and P2122 or P2131 and P2133, GO to DK17 . No INSTALL a new APP sensor. Clear the DTCs. PRESS the accelerator pedal several times and REPEAT the self-test. If DTCs are present: GO to DK9 .
(+) APP Sensor Con- nector, Component Side	(-) APP Sensor Con- nector, Component Side					
ETCREF - Pin 6, 7	ETCRTN - Pin 1, 3					
DK9	CHECK THE APPS1 CIRCUIT FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) APP Sensor Con- nector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>APPS1 - Pin 2</td><td>APPS1</td></tr></table> - Is the resistance less than 5 ohms?	(+) APP Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side	APPS1 - Pin 2	APPS1	Yes GO to DK10 . No REPAIR the open circuit.
(+) APP Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side					
APPS1 - Pin 2	APPS1					
DK10	CHECK THE APPS1 CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) APP Sensor Con- nector, Harness Side</td><td>(-) 12 Volt Vehicle Bat- tery</td></tr><tr><td>APPS1 - Pin 2</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) APP Sensor Con- nector, Harness Side	(-) 12 Volt Vehicle Bat- tery	APPS1 - Pin 2	Negative terminal	Yes GO to DK11 . No REPAIR the short circuit to GND.
(+) APP Sensor Con- nector, Harness Side	(-) 12 Volt Vehicle Bat- tery					
APPS1 - Pin 2	Negative terminal					

Accelerator Pedal Position Sensor

DK

Test Step		Results / Action to Take						
DK11	CHECK THE APPS1 CIRCUIT FOR A SHORT IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) APP Sensor Connector, Harness Side</th><th>(-) APP Sensor Connector, Harness Side</th></tr><tr><td>APPS1 - Pin 2</td><td>ETCRTN - Pin 1, 3</td></tr><tr><td>APPS1 - Pin 2</td><td>ETCREF - Pin 6, 7</td></tr></table> - Are the resistances greater than 10K ohms?	(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side	APPS1 - Pin 2	ETCRTN - Pin 1, 3	APPS1 - Pin 2	ETCREF - Pin 6, 7	Yes GO to DK12 . No REPAIR the short circuit.
(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side							
APPS1 - Pin 2	ETCRTN - Pin 1, 3							
APPS1 - Pin 2	ETCREF - Pin 6, 7							
DK12	CHECK THE APPS1 CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><th>(+) APP Sensor Connector, Harness Side</th><th>(-) 12 Volt Vehicle Battery</th></tr><tr><td>APPS1 - Pin 2</td><td>Negative terminal</td></tr></table> - Is any voltage present?	(+) APP Sensor Connector, Harness Side	(-) 12 Volt Vehicle Battery	APPS1 - Pin 2	Negative terminal	Yes REPAIR the short circuit. No GO to DK21 .		
(+) APP Sensor Connector, Harness Side	(-) 12 Volt Vehicle Battery							
APPS1 - Pin 2	Negative terminal							
DK13	CHECK THE APPS2 CIRCUIT FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><th>(+) APP Sensor Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>APPS2 - Pin 5</td><td>APPS2</td></tr></table> - Is the resistance less than 5 ohms?	(+) APP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	APPS2 - Pin 5	APPS2	Yes GO to DK14 . No REPAIR the open circuit.		
(+) APP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side							
APPS2 - Pin 5	APPS2							
DK14	CHECK THE APPS2 CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) 12 Volt Vehicle Battery</th></tr><tr><td>APPS2</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery	APPS2	Negative terminal	Yes GO to DK15 . No REPAIR the short circuit to GND.		
(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery							
APPS2	Negative terminal							
DK15	CHECK THE APPS2 CIRCUIT FOR A SHORT IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) APP Sensor Connector, Harness Side</th><th>(-) APP Sensor Connector, Harness Side</th></tr><tr><td>APPS2 - Pin 5</td><td>ETCRTN - Pin 1, 3</td></tr><tr><td>APPS2 - Pin 5</td><td>ETCREF - Pin 6, 7</td></tr></table> - Are the resistances greater than 10K ohms?	(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side	APPS2 - Pin 5	ETCRTN - Pin 1, 3	APPS2 - Pin 5	ETCREF - Pin 6, 7	Yes GO to DK16 . No REPAIR the short circuit.
(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side							
APPS2 - Pin 5	ETCRTN - Pin 1, 3							
APPS2 - Pin 5	ETCREF - Pin 6, 7							

DK11-DK15

Accelerator Pedal Position Sensor

DK

Test Step		Results / Action to Take						
DK16	CHECK THE APPS2 CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) 12 Volt Vehicle Battery</td></tr><tr><td>APPS2</td><td>Negative terminal</td></tr></table> - Is any voltage present?	(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery	APPS2	Negative terminal	Yes REPAIR the short circuit. No GO to DK22.		
(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery							
APPS2	Negative terminal							
DK17	CHECK THE APPS3 CIRCUIT FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) APP Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>APPS3 - Pin 8</td><td>APPS3</td></tr></table> - Is the resistance less than 5 ohms?	(+) APP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	APPS3 - Pin 8	APPS3	Yes GO to DK18. No REPAIR the open circuit.		
(+) APP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side							
APPS3 - Pin 8	APPS3							
DK18	CHECK THE APPS3 CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) 12 Volt Vehicle Battery</td></tr><tr><td>APPS3</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery	APPS3	Negative terminal	Yes GO to DK19. No REPAIR the short circuit to GND.		
(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery							
APPS3	Negative terminal							
DK19	CHECK THE APPS3 CIRCUIT FOR A SHORT IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) APP Sensor Connector, Harness Side</td><td>(-) APP Sensor Connector, Harness Side</td></tr><tr><td>APPS3 - Pin 8</td><td>ETCRTN - Pin 1, 3</td></tr><tr><td>APPS3 - Pin 8</td><td>ETCREF - Pin 6, 7</td></tr></table> - Are the resistances greater than 10K ohms?	(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side	APPS3 - Pin 8	ETCRTN - Pin 1, 3	APPS3 - Pin 8	ETCREF - Pin 6, 7	Yes GO to DK20. No REPAIR the short circuit.
(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side							
APPS3 - Pin 8	ETCRTN - Pin 1, 3							
APPS3 - Pin 8	ETCREF - Pin 6, 7							
DK20	CHECK THE APPS3 CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) 12 Volt Vehicle Battery</td></tr><tr><td>APPS3</td><td>Negative terminal</td></tr></table> - Is any voltage present?	(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery	APPS3	Negative terminal	Yes REPAIR the short circuit. No GO to DK23.		
(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery							
APPS3	Negative terminal							

DK16-DK20

Accelerator Pedal Position Sensor

DK

Test Step		Results / Action to Take										
DK21	CHECK THE APPS1 CIRCUIT FOR A SHORT TOGETHER • Key in OFF position. • PCM connector disconnected. • APP Sensor connector disconnected. • Measure the resistance between:<table><tr><th>(+) APP Sensor Connector, Harness Side</th><th>(-) APP Sensor Connector, Harness Side</th></tr><tr><td>APPS1 - Pin 2</td><td>APPS2 - Pin 5</td></tr><tr><td>APPS1 - Pin 2</td><td>APPS3 - Pin 8</td></tr><tr><td>APPS1 - Pin 2</td><td>ETCREF - Pin 6, 7</td></tr><tr><td>APPS1 - Pin 2</td><td>ETCRTN - Pin 1, 3</td></tr></table> • Are the resistances greater than 10K ohms?	(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side	APPS1 - Pin 2	APPS2 - Pin 5	APPS1 - Pin 2	APPS3 - Pin 8	APPS1 - Pin 2	ETCREF - Pin 6, 7	APPS1 - Pin 2	ETCRTN - Pin 1, 3	Yes GO to DK22 . No REPAIR the short circuit.
(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side											
APPS1 - Pin 2	APPS2 - Pin 5											
APPS1 - Pin 2	APPS3 - Pin 8											
APPS1 - Pin 2	ETCREF - Pin 6, 7											
APPS1 - Pin 2	ETCRTN - Pin 1, 3											
DK22	CHECK FOR THE APPS2 CIRCUIT SHORTED TO SIGNALS IN THE SAME HARNESS • Key in OFF position. • Measure the resistance between:<table><tr><th>(+) APP Sensor Connector, Harness Side</th><th>(-) APP Sensor Connector, Harness Side</th></tr><tr><td>APPS2 - Pin 5</td><td>APPS1 - Pin 2</td></tr><tr><td>APPS2 - Pin 5</td><td>APPS3 - Pin 8</td></tr><tr><td>APPS2 - Pin 5</td><td>ETCREF - Pin 6, 7</td></tr><tr><td>APPS2 - Pin 5</td><td>ETCRTN - Pin 1, 3</td></tr></table> • Are the resistances greater than 10K ohms?	(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side	APPS2 - Pin 5	APPS1 - Pin 2	APPS2 - Pin 5	APPS3 - Pin 8	APPS2 - Pin 5	ETCREF - Pin 6, 7	APPS2 - Pin 5	ETCRTN - Pin 1, 3	Yes GO to DK23 . No REPAIR the short circuit.
(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side											
APPS2 - Pin 5	APPS1 - Pin 2											
APPS2 - Pin 5	APPS3 - Pin 8											
APPS2 - Pin 5	ETCREF - Pin 6, 7											
APPS2 - Pin 5	ETCRTN - Pin 1, 3											
DK23	CHECK FOR THE APPS3 CIRCUIT SHORTED TO SIGNALS IN THE SAME HARNESS • Key in OFF position. • Measure the resistance between:<table><tr><th>(+) APP Sensor Connector, Harness Side</th><th>(-) APP Sensor Connector, Harness Side</th></tr><tr><td>APPS3 - Pin 8</td><td>APPS1 - Pin 2</td></tr><tr><td>APPS3 - Pin 8</td><td>APPS2 - Pin 5</td></tr><tr><td>APPS3 - Pin 8</td><td>ETCREF - Pin 6, 7</td></tr><tr><td>APPS3 - Pin 8</td><td>ETCRTN - Pin 1, 3</td></tr></table> • Are the resistances greater than 10K ohms?	(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side	APPS3 - Pin 8	APPS1 - Pin 2	APPS3 - Pin 8	APPS2 - Pin 5	APPS3 - Pin 8	ETCREF - Pin 6, 7	APPS3 - Pin 8	ETCRTN - Pin 1, 3	Yes GO to DK24 . No REPAIR the short circuit.
(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side											
APPS3 - Pin 8	APPS1 - Pin 2											
APPS3 - Pin 8	APPS2 - Pin 5											
APPS3 - Pin 8	ETCREF - Pin 6, 7											
APPS3 - Pin 8	ETCRTN - Pin 1, 3											

Accelerator Pedal Position Sensor**DK**

Test Step		Results / Action to Take								
DK24	CHECK THE APPS CIRCUIT FOR AN INTERMITTENT CONCERN									
• Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM. • Measure the resistance between:										
<table><tr><th>(+) APP Sensor Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>APPS1 - Pin 2</td><td>APPS1</td></tr><tr><td>APPS2 - Pin 5</td><td>APPS2</td></tr><tr><td>APPS3 - Pin 8</td><td>APPS3</td></tr></table>			(+) APP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	APPS1 - Pin 2	APPS1	APPS2 - Pin 5	APPS2	APPS3 - Pin 8	APPS3
(+) APP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side									
APPS1 - Pin 2	APPS1									
APPS2 - Pin 5	APPS2									
APPS3 - Pin 8	APPS3									
• Are the resistances less than 5 ohms?										

DK24

Test DL: Cylinder Head Temperature (CHT) Sensor
PINPOINT TEST DL: CYLINDER HEAD TEMPERATURE (CHT) SENSOR

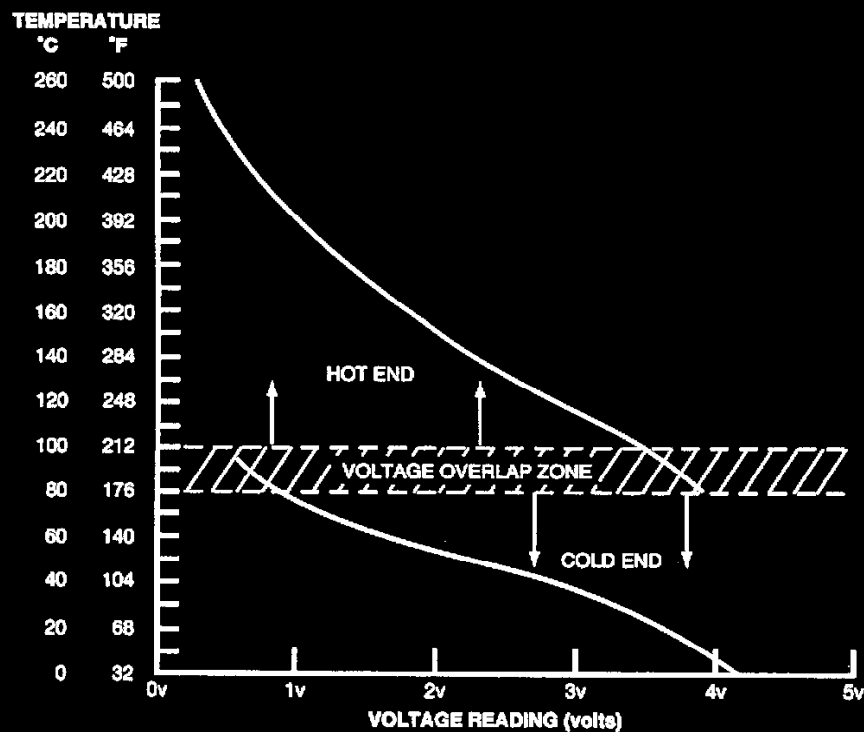
Cylinder Head Temperature (CHT) Sensor

DL

This pinpoint test is intended to diagnose the following:

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

On applications that do not use an ECT sensor, the CHT sensor is used to determine the engine coolant temperature. 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.



AA0885-B

Voltage values calculated for VREF = 5 volts. These values can vary by 15% due to sensor and VREF variations.

Note And Graph

Cylinder Head Temperature (CHT) Sensor

DL

CYLINDER HEAD TEMPERATURE SENSOR EXPECTED VALUES

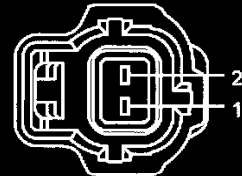
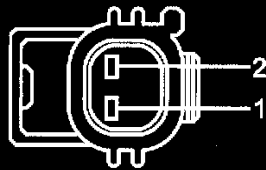
Temperature		CHT Sensor Values		
°C	°F	COLD END (volts)	HOT END (volts)	Resistance (K ohms)
-40	-40	4.89	-	965.808
-30	-22	4.81	-	513.019
-20	-4	4.67	-	283.664
-10	14	4.45	-	162.584
0	32	4.14	-	96.255
10	50	3.73	-	59.175
20	68	3.26	-	37.387
30	86	2.74	-	24.215
40	104	2.23	-	16.043
50	122	1.76	-	10.85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

Chart

Cylinder Head Temperature (CHT) Sensor

DL

Cylinder Head Temperature (CHT) Sensor Connector

A
B


A0077527

A0077551

Vehicle	Connector	Circuit	Pin
LS, Thunderbird	A	SIGRTN CHT	2 1
All other vehicles	B	SIGRTN CHT	2 1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	VREF SIGRTN CHT	E20 E17 E40
E-Series, F-Super Duty	170 Pin	VREF SIGRTN CHT	E57 E58 E41
Excursion, Freestar/Monterey, Ranger	104 Pin	VREF SIGRTN CHT	90 91 66
Expedition, F-150, Navigator	190 Pin	VREF SIGRTN CHT	E57 E58 E41

(Continued)

Cylinder Head Temperature (CHT) Sensor

DL

Vehicle	Connector	Circuit	Pin
LS, Thunderbird	150 (60-32-58) Pin	VREF SIGRTN CHT	E14 E17 E40
Mustang	170 Pin	VREF SIGRTN CHT	E24 E33 E41
All other vehicles	150 (50-50-50) Pin	VREF SIGRTN CHT	E40 E41 E33

Test Step		Results / Action to Take
DL1	SELF-TEST DTCS P1288 OR P1116: CHECK THE COOLING SYSTEM	Yes GO to DL2. No REFER to Cooling System. REPAIR as necessary.
	 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. - The DTC indicates the temperature sensor is out of self-test range. The engine is not at normal operating temperature. - Possible causes: - Cold engine. - Low engine coolant. - Engine overheat. - Damaged harness. - CHT sensor. - Damaged PCM. - Check the vehicle coolant level. - Is the cooling system OK?	
DL2	CHECK IF THE VEHICLE ENGINE STARTS	Yes GO to DL5. No GO to DL3.
	- Attempt to start the engine. - Does the engine start and run normally?	

Chart, DL1-DL2

Cylinder Head Temperature (CHT) Sensor

DL

Test Step		Results / Action to Take				
DL3	CHECK THE RESISTANCE OF THE CHT SENSOR WITH THE ENGINE OFF • Key in OFF position. • CHT Sensor connector disconnected. • Measure the resistance between:<table><tr><td>(+) CHT Sensor Con- nector, Component Side</td><td>(-) CHT Sensor Con- nector, Component Side</td></tr><tr><td>CHT</td><td>SIGRTN</td></tr></table> Note: Refer to the chart at the beginning of this test for resistance specifications. • Is the resistance within specification?	(+) CHT Sensor Con- nector, Component Side	(-) CHT Sensor Con- nector, Component Side	CHT	SIGRTN	Yes GO to DL4 . No INSTALL a new CHT sensor.
(+) CHT Sensor Con- nector, Component Side	(-) CHT Sensor Con- nector, Component Side					
CHT	SIGRTN					
DL4	CHECK CIRCUIT FROM MODULE TO COMPONENT • CHT Sensor connector connected. • Key in ON position. • Access the PCM and monitor the CHT V PID. • Using the data collected from the previous step, compare temperature resistance measured at the sensor to the PID temperature voltage measured at the PCM. Note: Refer to the chart at the beginning of this test for resistance specifications. • Does the measured value at the sensor agree with measured PID value at the PCM?	Yes No start or stalls. Concern is elsewhere. RETURN to Symptom Charts for further direction. No CHECK the harness. GO to DL11 .				
DL5	CHECK THE CHT SENSOR OPERATION • Run the engine until the engine temperature stabilizes. • Verify the upper radiator hose is hot and the cooling system is pressurized. • Check for self-test DTCs: • Are DTCs P1116 or P1288 present?	Yes GO to DL6 . No The engine temperature was not stabilized. REPAIR any other DTCs as necessary.				
DL6	CHECK THE RESISTANCE OF THE CHT SENSOR • Vehicle must be at normal operating temperature. • Key in OFF position. • CHT Sensor connector disconnected. • Measure the resistance between:<table><tr><td>(+) CHT Sensor Con- nector, Component Side</td><td>(-) CHT Sensor Con- nector, Component Side</td></tr><tr><td>CHT</td><td>SIGRTN</td></tr></table> Note: Refer to the chart at the beginning of this test for resistance specifications. • Is the resistance within specification?	(+) CHT Sensor Con- nector, Component Side	(-) CHT Sensor Con- nector, Component Side	CHT	SIGRTN	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new CHT sensor.
(+) CHT Sensor Con- nector, Component Side	(-) CHT Sensor Con- nector, Component Side					
CHT	SIGRTN					

DL3-DL6

Cylinder Head Temperature (CHT) Sensor

DL

Test Step		Results / Action to Take					
DL7	DTCS P0117, P0118, P1289 OR P1290: ACCESS THE CHT PID AND CHECK THE VOLTAGE	Yes Key in OFF position. GO to DL8. No Key in OFF position. GO to DL9.					
- Key in ON position. - Access the PCM and monitor the CHT V PID. - Is the voltage less than 0.2 V?							
DL8	CHECK FOR A GROUNDED CIRCUIT	Yes INSTALL a new CHT sensor. No GO to DL13.					
- CHT Sensor connector disconnected. - Key in ON position. - Access the PCM and monitor the CHT V PID. - Is the voltage greater than 4.6 V?							
DL9	CHECK THE CHT CIRCUIT FOR A SHORT TO POWER	Yes Key in OFF position. REPAIR the short circuit to PWR. CHECK the CHT sensor for damage. GO to DL10. No Key in OFF position. GO to DL10.					
- CHT Sensor connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) CHT Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>CHT</td><td>Ground</td></tr></table> - Is the voltage greater than 5.5 V?			(+) CHT Sensor Connector, Harness Side	(-)	CHT	Ground	
(+) CHT Sensor Connector, Harness Side	(-)						
CHT	Ground						
DL10	CHECK THE RESISTANCE OF THE CHT SENSOR WITH THE ENGINE OFF	Yes GO to DL11. No INSTALL a new CHT sensor.					
- CHT Sensor connector disconnected. - Measure the resistance between:<table><tr><td>(+) CHT Sensor Connector, Component Side</td><td>(-) CHT Sensor Connector, Component Side</td></tr><tr><td>CHT</td><td>SIGRTN</td></tr></table> - Note: Refer to the chart at the beginning of this test for resistance specifications. - Is the resistance within specification?			(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side	CHT	SIGRTN	
(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side						
CHT	SIGRTN						
DL11	CHECK THE SIGNAL AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS	Yes GO to DL12. No REPAIR the open circuit.					
- PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) CHT Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>CHT</td><td>CHT</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> - Are the resistances less than 5 ohms?			(+) CHT Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	CHT	CHT	SIGRTN
(+) CHT Sensor Connector, Harness Side	(-) PCM Connector, Harness Side						
CHT	CHT						
SIGRTN	SIGRTN						

DL7-DL11

Cylinder Head Temperature (CHT) Sensor

DL

Test Step		Results / Action to Take								
DL12	CHECK THE SENSOR SIGNAL FOR A SHORT TO VREF - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>CHT</td><td>VREF</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	CHT	VREF	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit to VREF.				
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
CHT	VREF									
DL13	CHECK THE SENSOR SIGNAL FOR A SHORT TO GROUND - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>CHT</td><td>SIGRTN</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) 12 Volt Vehicle Bat- tery</td></tr><tr><td>CHT</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	CHT	SIGRTN	(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Bat- tery	CHT	Negative terminal	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
CHT	SIGRTN									
(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Bat- tery									
CHT	Negative terminal									
DL14	DTCS P0117, P0118, P0119, P1117, P1289, P1290 OR P128A: INTERMITTENT CHECK - Key in ON position. - Access the PCM and monitor the CHT V PID. - While observing the PID, carry out the following: - Tap on the sensor to simulate road shock. - Wiggle the sensor connector. - Is there a large change in the voltage reading?	Yes DISCONNECT and INSPECT the connector. If OK, INSTALL a new CHT sensor. No GO to DL15.								
DL15	CHECK THE ELECTRONIC ENGINE CONTROL (EC) WIRING HARNESS - Access the PCM and monitor the CHT V PID. - While observing the PID, carry out the following: - Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM. - Is there a large change in the voltage reading?	Yes ISOLATE the fault. Repair as necessary. No GO to DL16.								

DL12-DL15

Cylinder Head Temperature (CHT) Sensor

DL

Test Step		Results / Action to Take
DL16	CHECK THE PCM AND VEHICLE HARNESS CONNECTORS - PCM connector disconnected. - CHT Sensor connector disconnected. Are the connectors and terminals OK?	Yes The fault is not present at this time. DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No REPAIR as necessary.
DL17	SELF-TEST DTC P1285: EARLY WARNING OF ENGINE OVERHEAT CONDITION  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. - An engine overheat condition was sensed by the CHT sensor. - Check the cooling system for: - Correct coolant level. - Internal or external coolant leaks. - Blockage of the radiator. - Cooling fan operation. Note: If the electric cooling fan does not operate, return to Symptom Charts for electric cooling fan DTC or symptom diagnosis. Is the cooling system OK?	Yes Check: CHT sensor GO to DL18 . No REFER to Cooling System. Repair as necessary.
DL18	CHECK THE OPERATION OF THE CYLINDER HEAD TEMPERATURE SENSOR - Run the engine until the engine temperature stabilizes. - Verify the upper radiator hose is hot and the cooling system is pressurized. - Check for self-test DTCs: Is DTC P1285 present?	Yes GO to DL19 . No Engine overheat temperature was not detected. REPAIR any other DTCs as necessary.

Cylinder Head Temperature (CHT) Sensor

DL

Test Step		Results / Action to Take				
DL19	CHECK THE RESISTANCE OF THE CHT SENSOR - Vehicle must be at normal operating temperature. - Key in OFF position. - CHT Sensor connector disconnected. - Measure the resistance between:<table><tr><td>(+) CHT Sensor Con- nector, Component Side</td><td>(-) CHT Sensor Con- nector, Component Side</td></tr><tr><td>CHT</td><td>SIGRTN</td></tr></table> - Refer to the chart at the beginning of this test for resistance specifications. - Is the resistance within specification?	(+) CHT Sensor Con- nector, Component Side	(-) CHT Sensor Con- nector, Component Side	CHT	SIGRTN	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new CHT sensor.
(+) CHT Sensor Con- nector, Component Side	(-) CHT Sensor Con- nector, Component Side					
CHT	SIGRTN					
DL20	SELF-TEST DTC P1299: INDICATES AN ENGINE OVERHEAT CONDITION  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: Refer to Diagnostic Trouble Code (DTC) Description for possible causes and additional DTC description information. - Check the engine coolant level. - Is the engine coolant fill level correct?	Yes REFER to Cooling System to diagnose the overheating condition. No REFER to Cooling System to diagnose the loss of coolant.				
DL21	SELF-TEST DTCS P0125 OR P0128: CHECK THE 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 loosened slightly. - Diagnostic Trouble Code (DTC) indicates the engine coolant temperature has not achieved the required engine operation temperature level, since start-up within a specified amount of time. - Possible causes: — Insufficient warm up time. — Leaking or stuck-open thermostat. — Low engine coolant. - Check the engine coolant level. - Is the engine coolant fill level correct?	Yes GO to DL22. No REFER to Cooling System to diagnose the loss of coolant.				

Cylinder Head Temperature (CHT) Sensor

DL

Test Step		Results / Action to Take				
DL22	CHECK SENSOR OPERATION - Run the engine until the engine temperature stabilizes. - Verify the upper radiator hose is hot and the cooling system is pressurized. - Access the PCM and monitor the CHT PID. - Is the temperature greater than 77°C (170.6°F)?	Yes Test complete. No REFER to Cooling System.				
DL23	DTC P0116: CHECK THE RESISTANCE OF THE CHT SENSOR WITH THE ENGINE OFF Note: Verify the 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) Charts and Descriptions, for information concerning P0116. - Key in OFF position. - CHT Sensor connector disconnected. - Measure the resistance between: <table><tr><td>(+) CHT Sensor Connector, Component Side</td><td>(-) CHT Sensor Connector, Component Side</td></tr><tr><td>CHT</td><td>SIGRTN</td></tr></table> - Refer to the chart at the beginning of this test for resistance specifications. - Is the resistance within specification?	(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side	CHT	SIGRTN	Yes CONNECT the CHT GO to DL24. No INSTALL a new CHT sensor.
(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side					
CHT	SIGRTN					
DL24	DTC P0116: CHECK THE RESISTANCE OF THE CHT SENSOR - Run the engine until the engine temperature stabilizes. - Key in OFF position. Note: Verify the engine is at operating temperature before taking the CHT reading. - CHT Sensor connector disconnected. - Measure the resistance between: <table><tr><td>(+) CHT Sensor Connector, Component Side</td><td>(-) CHT Sensor Connector, Component Side</td></tr><tr><td>CHT</td><td>SIGRTN</td></tr></table> - Refer to the chart at the beginning of this test for resistance specifications. - Is the resistance within specification?	(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side	CHT	SIGRTN	Yes The fault is not present at this time CARRY OUT the OBD drive cycle to determine if fuel, HO2S, catalyst and misfire monitors can be executed. REFER to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle Retest if necessary. No INSTALL a new CHT sensor.
(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side					
CHT	SIGRTN					

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

Test Step		Results / Action to Take
DL25	DTC P0298: ENGINE OIL OVER TEMPERATURE CONDITION	Yes ISOLATE the fault. REPAIR as necessary. No GO to DL26.
	Note: Engine oil temperature protection strategy in the PCM has been activated. This protects the engine against mechanical damage due to overheating. Refer to Diagnostic Trouble Code (DTC) Charts and Descriptions for possible causes and additional DTC description information. • Check for an overheating condition and base engine concerns. • Are there any overheating or base engine concerns?	
DL26	CHECK FOR CHT DTCS	Yes DISREGARD the engine oil temperature (EOT) diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to DL27.
	• Check for self-test DTCS: • Are DTCS P1285, P1288, P1289 or P1299 present?	
DL27	ROAD TEST THE VEHICLE AND MONITOR FOR ENGINE OVER TEMPERATURE	Yes REFER to Cooling System. REPAIR as necessary No Unable to duplicate or identify the fault at this time.
	• Access the Freeze Frame Data (if available) and record the DTC malfunction conditions. • Access the PCM and monitor the CHT V PID. • Test drive the vehicle and allow the engine to reach normal operating temperature. • Observe CHT PID. • Does the engine overheat?	
DL28	ENGINE TEMPERATURE WARNING INDICATOR LAMP ON OR TEMPERATURE GAUGE INDICATES HOT, BUT ENGINE IS NOT OVERHEATING	Yes No DTCS present GO to DL29. No Concern is elsewhere. RETURN to Symptom Charts for further direction.
	Note: PCM Self-Test must be carried out prior to entering this Pinpoint Test. • Was PCM Self-Test carried out prior to entering this Pinpoint Test?	

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

Test Step		Results / Action to Take
DL29	ENGINE TEMPERATURE INDICATOR LAMP ON OR TEMPERATURE GAUGE INDICATES HOT, WITH NO DTCS	
Note: 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 mode is needed, the PCM can signal the driver in 2 ways: • Temperature Warning Indicator information received through the vehicle Communication Link (SCP or CAN): The PCM sends a SCP or CAN 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 the H (hot) zone. DTC P1285 will also be stored in the PCM. • Temperature Warning Indicator hard wired to the PCM: The 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 the H (hot) zone. DTC P1285 will also be stored in the PCM. • This pinpoint test ONLY diagnoses the PCM hardware systems with no PCM DTCs. Currently only the 2.3L Ranger, Crown Victoria, and Grand Marquis use the hardwire system. • For any other type of Engine Temperature Warning Indicator system problems, refer to Instrument Panel, Gauges and Warning Indicators. • Possible causes: — Damaged engine coolant temperature sensor. — Instrument cluster concern. — Wiring harness fault between PCM and Instrument Cluster. — Damaged PCM. • PCM connector disconnected. • Key in ON position. • Does the engine temperature warning indicator lamp turn OFF (prove out) and/or the temperature gauge return to the normal zone with the PCM disconnected?		Yes Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No PCM has not attempted to set the Warning Indicators. REFER to Instrument Cluster to diagnose the temperature gauge.

DL29

Test DM: Manifold Absolute Pressure (MAP) Sensor
PINPOINT TEST DM: MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

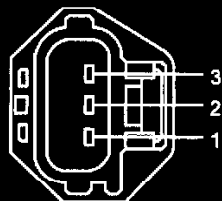
Manifold Absolute Pressure (MAP) Sensor

DM

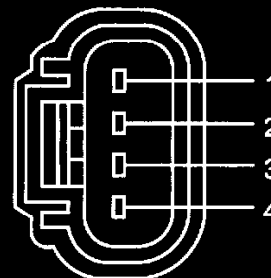
This pinpoint test is intended to diagnose the following:

- Manifold Absolute Pressure (MAP) Sensor (9F479).
- Harness Circuits: MAP, SIGRTN, VREF.
- Powertrain control module (PCM) (12A650).

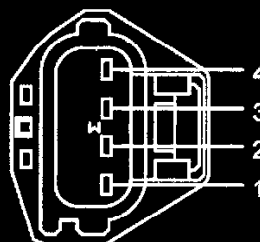
Manifold Absolute Pressure (MAP) Sensor Connector

A

A0077537

B

A0077580

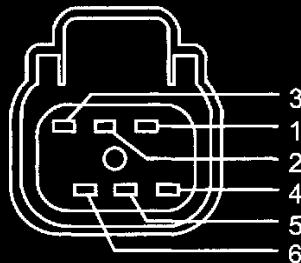
C

A0077519

Note, Connector

**Manifold Absolute Pressure (MAP)
Sensor****DM**

Vehicle	Connector	Circuit	Pin
Escape 3.0L	A	MAP SIGRTN VREF	2 3 1
Ford GT	B	MAP SIGRTN VREF	1 4 2
Ranger	C	MAP SIGRTN VREF	4 1 3
All other vehicles	C	MAP SIGRTN VREF	1 4 2

EGR System Module (ESM) Connector

A0C77577

Circuit	Pin
VPWR (Power Supply)	4
MAP (Manifold Absolute Pressure)	3
SIGRTN (Signal return)	6
VREF (Reference Voltage)	2

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Manifold Absolute Pressure (MAP) Sensor

DM

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	SIGRTN MAP	E17 E59
E-Series, F-Super Duty	170 Pin	SIGRTN MAP	E58 E62
Focus 2.0L	150 (50-50-50) Pin	SIGRTN MAP	E41 E32
Freestar/Monterey	104 Pin	SIGRTN MAP	91 9
Ford GT	104 Pin	SIGRTN MAP	91 10
LS, Thunderbird	150 (60-32-58) Pin	SIGRTN MAP	E17 E23
Mustang	170 Pin	SIGRTN MAP	E33 E62
Ranger	104 Pin	SIGRTN MAP	91 63
All other vehicles	150 (50-50-50) Pin	SIGRTN MAP	E41 E23

Test Step		Results / Action to Take
DM1	MONITOR THE MAP_V PID	Yes VERIFY the PCM is at the latest calibration level. REPROGRAM if necessary. Otherwise, the fault is not present at this time. No Key in OFF position. GO to DM2 .
	• Key on engine running. • Carry out KOER self-test. • Access the PCM and monitor the MAP_V PID. • Is the voltage between 0.05 V - 4.95 V?	
DM2	VERIFY HARNESS AND CONNECTOR INTEGRITY	Yes REPAIR as necessary. No GO to DM3 .
	• ESM connector disconnected. • Carry out 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?	
DM3	MONITOR THE MAP_V PID	Yes The fault is not present at this time No GO to DM4 .
	• Key in ON position. • Access the PCM and monitor the MAP_V PID. • Is the voltage between 0.05 V - 4.95 V?	

Chart, DM1-DM3

Manifold Absolute Pressure (MAP) Sensor

DM

Test Step		Results / Action to Take								
DM4	DETERMINE THE PRESENT MAP_V PID VOLTAGE - Access the PCM and monitor the MAP_V PID. - Is the voltage less than 0.05 V?	Yes GO to DM5 . No GO to DM8 .								
DM5	KOEO AND KOER DTC P0107: CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN AT THE ESM SENSOR - ESM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) ESM Connector, Harness Side</td><td>(-) ESM Connector, Harness Side</td></tr><tr><td>VREF - Pin 2</td><td>SIGRTN - Pin 6</td></tr></table> - Is the voltage between 4 V - 5.5 V?	(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side	VREF - Pin 2	SIGRTN - Pin 6	Yes Key in OFF position. GO to DM6 . No Key in OFF position. GO to C1 .				
(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side									
VREF - Pin 2	SIGRTN - Pin 6									
DM6	CHECK THE MAP CIRCUIT FOR A SHORT TO SIGRTN AND GND IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) ESM Connector, Harness Side</td><td>(-)</td></tr><tr><td>MAP - Pin 3</td><td>Ground</td></tr></table> - Measure the resistance between:<table><tr><td>(+) ESM Connector, Harness Side</td><td>(-) ESM Connector, Harness Side</td></tr><tr><td>MAP - Pin 3</td><td>SIGRTN - Pin 6</td></tr></table> - Is the resistance greater than 10K ohms?	(+) ESM Connector, Harness Side	(-)	MAP - Pin 3	Ground	(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side	MAP - Pin 3	SIGRTN - Pin 6	Yes GO to DM7 . No REPAIR the short circuit.
(+) ESM Connector, Harness Side	(-)									
MAP - Pin 3	Ground									
(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side									
MAP - Pin 3	SIGRTN - Pin 6									
DM7	INDUCE THE OPPOSITE MAP SENSOR VOLTAGE TO SIMULATE HIGH CONDITION - PCM connector connected. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A ESM Connector, Harness Side</td><td>Point B ESM Connector, Harness Side</td></tr><tr><td>MAP - Pin 3</td><td>VREF - Pin 2</td></tr></table> - Key in ON position. - Access the PCM and monitor the MAP_V PID. - Is the voltage greater than 4.6 V?	Point A ESM Connector, Harness Side	Point B ESM Connector, Harness Side	MAP - Pin 3	VREF - Pin 2	Yes Key in OFF position. INSTALL a new ESM. CLEAR the DTCs and REPEAT the self-test. No Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).				
Point A ESM Connector, Harness Side	Point B ESM Connector, Harness Side									
MAP - Pin 3	VREF - Pin 2									

Manifold Absolute Pressure (MAP) Sensor

DM

Test Step		Results / Action to Take						
DM8	KOEO AND KOER DTC P0108: CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN AT THE ESM SENSOR - ESM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) ESM Connector, Harness Side</td><td>(-) ESM Connector, Harness Side</td></tr><tr><td>VREF - Pin 2</td><td>SIGRTN - Pin 6</td></tr></table> - Is the voltage between 4 V - 5.5 V?	(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side	VREF - Pin 2	SIGRTN - Pin 6	Yes Key in OFF position. GO to DM9 . No Key in OFF position. GO to C1 .		
(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side							
VREF - Pin 2	SIGRTN - Pin 6							
DM9	CHECK THE MAP AND SIGRTN CIRCUIT(S) FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) ESM Connector, Harness Side</td></tr><tr><td>MAP</td><td>MAP - Pin 3</td></tr><tr><td>SIGRTN</td><td>SIGRTN - Pin 6</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) ESM Connector, Harness Side	MAP	MAP - Pin 3	SIGRTN	SIGRTN - Pin 6	Yes GO to DM10 . No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) ESM Connector, Harness Side							
MAP	MAP - Pin 3							
SIGRTN	SIGRTN - Pin 6							
DM10	CHECK THE MAP CIRCUIT FOR A SHORT TO VREF IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) ESM Connector, Harness Side</td><td>(-) ESM Connector, Harness Side</td></tr><tr><td>MAP - Pin 3</td><td>VREF - Pin 2</td></tr></table> - Is the resistance greater than 10K ohms?	(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side	MAP - Pin 3	VREF - Pin 2	Yes GO to DM11 . No REPAIR the short circuit.		
(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side							
MAP - Pin 3	VREF - Pin 2							
DM11	CHECK THE MAP CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) ESM Connector, Harness Side</td><td>(-) ESM Connector, Harness Side</td></tr><tr><td>MAP - Pin 3</td><td>VPWR - Pin 4</td></tr></table> - Is the resistance greater than 10K ohms?	(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side	MAP - Pin 3	VPWR - Pin 4	Yes GO to DM12 . No REPAIR the short circuit.		
(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side							
MAP - Pin 3	VPWR - Pin 4							

Manifold Absolute Pressure (MAP) Sensor

DM

Test Step		Results / Action to Take										
DM12	INDUCE THE OPPOSITE MAP SENSOR VOLTAGE TO SIMULATE LOW CONDITION - PCM connector connected. - Connect a 5 amp fused jumper wire between the following:<table><tr><th>Point A ESM Connector, Harness Side</th><th>Point B ESM Connector, Harness Side</th></tr><tr><td>MAP - Pin 3</td><td>SIGRTN - Pin 6</td></tr></table> - Key in ON position. - Access the PCM and monitor the MAP_V PID. - Is the voltage less than 0.1 V?	Point A ESM Connector, Harness Side	Point B ESM Connector, Harness Side	MAP - Pin 3	SIGRTN - Pin 6	Yes Key in OFF position. INSTALL a new ESM. CLEAR the DTCs and REPEAT the self-test. No Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).						
Point A ESM Connector, Harness Side	Point B ESM Connector, Harness Side											
MAP - Pin 3	SIGRTN - Pin 6											
DM13	DTCS P0107, P0108 AND P0109: CHECK THE MAP CIRCUIT(S) FOR INTERMITTENT CONCERNS - Key in ON position. - Access the PCM and monitor the MAP_V PID. - Carry out a thorough wiggle test on the ESM harness. Lightly tap on the ESM to simulate road shock. - Does a sudden change in voltage occur while monitoring the PID.	Yes ISOLATE the fault. REPAIR as necessary. No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1.										
DM14	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 in OFF position. - ESM connector disconnected. - Connect a 5 amp fused jumper wire between the following:<table><tr><th>Point A ESM Connector, Harness Side</th><th>Point B ESM Connector, Component Side</th></tr><tr><td>VREF - Pin 2</td><td>VREF - Pin 2</td></tr><tr><td>SIGRTN - Pin 6</td><td>SIGRTN - Pin 6</td></tr></table> - Key on engine running. - Measure the voltage between:<table><tr><th>(+) ESM Connector, Component Side</th><th>(-) Vehicle Battery</th></tr><tr><td>MAP - Pin 3</td><td>Negative terminal</td></tr></table> - Is the voltage between 1 V - 2 V?	Point A ESM Connector, Harness Side	Point B ESM Connector, Component Side	VREF - Pin 2	VREF - Pin 2	SIGRTN - Pin 6	SIGRTN - Pin 6	(+) ESM Connector, Component Side	(-) Vehicle Battery	MAP - Pin 3	Negative terminal	Yes Record the actual MAP voltage values at KOEO, idle, 1,000 and 2,000 RPM. You will use the values for comparison in the following test step. GO to DM15. No Key in OFF position. CHECK the MAP circuit in ESM harness for open and short circuits.
Point A ESM Connector, Harness Side	Point B ESM Connector, Component Side											
VREF - Pin 2	VREF - Pin 2											
SIGRTN - Pin 6	SIGRTN - Pin 6											
(+) ESM Connector, Component Side	(-) Vehicle Battery											
MAP - Pin 3	Negative terminal											

Manifold Absolute Pressure (MAP) Sensor

DM

Test Step		Results / Action to Take			
DM15	COMPARE ACTUAL MAP VOLTAGE TO MAP_V PID VOLTAGE	Yes The fault is not present at this time. CLEAR the DTCs and REPEAT the self-test. No INSTALL a new ESM. CLEAR the DTCs and REPEAT the self-test.			
• Key in ON position. • Access the PCM and monitor the MAP_V PID. • Note the MAP_V PID voltage. • Key on engine running. • Note the MAP_V PID voltage. • Increase engine speed to 1,000 RPM. Note the MAP_V PID voltage. • Increase engine speed to 2,000 RPM. Note the MAP_V PID voltage. • Does the MAP_V PID voltage stay within 0.5 volt of the actual MAP voltage?					
DM16	KOEO AND KOER DTCS P0106, P0107 AND P0108: CHECK THE VOLTAGE BETWEEN VREF AND SIGRTN AT THE MAP SENSOR	Yes GO to DM18. No GO to DM17.			
• MAP Sensor connector disconnected. • Key in ON position. • Measure the voltage between: <table><tr><td>(+) MAP Sensor Connector, Harness Side</td><td>(-) MAP Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> • Is the voltage between 4.5 V - 5.5 V?			(+) MAP Sensor Connector, Harness Side	(-) MAP Sensor Connector, Harness Side	VREF
(+) MAP Sensor Connector, Harness Side	(-) MAP Sensor Connector, Harness Side				
VREF	SIGRTN				
DM17	CHECK FOR VREF VOLTAGE AT SENSOR	Yes Key in OFF position. REPAIR open SIGRTN circuit. No Key in OFF position. GO to C1.			
• Measure the voltage between: <table><tr><td>(+) MAP Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VREF</td><td>Negative terminal</td></tr></table> • Is the voltage between 4.5 V - 5.5 V?			(+) MAP Sensor Connector, Harness Side	(-) Vehicle Battery	VREF
(+) MAP Sensor Connector, Harness Side	(-) Vehicle Battery				
VREF	Negative terminal				
DM18	CHECK MAP SIGNAL VOLTAGE AT SENSOR	Yes GO to DM19. No Key in OFF position. GO to DM20.			
• Measure the voltage between: <table><tr><td>(+) MAP Sensor Connector, Harness Side</td><td>(-) MAP Sensor Connector, Harness Side</td></tr><tr><td>MAP</td><td>SIGRTN</td></tr></table> • Is the voltage between 4.5 V - 5.5 V?			(+) MAP Sensor Connector, Harness Side	(-) MAP Sensor Connector, Harness Side	MAP
(+) MAP Sensor Connector, Harness Side	(-) MAP Sensor Connector, Harness Side				
MAP	SIGRTN				

Manifold Absolute Pressure (MAP) Sensor

DM

Test Step		Results / Action to Take						
DM19	INDUCE OPPOSITE SIGNAL - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A MAP Sensor Connector, Harness Side</td><td>Point B MAP Sensor Connector, Harness Side</td></tr><tr><td>MAP</td><td>SIGRTN</td></tr></table> - Access the PCM and monitor the MAP_V PID. - Is the voltage less than 0.1 V?	Point A MAP Sensor Connector, Harness Side	Point B MAP Sensor Connector, Harness Side	MAP	SIGRTN	Yes INSTALL a new MAP sensor. CLEAR the DTCs and REPEAT the self-test. No Key in OFF position. GO to DM21 .		
Point A MAP Sensor Connector, Harness Side	Point B MAP Sensor Connector, Harness Side							
MAP	SIGRTN							
DM20	CHECK THE MAP CIRCUIT(S) FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) MAP Sensor Connector, Harness Side</td><td>(-) MAP Sensor Connector, Harness Side</td></tr><tr><td>MAP</td><td>MAP</td></tr></table> - Is the resistance less than 5 ohms?	(+) MAP Sensor Connector, Harness Side	(-) MAP Sensor Connector, Harness Side	MAP	MAP	Yes GO to DM21 . No REPAIR the open circuit.		
(+) MAP Sensor Connector, Harness Side	(-) MAP Sensor Connector, Harness Side							
MAP	MAP							
DM21	CHECK THE MAP CIRCUIT FOR A SHORT TO VREF OR SIGRTN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) MAP Sensor Connector, Harness Side</td><td>(-) MAP Sensor Connector, Harness Side</td></tr><tr><td>MAP</td><td>VREF</td></tr><tr><td>MAP</td><td>SIGRTN</td></tr></table> - Are the resistances greater than 10K ohms?	(+) MAP Sensor Connector, Harness Side	(-) MAP Sensor Connector, Harness Side	MAP	VREF	MAP	SIGRTN	Yes Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) MAP Sensor Connector, Harness Side	(-) MAP Sensor Connector, Harness Side							
MAP	VREF							
MAP	SIGRTN							
DM22	DTCS P0107, P0108 AND P0109: CHECK THE MAP CIRCUIT(S) FOR INTERMITTENT CONCERNS - Key in ON position. - Access the PCM and monitor the MAP_V PID. - Carry out a thorough wiggle test on the MAP harness. Lightly tap on the MAP to simulate road shock. - Did a sudden change in voltage occur while monitoring the PID?	Yes GO to DM16 . No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1 .						

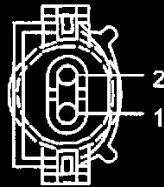
DM19-DM22

Test DP: Vehicle Speed Sensor (VSS)/Transfer Case Speed Sensor (TCSS)
PINPOINT TEST DP: VEHICLE SPEED SENSOR (VSS)/TRANSFER CASE SPEED SENSOR (TCSS)

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

This pinpoint test is intended to diagnose the following:

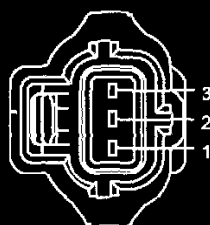
- VSS/(TCSS (7F293).
- Harness circuits: VSS, TCSS, and SIGRTN.
- Powertrain control module (PCM) (12A650).

Transfer Case Speed Sensor (TCSS) Connector

A0077536

Circuit	Pin
TCSS (Transfer Case Speed Sensor)	2
SIGRTN (Signal return)	1

Note, Connector

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

A0077554

B

A0077536

Vehicle	Connector	Circuit	Pin
Focus	A	VSS PWRGND VPWR	2 1 3
Ford GT, Mustang	B	VSS-GND VSS	2 1
All other vehicles	B	VSS-GND VSS	1 2

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
F-150 4.6L, F-150 5.4L	190 Pin	VPWR TCSS PWRGND SIGRTN	B51 T16 B67, B68, B69, B70 E58, T43
F-150 4.2L	190 Pin	VPWR PWRGND SIGRTN VSS	B51 B67, B68, B69, B70 E58, T43 T14

(Continued)

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

DP

Vehicle	Connector	Circuit	Pin
Ford GT	104 Pin	VPWR PWRGND SIGRTN VSS	71 103, 3, 51, 76 91 84
Mustang	170 Pin	VPWR PWRGND SIGRTN VSS	B35 B47, B48, B49, B50 E33, T41 T3
Ranger	104 Pin	VPWR PWRGND SIGRTN VSS	71 103, 24, 51, 76, 77 91 84
All other vehicles	150 (50-50-50) Pin	VPWR PWRGND SIGRTN VSS	B35 B47, B48, B49 E41, T41 T3

Test Step		Results / Action to Take			
DP1	DTCS P0500, P0501 AND P1502: VERIFY DRIVE CYCLE	Yes VSS performed as expected. GO to DP2. No Key in OFF position. GO to DP3.			
	- Access the PCM and monitor the VSS PID. - Drive the vehicle. - Monitor the PID in all transmission gear ranges while increasing and decreasing the speed. - Does the PID reading increase and decrease with engine and vehicle speed?				
DP2	VISUAL INSPECTION	Yes REPAIR as necessary No GO to Z1.			
	- VSS connector disconnected. - Inspect the VSS harness for damage. Inspect the VSS vehicle harness connector for damage and proper seating. - If possible, carry out a wiggle test. - Is a concern present?				
DP3	VERIFY THE TYPE OF VSS SENSOR	Yes GO to DP4. No GO to DP6.			
	Note: VR (variable reluctance) sensors have 2-wire connectors, Hall-effect sensors have 3-wire connectors. - Inspect for a Hall-effect or a VR type of VSS sensor. - Is this a Hall-effect type VSS sensor?				
DP4	CHECK VPWR TO THE VSS SENSOR	Yes Key in OFF position. GO to DP5. No Key in OFF position. REPAIR the open circuit.			
	- VSS connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) VSS Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VPWR</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 10.5 V?		(+) VSS Connector, Harness Side	(-) Vehicle Battery	VPWR
(+) VSS Connector, Harness Side	(-) Vehicle Battery				
VPWR	Negative terminal				

Chart, DP1-DP4

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

DP

Test Step		Results / Action to Take										
DP5	CHECK THE VPWR GROUND TO THE VSS SENSOR - Measure the resistance between:<table><tr><td>(+) VSS Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>PWRGND</td><td>Negative terminal</td></tr></table> - Is the resistance less than 5 ohms?	(+) VSS Connector, Harness Side	(-) Vehicle Battery	PWRGND	Negative terminal	Yes GO to DP6. No REPAIR the open circuit.						
(+) VSS Connector, Harness Side	(-) Vehicle Battery											
PWRGND	Negative terminal											
DP6	CHECK THE VSS CIRCUIT FOR A SHORT TO VREF AND VPWR IN THE HARNESS - Key in ON position. - VSS connector disconnected. - Measure the voltage between:<table><tr><td>(+) VSS Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VSS</td><td>Negative terminal</td></tr></table> - Is the voltage less than 1 V?	(+) VSS Connector, Harness Side	(-) Vehicle Battery	VSS	Negative terminal	Yes Key in OFF position. GO to DP7. No Key in OFF position. REPAIR the short circuit.						
(+) VSS Connector, Harness Side	(-) Vehicle Battery											
VSS	Negative terminal											
DP7	CHECK THE VSS CIRCUIT(S) FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - VSS connector disconnected. Note: Hall-effect sensors are not equipped with a SIGRTN circuit. Disregard SIGRTN measurement. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) VSS Connector, Harness Side</td></tr><tr><td>VSS</td><td>VSS</td></tr><tr><td>SIGRTN</td><td>PWRGND</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) VSS Connector, Harness Side	VSS	VSS	SIGRTN	PWRGND	Yes GO to DP8. No REPAIR the open circuit.				
(+) PCM Connector, Harness Side	(-) VSS Connector, Harness Side											
VSS	VSS											
SIGRTN	PWRGND											
DP8	CHECK THE VSS CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) VSS Connector, Harness Side</td><td>(-) VSS Connector, Harness Side</td></tr><tr><td>VSS</td><td>PWRGND</td></tr><tr><td>VSS</td><td>VSS-GND</td></tr></table> - Measure the resistance between:<table><tr><td>(+) VSS Connector, Harness Side</td><td>(-)</td></tr><tr><td>VSS</td><td>Ground</td></tr></table> - Are the resistances greater than 10,000 Ohms?	(+) VSS Connector, Harness Side	(-) VSS Connector, Harness Side	VSS	PWRGND	VSS	VSS-GND	(+) VSS Connector, Harness Side	(-)	VSS	Ground	Yes For Hall Effect GO to DP9. For VR (Variable Reluctance) GO to DP10. No REPAIR the short circuit.
(+) VSS Connector, Harness Side	(-) VSS Connector, Harness Side											
VSS	PWRGND											
VSS	VSS-GND											
(+) VSS Connector, Harness Side	(-)											
VSS	Ground											

DP5-DP8

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

DP

Test Step		Results / Action to Take				
DP9	CHECK THE VSS SIGNAL OUTPUT TO THE PCM, HALL-EFFECT TYPE SENSOR - PCM connector disconnected. - Raise the vehicle to allow for the rotation of the front drive wheels. - Key in ON position. - Transmission in NEUTRAL. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VSS</td><td>PWRGND</td></tr></table> - Note: The opposite wheel must be held stationary. - The voltage should rise above 5 volts and fall below 1 volt in a regular cycle. Observe several cycles. - Does the VSS output voltage rise and fall as specified?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	VSS	PWRGND	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REMOVE the VSS sensor and inspect the target wheel. REPAIR as necessary. If OK, INSTALL a new VSS sensor.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side					
VSS	PWRGND					
DP10	CHECK THE RESISTANCE OF THE VSS SENSOR - Measure the resistance between:<table><tr><td>(+) VSS Connector, Component Side</td><td>(-) VSS Connector, Component Side</td></tr><tr><td>VSS</td><td>VSS-GND</td></tr></table> - Is the resistance between 170 ohms - 270 ohms?	(+) VSS Connector, Component Side	(-) VSS Connector, Component Side	VSS	VSS-GND	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REMOVE the VSS sensor and inspect the target wheel. REPAIR as necessary. If OK, INSTALL a new VSS sensor.
(+) VSS Connector, Component Side	(-) VSS Connector, Component Side					
VSS	VSS-GND					
DP11	KOER DTC P1501: CHECK THE VSS PID FOR AN INPUT SIGNAL - Key on engine running. - Access the PCM and monitor the VSS PID. - Observe the VSS input to the PCM. - Increase the engine speed, not greater than 2,000 RPM, several times while observing the VSS PID. - Is the reading on the PID less than 5 km/h (3 mph)?	Yes Unable to duplicate or identify the fault at this time. REFER to Diagnostic Trouble Code (DTC) Description for possible causes and additional DTC description information. If DTC P1501 still exists GO to Z1. No GO to DP14.				

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

DP

Test Step		Results / Action to Take
DP12	DTCS P0503 AND P1500: INSPECT THE VSS AND THE CIRCUIT FOR AN INTERMITTENT	Yes REPAIR as necessary. No GO to DP13.
- Visually inspect the VSS and harness circuits for any potential failures. - Use the following check list for reference: - Loose wires/connectors. - Pushed out connector pins. - Damaged wiring harness insulation. - Incorrect harness routing. - Incorrect VSS mounting. Is a concern present?		
DP13	CHECK THE PCM VSS PID FOR AN INPUT SIGNAL	Yes GO to DP14. No Unable to duplicate or identify the fault at this time. REPAIR any other DTCs. Concern is elsewhere. RETURN to Symptom Charts for further direction.
- Access the PCM and monitor the VSS PID. - Drive the vehicle at several steady state speeds above and below 50 km/h (30 mph). - Note: For diagnostic tools which have a data record feature, record the data for future playback to help identify any variations. During each steady state speed observe the VSS PID for variations of (+) or (-) 8 km/h (5 mph) for greater than 10 seconds. Are there any indicators of a noisy or intermittent signal with the VSS PID?		
DP14	CHECK THE VSS HARNESS ROUTING	Yes REPAIR as necessary. No Unable to duplicate or identify the fault at this time. REFER to Diagnostic Trouble Code (DTC) Description for possible causes and additional DTC description information. GO to Z1.
- Check the VSS harness routing. Verify the harness is not routed adjacent to any high current wires such as ignition wires or generator wiring. Verify the VSS harness is shielded and grounded, if applicable. Measure the resistance of the VSS harness. Refer to Pinpoint Test Schematic and Connectors at the beginning of this pinpoint test. Is a concern present?		
DP15	DTCS P0500 AND P1502: VISUAL INSPECTION OF TCSS	Yes REPAIR as necessary. No GO to DP16.
- Note: The TCSS provides the rotational speed of the output shaft of the transfer case. - The PCM uses this information to control the powertrain behavior and on some applications it is used as the source for the vehicle speed information. - TCSS connector disconnected. - Inspect the TCSS vehicle harness connector for damage and proper seating. Is a concern present?		

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

DP

Test Step		Results / Action to Take						
DP16	CHECK THE RESISTANCE OF THE TCSS - Measure the resistance between:<table><tr><td>(+) TCSS Connector, Component Side</td><td>(-) TCSS Connector, Component Side</td></tr><tr><td>SIGRTN - Pin 1</td><td>TCSS - Pin 2</td></tr></table> - Is the resistance between 1K ohms - 1.25K ohms?	(+) TCSS Connector, Component Side	(-) TCSS Connector, Component Side	SIGRTN - Pin 1	TCSS - Pin 2	Yes GO to DP17. No INSTALL a new TCSS.		
(+) TCSS Connector, Component Side	(-) TCSS Connector, Component Side							
SIGRTN - Pin 1	TCSS - Pin 2							
DP17	CHECK THE TCSS SENSOR OUTPUT - Raise the vehicle. Refer to Vehicle/Application and ID, maintenance for the proper way to lift the vehicle. Put the vehicle in NEUTRAL with the parking brake off. Take safety precautions as necessary. - Measure the frequency between:<table><tr><td>(+) TCSS Connector, Component Side</td><td>(-) TCSS Connector, Component Side</td></tr><tr><td>SIGRTN - Pin 1</td><td>TCSS - Pin 2</td></tr></table> - Monitor the TCSS signal while rotating the driven wheel as fast as possible. Note: The opposite wheel must be held stationary. - Refer to Typical Diagnostic Reference Values. - Does the frequency reading increase and decrease with the wheel speed?	(+) TCSS Connector, Component Side	(-) TCSS Connector, Component Side	SIGRTN - Pin 1	TCSS - Pin 2	Yes GO to DP18. No REMOVE the TCSS and inspect the target wheel. REPAIR as necessary. If OK, INSTALL a new TCSS sensor.		
(+) TCSS Connector, Component Side	(-) TCSS Connector, Component Side							
SIGRTN - Pin 1	TCSS - Pin 2							
DP18	CHECK THE TCSS CIRCUIT(S) FOR A SHORT TO GROUND AND POWER IN THE HARNESS - Key in ON position. - TCSS connector disconnected. - Measure the voltage between:<table><tr><td>(+) TCSS Connector, Harness Side</td><td>(-)</td></tr><tr><td>TCSS - Pin 2</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) TCSS Connector, Harness Side	(-)	TCSS - Pin 2	Ground	Yes Key in OFF position. GO to DP19. No Key in OFF position. REPAIR the short circuit.		
(+) TCSS Connector, Harness Side	(-)							
TCSS - Pin 2	Ground							
DP19	CHECK THE CIRCUIT(S) FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) TCSS Connector, Harness Side</td></tr><tr><td>TCSS</td><td>TCSS - Pin 2</td></tr><tr><td>SIGRTN</td><td>SIGRTN - Pin 1</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) TCSS Connector, Harness Side	TCSS	TCSS - Pin 2	SIGRTN	SIGRTN - Pin 1	Yes GO to DP20. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) TCSS Connector, Harness Side							
TCSS	TCSS - Pin 2							
SIGRTN	SIGRTN - Pin 1							

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

Test Step		Results / Action to Take
DP20	CHECK THE HARNESS FOR A SHORT TO GROUND	
• Measure the resistance between:		
(+) TCSS Connector, Harness Side	(-) TCSS Connector, Harness Side	
SIGRTN - Pin 1	TCSS - Pin 2	
• Measure the resistance between:		
(+) TCSS Connector, Harness Side	(-)	
TCSS - Pin 2	Ground	
• Are all the resistances greater than 10,000 ohms?		

Yes
INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).

No
REPAIR the short circuit.

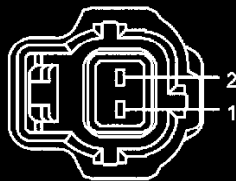
DP20

Test DR: Camshaft Position (CMP) Sensor
PINPOINT TEST DR: CAMSHAFT POSITION (CMP) SENSOR

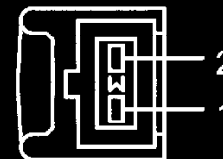
Camshaft Position (CMP) Sensor**DR**

This pinpoint test is intended to diagnose the following:

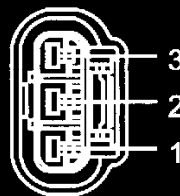
- Camshaft position (CMP) sensor (6B288).
- Harness circuits: CMP, CMP2 and SIGRTN.
- Powertrain control module (PCM) (12A650).

Camshaft Position (CMP) Sensor Connector**A**

A0077551

B

A0077522

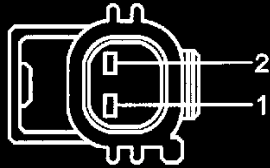
C

N0002293

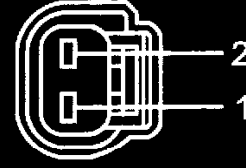
D

A0077512

Note, Connector

Camshaft Position (CMP) Sensor**DR****E****F**

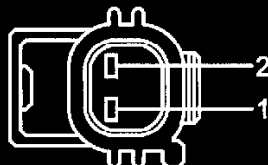
A0077524



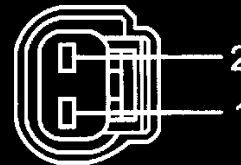
A0077505

Vehicle	Connector	Circuit	Pin
Escape, Focus, Mariner	A	SIGRTN CMP	1 2
Explorer 4.0L, Explorer SportTrac 4.0L, Mountaineer 4.0L, Mustang 4.0L, Ranger 4.0L	B	SIGRTN CMP	2 1
F-150 4.2L	C	PWRGND VPWR CMP	3 1 2
LS 3.0L	D	SIGRTN CMP	1 2
LS 3.9L, Thunderbird	E	SIGRTN CMP	1 2
All other vehicles	F	SIGRTN CMP	1 2

Connector

Camshaft Position (CMP) Sensor**DR****Camshaft Position 2 (CMP2) Sensor Connector****A**

A0077524

B

A0077505

Vehicle	Connector	Circuit	Pin
LS 3.9L, Thunderbird	A	SIGRTN CMP2	2 1
All other vehicles	B	SIGRTN CMP2	1 2

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	PWRGND SIGRTN CMP	B24 E17 E53
E-Series, F-Super Duty 6.8L	170 Pin	PWRGND SIGRTN CMP	B47 E58 E45
Excursion 5.4L, Excursion 6.8L	104 Pin	PWRGND SIGRTN CMP	3 91 85
Expedition, F-150 5.4L, Navigator	190 Pin	PWRGND CMP2 SIGRTN CMP	B67 E44 E58 E45

(Continued)

Camshaft Position (CMP) Sensor**DR**

Vehicle	Connector	Circuit	Pin
Explorer SportTrac, Freestar/Monterey, Ford GT, Ranger, Sable, Taurus	104 Pin	PWRGND SIGRTN CMP	103 91 85
F-150 4.6L, F-150 4.2L	190 Pin	PWRGND SIGRTN CMP	B67 E58 E45
F-Super Duty 5.4L	170 Pin	PWRGND CMP2 SIGRTN CMP	B47 E44 E58 E45
LS, Thunderbird	150 (60-32-58) Pin	PWRGND CMP2 SIGRTN CMP	B24 E54 E17 E53
Mustang 4.0L	170 Pin	PWRGND SIGRTN CMP	B47 E33 E45
Mustang 4.6L	170 Pin	PWRGND CMP2 SIGRTN CMP	B47 E44 E33 E45
All other vehicles	150 (50-50-50) Pin	PWRGND SIGRTN CMP	B47 E41 E25

Test Step		Results / Action to Take
DR1	CONTINUOUS MEMORY DTCS P0340 AND P0345: CHECK IF THE ENGINE WILL START	Yes GO to DR2 . No Concern is elsewhere. RETURN to Symptom Charts for further direction.
	- Attempt to start the engine. Does the engine start?	
DR2	CLEAR AND ATTEMPT TO RETRIEVE THE DTC	Yes For continuous memory DTC P0340, GO to DR3 . For continuous memory DTC P0345, GO to DR11 . No GO to Z1 .
	- Key in ON position. - Clear the PCM DTCs. - Key on engine running. - Increase engine speed to greater than 1,500 RPM for 10 seconds. - Repeat this 3 times. - Retrieve the continuous memory DTCs. Are DTCs P0340 or P0345 present?	

Chart, DR1-DR2

Camshaft Position (CMP) Sensor

DR

Test Step		Results / Action to Take																
DR3	DETERMINE THE CMP SENSOR PHYSICAL TYPE	Yes GO to DR4. No GO to DR5.																
	- Key in OFF position. - Is the CMP sensor a synchronizer (gear driven) type?																	
DR4	VERIFY THE CORRECT INSTALLATION OF THE CMP SENSOR	Yes GO to DR5. No INSTALL the CMP sensor correctly. REFER to Computers and Control Systems.																
	- 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. Note: If the vehicle has a miss with DTC P0340, ignition, alternator noise, RFI and CKP concerns should be considered. - Is the CMP sensor installed correctly?																	
DR5	DETERMINE THE CMP SENSOR ELECTRONIC TYPE	Yes Key in OFF position. GO to DR6. No The CMP sensor is a Hall-effect type. GO to DR17.																
	Note: The variable reluctance (VR) sensors have 2-wire connectors, Hall-effect sensors have 3-wire connectors. Is the CMP sensor a VR-type?																	
DR6	CONTINUOUS MEMORY DTC P0340: CHECK THE CMP SENSOR RESISTANCE	Yes GO to DR7. No INSTALL a new CMP sensor. Clear the PCM DTCs. REPEAT the self-test.																
	- CMP Sensor connector disconnected. - Measure the resistance between: <table><tr><td>(+) CMP Sensor Con- nector, Component Side</td><td>(-) CMP Sensor Con- nector, Component Side</td></tr><tr><td>CMP</td><td>SIGRTN</td></tr></table> <table><tr><td>Vehicle</td><td>Low Limit</td><td>High Limit</td></tr><tr><td>LS, Thunderbird 3.9L</td><td>1850 Ohms</td><td>2850 Ohms</td></tr><tr><td>F-150</td><td>300 Ohms</td><td>425 Ohms</td></tr><tr><td>All others</td><td>250 Ohms</td><td>1000 Ohms</td></tr></table> - Is the resistance within specification?		(+) CMP Sensor Con- nector, Component Side	(-) CMP Sensor Con- nector, Component Side	CMP	SIGRTN	Vehicle	Low Limit	High Limit	LS, Thunderbird 3.9L	1850 Ohms	2850 Ohms	F-150	300 Ohms	425 Ohms	All others	250 Ohms	1000 Ohms
(+) CMP Sensor Con- nector, Component Side	(-) CMP Sensor Con- nector, Component Side																	
CMP	SIGRTN																	
Vehicle	Low Limit	High Limit																
LS, Thunderbird 3.9L	1850 Ohms	2850 Ohms																
F-150	300 Ohms	425 Ohms																
All others	250 Ohms	1000 Ohms																

DR3-DR6

Camshaft Position (CMP) Sensor

DR

Test Step		Results / Action to Take										
DR7	CHECK THE CMP CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) CMP Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>CMP</td><td>Negative terminal</td></tr></table> - Is the voltage less than 1 V?	(+) CMP Sensor Connector, Harness Side	(-) Vehicle Battery	CMP	Negative terminal	Yes Key in OFF position. GO to DR8. No REPAIR the short circuit.						
(+) CMP Sensor Connector, Harness Side	(-) Vehicle Battery											
CMP	Negative terminal											
DR8	CHECK THE CMP CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) CMP Sensor Connector, Harness Side</td></tr><tr><td>CMP</td><td>CMP</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) CMP Sensor Connector, Harness Side	CMP	CMP	SIGRTN	SIGRTN	Yes GO to DR9. No REPAIR the open circuit.				
(+) PCM Connector, Harness Side	(-) CMP Sensor Connector, Harness Side											
CMP	CMP											
SIGRTN	SIGRTN											
DR9	CHECK FOR A SHORT IN THE HARNESS BETWEEN THE PCM AND THE CMP SENSOR - Measure the resistance between:<table><tr><td>(+) CMP Sensor Connector, Harness Side</td><td>(-) CMP Sensor Connector, Harness Side</td></tr><tr><td>CMP</td><td>SIGRTN</td></tr></table> - Measure the resistance between:<table><tr><td>(+) CMP Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>CMP</td><td>Negative terminal</td></tr><tr><td>SIGRTN</td><td>Negative terminal</td></tr></table> - The measurement can be performed at either the PCM or CMP harness connector. - Are the resistances greater than 10K ohms?	(+) CMP Sensor Connector, Harness Side	(-) CMP Sensor Connector, Harness Side	CMP	SIGRTN	(+) CMP Sensor Connector, Harness Side	(-) Vehicle Battery	CMP	Negative terminal	SIGRTN	Negative terminal	Yes GO to DR10. No REPAIR the short circuit.
(+) CMP Sensor Connector, Harness Side	(-) CMP Sensor Connector, Harness Side											
CMP	SIGRTN											
(+) CMP Sensor Connector, Harness Side	(-) Vehicle Battery											
CMP	Negative terminal											
SIGRTN	Negative terminal											
DR10	CHECK THE CMP SENSOR OUTPUT - PCM connector connected. - CMP Sensor connector disconnected. - Digital multimeter on low voltage AC scale. - Measure the voltage between:<table><tr><td>(+) CMP Sensor Connector, Component Side</td><td>(-) CMP Sensor Connector, Component Side</td></tr><tr><td>CMP</td><td>SIGRTN</td></tr></table> - Run the engine at approximately 2,500 RPM. - Is the voltage greater than 0.25 V?	(+) CMP Sensor Connector, Component Side	(-) CMP Sensor Connector, Component Side	CMP	SIGRTN	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new CMP sensor.						
(+) CMP Sensor Connector, Component Side	(-) CMP Sensor Connector, Component Side											
CMP	SIGRTN											

DR7-DR10

Camshaft Position (CMP) Sensor

DR

Test Step		Results / Action to Take																
DR11	CONTINUOUS MEMORY DTC P0345: CHECK THE CMP2 SENSOR RESISTANCE - Key in OFF position. - CMP2 Sensor connector disconnected. - Measure the resistance between:<table><tr><th>(+) CMP2 Sensor Connector, Component Side</th><th>(-) CMP2 Sensor Connector, Component Side</th></tr><tr><td>CMP2</td><td>SIGRTN</td></tr></table><table><tr><th>Vehicle</th><th>Low Limit</th><th>High Limit</th></tr><tr><td>LS, Thunderbird 3.9L</td><td>1850 Ohms</td><td>2850 Ohms</td></tr><tr><td>F-150</td><td>300 Ohms</td><td>425 Ohms</td></tr><tr><td>All others</td><td>250 Ohms</td><td>1000 Ohms</td></tr></table> - Is the resistance value(s) within specifications?	(+) CMP2 Sensor Connector, Component Side	(-) CMP2 Sensor Connector, Component Side	CMP2	SIGRTN	Vehicle	Low Limit	High Limit	LS, Thunderbird 3.9L	1850 Ohms	2850 Ohms	F-150	300 Ohms	425 Ohms	All others	250 Ohms	1000 Ohms	Yes GO to DR12 . No INSTALL a new CMP2 sensor. Clear the PCM DTCs. REPEAT the self-test.
(+) CMP2 Sensor Connector, Component Side	(-) CMP2 Sensor Connector, Component Side																	
CMP2	SIGRTN																	
Vehicle	Low Limit	High Limit																
LS, Thunderbird 3.9L	1850 Ohms	2850 Ohms																
F-150	300 Ohms	425 Ohms																
All others	250 Ohms	1000 Ohms																
DR12	CHECK THE CMP2 CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><th>(+) CMP2 Sensor Connector, Harness Side</th><th>(-) Vehicle Battery</th></tr><tr><td>CMP2</td><td>Negative terminal</td></tr></table> - Is the voltage less than 1 V?	(+) CMP2 Sensor Connector, Harness Side	(-) Vehicle Battery	CMP2	Negative terminal	Yes Key in OFF position. GO to DR13 . No REPAIR the short circuit.												
(+) CMP2 Sensor Connector, Harness Side	(-) Vehicle Battery																	
CMP2	Negative terminal																	
DR13	CHECK THE CMP2 CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) CMP2 Sensor Connector, Harness Side</th></tr><tr><td>CMP2</td><td>CMP2</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) CMP2 Sensor Connector, Harness Side	CMP2	CMP2	SIGRTN	SIGRTN	Yes GO to DR14 . No REPAIR the open circuit.										
(+) PCM Connector, Harness Side	(-) CMP2 Sensor Connector, Harness Side																	
CMP2	CMP2																	
SIGRTN	SIGRTN																	

DR11-DR13

Camshaft Position (CMP) Sensor

DR

Test Step		Results / Action to Take										
DR14	CHECK FOR A SHORT IN THE HARNESS BETWEEN THE PCM AND THE CMP2 SENSOR - Measure the resistance between:<table><tr><td>(+) CMP2 Sensor Connector, Harness Side</td><td>(-) CMP2 Sensor Connector, Harness Side</td></tr><tr><td>CMP2</td><td>SIGRTN</td></tr></table> - Measure the resistance between:<table><tr><td>(+) CMP2 Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>CMP2</td><td>Negative terminal</td></tr><tr><td>SIGRTN</td><td>Negative terminal</td></tr></table> - Are the resistances greater than 10K ohms?	(+) CMP2 Sensor Connector, Harness Side	(-) CMP2 Sensor Connector, Harness Side	CMP2	SIGRTN	(+) CMP2 Sensor Connector, Harness Side	(-) Vehicle Battery	CMP2	Negative terminal	SIGRTN	Negative terminal	Yes GO to DR15. No REPAIR the short circuit.
(+) CMP2 Sensor Connector, Harness Side	(-) CMP2 Sensor Connector, Harness Side											
CMP2	SIGRTN											
(+) CMP2 Sensor Connector, Harness Side	(-) Vehicle Battery											
CMP2	Negative terminal											
SIGRTN	Negative terminal											
DR15	CHECK FOR A SHORT BETWEEN THE CMP AND THE CMP2 CIRCUITS - CMP Sensor connector disconnected. - CMP2 Sensor connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>CMP</td><td>CMP2</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	CMP	CMP2	Yes GO to DR16. No REPAIR the short circuit.						
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side											
CMP	CMP2											
DR16	CHECK THE CMP2 SENSOR OUTPUT - PCM connector connected. - Digital multimeter on low voltage AC scale. - Measure the voltage between:<table><tr><td>(+) CMP2 Sensor Connector, Component Side</td><td>(-) CMP2 Sensor Connector, Component Side</td></tr><tr><td>CMP2</td><td>SIGRTN</td></tr></table> - Run the engine at approximately 2,500 RPM. - Is the voltage greater than 0.25 V?	(+) CMP2 Sensor Connector, Component Side	(-) CMP2 Sensor Connector, Component Side	CMP2	SIGRTN	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new CMP2 sensor.						
(+) CMP2 Sensor Connector, Component Side	(-) CMP2 Sensor Connector, Component Side											
CMP2	SIGRTN											
DR17	CONTINUOUS MEMORY DTC P0340: CHECK THE VPWR VOLTAGE TO CMP SENSOR - CMP Sensor connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) CMP Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VPWR</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 10.5 V?	(+) CMP Sensor Connector, Harness Side	(-) Vehicle Battery	VPWR	Negative terminal	Yes Key in OFF position. GO to DR18. No Key in OFF position. REPAIR the open circuit.						
(+) CMP Sensor Connector, Harness Side	(-) Vehicle Battery											
VPWR	Negative terminal											

Camshaft Position (CMP) Sensor

DR

Test Step		Results / Action to Take						
DR18	CHECK THE PWRGND VOLTAGE TO CMP SENSOR - Measure the voltage between:<table><tr><td>(+) Vehicle Battery</td><td>(-) CMP Sensor Con- nector, Harness Side</td></tr><tr><td>Positive terminal</td><td>PWRGND</td></tr></table> - Is the voltage greater than 10.5 V?	(+) Vehicle Battery	(-) CMP Sensor Con- nector, Harness Side	Positive terminal	PWRGND	Yes GO to DR19. No REPAIR the open circuit.		
(+) Vehicle Battery	(-) CMP Sensor Con- nector, Harness Side							
Positive terminal	PWRGND							
DR19	CHECK THE CMP CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) CMP Sensor Con- nector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>CMP</td><td>Negative terminal</td></tr></table> - Is the voltage less than 1 V?	(+) CMP Sensor Con- nector, Harness Side	(-) Vehicle Battery	CMP	Negative terminal	Yes Key in OFF position. GO to DR20. No REPAIR the short circuit.		
(+) CMP Sensor Con- nector, Harness Side	(-) Vehicle Battery							
CMP	Negative terminal							
DR20	CHECK FOR AN OPEN CIRCUIT BETWEEN THE PCM AND CMP SENSOR - CMP Sensor connector disconnected. - Measure the resistance between:<table><tr><td>(+) CMP Sensor Con- nector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>CMP</td><td>CMP</td></tr></table> - Is the resistance less than 5 ohms?	(+) CMP Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side	CMP	CMP	Yes GO to DR21. No REPAIR the open circuit.		
(+) CMP Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side							
CMP	CMP							
DR21	CHECK THE CMP SENSOR CIRCUIT FOR A SHORT TO GND IN THE HARNESS Note: The measurement may be taken at the PCM or CMP connector, whichever is easier to access. - Measure the resistance between:<table><tr><td>(+) CMP Sensor Con- nector, Harness Side</td><td>(-) CMP Sensor Con- nector, Harness Side</td></tr><tr><td>CMP</td><td>PWRGND</td></tr></table> - Is the resistance greater than 10K ohms?	(+) CMP Sensor Con- nector, Harness Side	(-) CMP Sensor Con- nector, Harness Side	CMP	PWRGND	Yes GO to DR22. No REPAIR the short circuit.		
(+) CMP Sensor Con- nector, Harness Side	(-) CMP Sensor Con- nector, Harness Side							
CMP	PWRGND							
DR22	CHECK FOR SHORTS IN THE PCM - Measure the resistance between:<table><tr><td>(+) CMP Sensor Con- nector, Harness Side</td><td>(-) CMP Sensor Con- nector, Harness Side</td></tr><tr><td>CMP</td><td>VPWR</td></tr><tr><td>CMP</td><td>PWRGND</td></tr></table> - Are the resistances greater than 500 ohms?	(+) CMP Sensor Con- nector, Harness Side	(-) CMP Sensor Con- nector, Harness Side	CMP	VPWR	CMP	PWRGND	Yes GO to DR23. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
(+) CMP Sensor Con- nector, Harness Side	(-) CMP Sensor Con- nector, Harness Side							
CMP	VPWR							
CMP	PWRGND							

Camshaft Position (CMP) Sensor**DR**

Test Step		Results / Action to Take			
DR23	CHECK THE CMP SENSOR OUTPUT DURING CRANK MODE				
• CMP Sensor connector connected. • Digital multimeter on low voltage DC scale. • Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>CMP</td><td>PWRGND</td></tr></table> • Crank the engine for at least 10 revolutions. • Does the voltage switch between LOW (less than 2 volts DC) and HIGH (greater than 8 volts DC)?			(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	CMP
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side				
CMP	PWRGND				
		Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new CMP sensor.			

DR23

Test DS: Air Conditioning Pressure (ACP) Sensor
PINPOINT TEST DS: AIR CONDITIONING PRESSURE (ACP) SENSOR

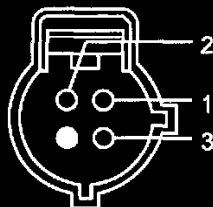
Air Conditioning Pressure (ACP) Sensor

DS

This pinpoint test is intended to diagnose the following:

- ACP sensor (19D594).
- Harness Circuits: ACP, VREF, SIGRTN.
- Powertrain control module (PCM) (12A650).

Air Conditioning Pressure (ACP) Sensor Connector



A0077539

Circuit	Pin
ACP (Air Conditioning Pressure)	3
SIGRTN (Signal return)	1
VREF (Reference Voltage)	2

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Note, Connectors

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

Vehicle	Connector	Circuit	Pin
Freestar/Monterey	104 Pin	VPWR PWRGND ACP	71 103 86
LS, Thunderbird	150 (60-32-58) Pin	VPWR PWRGND ACP	B32 B24 B42
Mustang	170 Pin	VPWR PWRGND ACP	B35 B47 B26
All other vehicles	150 (50-50-50) Pin	VPWR PWRGND ACP	B35 B47 B31

Test Step		Results / Action to Take			
DS1	DTC P0532, P1461: CHECK THE ACP V PID	Yes Key in OFF position. The ACP voltage is now below maximum. GO to DS16 . No Key in OFF position. GO to DS2 .			
	- Key in ON position. - Access the PCM and monitor the ACP V PID. Is the voltage less than 4.9 V?				
DS2	CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN CIRCUITS AT THE ACP SENSOR VEHICLE HARNESS CONNECTOR	Yes GO to DS3 . No Key in OFF position. GO to C1 .			
	- ACP Sensor connector disconnected. - Key in ON position. - Measure the voltage between: <table border="1"> <tr> <td>(+) ACP Sensor Connector, Harness Side</td> <td>(-) ACP Sensor Connector, Harness Side</td> </tr> <tr> <td>VREF - Pin 2</td> <td>SIGRTN - Pin 1</td> </tr> </table> Is the voltage between 4 V - 6 V?		(+) ACP Sensor Connector, Harness Side	(-) ACP Sensor Connector, Harness Side	VREF - Pin 2
(+) ACP Sensor Connector, Harness Side	(-) ACP Sensor Connector, Harness Side				
VREF - Pin 2	SIGRTN - Pin 1				
DS3	SIMULATE AN OPPOSITE SIGNAL TO THE PCM	Yes Key in OFF position. INSTALL a new ACP sensor. No Key in OFF position. GO to DS4 .			
	- Access the PCM and monitor the ACP V PID. Is the voltage less than 4.9 V?				

Chart, DS1-DS3

Air Conditioning Pressure (ACP) Sensor

DS

Test Step		Results / Action to Take				
DS4	CHECK THE ACP CIRCUIT FOR A SHORT TO VREF - Diagnostic tool connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) ACP Sensor Connector, Harness Side</td><td>(-) ACP Sensor Connector, Harness Side</td></tr><tr><td>ACP - Pin 3</td><td>VREF - Pin 2</td></tr></table> - Is the resistance greater than 10K ohms?	(+) ACP Sensor Connector, Harness Side	(-) ACP Sensor Connector, Harness Side	ACP - Pin 3	VREF - Pin 2	Yes GO to DS5. No REPAIR the short circuit to VREF.
(+) ACP Sensor Connector, Harness Side	(-) ACP Sensor Connector, Harness Side					
ACP - Pin 3	VREF - Pin 2					
DS5	CHECK THE ACP CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) ACP Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>ACP - Pin 3</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) ACP Sensor Connector, Harness Side	(-)	ACP - Pin 3	Ground	Yes Key in OFF position. GO to DS6. No REPAIR the short circuit to PWR.
(+) ACP Sensor Connector, Harness Side	(-)					
ACP - Pin 3	Ground					
DS6	CHECK FOR AN OPEN ACP CIRCUIT IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) ACP Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>ACP - Pin 3</td><td>ACP</td></tr></table> - Is the resistance less than 5 ohms?	(+) ACP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	ACP - Pin 3	ACP	Yes GO to DS7. No REPAIR the open circuit.
(+) ACP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side					
ACP - Pin 3	ACP					
DS7	CHECK THE PCM - PCM connector connected. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A ACP Sensor Connector, Harness Side</td><td>Point B ACP Sensor Connector, Harness Side</td></tr><tr><td>ACP - Pin 3</td><td>SIGRTN - Pin 1</td></tr></table> - Key in ON position. Note: If a diagnostic tool communication concern exists, follow the NO answer. - Access the PCM and monitor the ACP V PID. - Is the voltage less than 4.9 V?	Point A ACP Sensor Connector, Harness Side	Point B ACP Sensor Connector, Harness Side	ACP - Pin 3	SIGRTN - Pin 1	Yes Key in OFF position. INSTALL a new ACP sensor. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
Point A ACP Sensor Connector, Harness Side	Point B ACP Sensor Connector, Harness Side					
ACP - Pin 3	SIGRTN - Pin 1					

Air Conditioning Pressure (ACP) Sensor

DS

Test Step		Results / Action to Take				
DS8	DTC P0533, P1462: CHECK THE ACP V PID - Key in ON position. - Access the PCM and monitor the ACP V PID. Is the voltage greater than 0.15 V?	Yes To determine if an intermittent condition exists. GO to DS16 . No Key in OFF position. GO to DS9 .				
DS9	CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN CIRCUITS AT THE ACP SENSOR VEHICLE HARNESS CONNECTOR - ACP Sensor connector disconnected. - Key in ON position. - Measure the voltage between:<table border="1"><tr><td>(+) ACP Sensor Connector, Harness Side</td><td>(-) ACP Sensor Connector, Harness Side</td></tr><tr><td>VREF - Pin 2</td><td>SIGRTN - Pin 1</td></tr></table> Is the voltage between 4 V - 6 V?	(+) ACP Sensor Connector, Harness Side	(-) ACP Sensor Connector, Harness Side	VREF - Pin 2	SIGRTN - Pin 1	Yes Key in OFF position. GO to DS10 . No Key in OFF position. GO to C1 .
(+) ACP Sensor Connector, Harness Side	(-) ACP Sensor Connector, Harness Side					
VREF - Pin 2	SIGRTN - Pin 1					
DS10	SIMULATE AN OPPOSITE SIGNAL TO THE PCM - Connect a 5 amp fused jumper wire between the following:<table border="1"><tr><td>Point A ACP Sensor Connector, Harness Side</td><td>Point B ACP Sensor Connector, Harness Side</td></tr><tr><td>VREF - Pin 2</td><td>ACP - Pin 3</td></tr></table> - Key in ON position. - Access the PCM and monitor the ACP V PID. Is the voltage greater than 4 V?	Point A ACP Sensor Connector, Harness Side	Point B ACP Sensor Connector, Harness Side	VREF - Pin 2	ACP - Pin 3	Yes Key in OFF position. INSTALL a new ACP sensor. No Key in OFF position. GO to DS11 .
Point A ACP Sensor Connector, Harness Side	Point B ACP Sensor Connector, Harness Side					
VREF - Pin 2	ACP - Pin 3					
DS11	CHECK THE ACP CIRCUIT FOR A SHORT TO GND - Diagnostic tool connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table border="1"><tr><td>(+) ACP Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>ACP - Pin 3</td><td>Ground</td></tr></table> Is the resistance greater than 10K ohms?	(+) ACP Sensor Connector, Harness Side	(-)	ACP - Pin 3	Ground	Yes GO to DS12 . No REPAIR the short circuit.
(+) ACP Sensor Connector, Harness Side	(-)					
ACP - Pin 3	Ground					
DS12	CHECK THE ACP CIRCUIT FOR A SHORT TO SIGRTN - Measure the resistance between:<table border="1"><tr><td>(+) ACP Sensor Connector, Harness Side</td><td>(-) ACP Sensor Connector, Harness Side</td></tr><tr><td>ACP - Pin 3</td><td>SIGRTN - Pin 1</td></tr></table> Is the resistance greater than 10K ohms?	(+) ACP Sensor Connector, Harness Side	(-) ACP Sensor Connector, Harness Side	ACP - Pin 3	SIGRTN - Pin 1	Yes GO to DS13 . No REPAIR the short circuit.
(+) ACP Sensor Connector, Harness Side	(-) ACP Sensor Connector, Harness Side					
ACP - Pin 3	SIGRTN - Pin 1					

Air Conditioning Pressure (ACP) Sensor

DS

Test Step		Results / Action to Take			
DS13	CHECK THE ACP CIRCUIT(S) FOR AN OPEN IN THE HARNESS	Yes GO to DS14. No Key in OFF position. REPAIR the open circuit.			
- Measure the resistance between:<table><tr><td>(+) ACP Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>ACP - Pin 3</td><td>ACP</td></tr></table> - Is the resistance less than 5 ohms?			(+) ACP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	ACP - Pin 3
(+) ACP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side				
ACP - Pin 3	ACP				
DS14	CHECK FOR THE A/C TO ENGAGE	Yes Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No GO to DS15.			
DS15	VERIFY THE A/C SYSTEM FUNCTION, INCLUDING THE REFRIGERANT CHARGE	Yes Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No Key in OFF position. REFER to Heating and Air Conditioning to continue to diagnose the A/C system pressure.			
DS16	CHECK THE ACP CIRCUIT FOR AN INTERMITTENT CONCERN	Yes ISOLATE the fault and REPAIR as necessary. No Unable to duplicate or identify the fault at this time. GO to Z1.			

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

Test Step		Results / Action to Take
DS17	DTC P1463: VERIFY THE A/C CLUTCH CAN DISENGAGE - A/C and defroster OFF. - Key on engine running. - Verify the A/C clutch can disengage. Is the A/C clutch disengaged?	Yes Key in OFF position. GO to DS18 . No REFER to Heating and Air Conditioning to continue diagnosis for the lack of the A/C clutch disengagement.
DS18	CHECK FOR VOLTAGE AND GROUND TO THE A/C CLUTCH USING A NON-POWERED TEST LAMP Note: If voltage and ground to the A/C clutch have already been checked 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. - A/CCS Switch connector disconnected. - Connect a jumper wire in the A/C low pressure cycling switch harness connector to complete the circuit. - A/CC Assembly connector disconnected. - Connect a non-powered test lamp between the power pin and ground pin at the A/C clutch harness connector. - Key on engine running. - Turn the A/C on, and wait 15 seconds. - Monitor the test lamp. - Reconnect the A/C clutch and A/C cycling switch when done testing. Does the lamp illuminate, or can the A/C clutch be heard clicking on?	Yes GO to DS19 . No REFER to Heating and Air Conditioning to further diagnose the circuits to the A/C Clutch.

Air Conditioning Pressure (ACP) Sensor

DS

Test Step		Results / Action to Take			
DS19	DETERMINE IF A SUFFICIENT A/C PRESSURE CHANGE CAN BE DETECTED BY THE ACP V PID	Yes Key in OFF position. The ACP sensor and the PCM can detect a sufficient change in the A/C pressure. For symptom without DTC P1463: REFER to Symptom Charts. All others: REFER to Heating and Air Conditioning to further diagnose the circuits to the A/C pressure system. No Key in OFF position. A/C OFF. GO to DS20 .			
	• Key on engine running. • A/C and defroster OFF. • Access the PCM and monitor the ACP V PID. • A/C and defroster on. • Five seconds after A/C clutch engagement, note the voltage. If the clutch does not engage, follow the NO answer instructions. • Did the PCM-ACP V PID change more than 0.3 volt within 5 seconds of clutch engagement?				
DS20	CHECK THE A/C SYSTEM PRESSURE AND PRESSURE CHANGE	Yes Key in OFF position. GO to DS21 . No Key in OFF position. REFER to Heating and Air Conditioning to further diagnose the A/C pressure system.			
	• INSTALL an A/C system manifold gauge set and check the A/C system high pressure reading. • Key on engine running. • A/C and defroster 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 and defroster OFF. • Did the A/C high pressure reading change more than 207 kPa (30 psi) within 5 seconds of clutch engagement?				
DS21	CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN CIRCUITS AT THE ACP SENSOR VEHICLE HARNESS CONNECTOR	Yes GO to DS22 . No GO to C1 .			
	• ACP Sensor connector disconnected. • Key in ON position. • Measure the voltage between:<table border="1"><tr><td>(+) ACP Sensor Connector, Harness Side</td><td>(-) ACP Sensor Connector, Harness Side</td></tr><tr><td>VREF - Pin 2</td><td>SIGRTN - Pin 1</td></tr></table> • Is the voltage between 4 V - 6 V?		(+) ACP Sensor Connector, Harness Side	(-) ACP Sensor Connector, Harness Side	VREF - Pin 2
(+) ACP Sensor Connector, Harness Side	(-) ACP Sensor Connector, Harness Side				
VREF - Pin 2	SIGRTN - Pin 1				

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

Test Step			Results / Action to Take			
DS22	CHECK THE ACP CIRCUIT(S) FOR AN OPEN IN THE HARNESS		Yes Key in OFF position. INSTALL a new ACP sensor. No Key in OFF position. REPAIR the open circuit.			
- PCM connector disconnected. - Measure the resistance between:						
<table><tr><td>(+) ACP Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>ACP - Pin 3</td><td>ACP</td></tr></table>		(+) ACP Sensor Connector, Harness Side		(-) PCM Connector, Harness Side	ACP - Pin 3	ACP
(+) ACP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side					
ACP - Pin 3	ACP					
Is the resistance less than 5 ohms?						

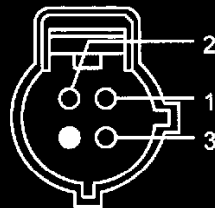
DS22

Test DT: Power Steering Pressure (PSP) Sensor**PINPOINT TEST DT: POWER STEERING PRESSURE (PSP) SENSOR**

Power Steering Pressure (PSP) Sensor**DT**

This pinpoint test is intended to diagnose the following:

- PSP sensor (3K215).
- Harness circuit(s): PSP, SIGRTN and VREF.
- Powertrain control module (PCM) (12A650).

Power Steering Pressure (PSP) Sensor Connector

A0077539

Circuit	Pin
PSP (Power Steering Pressure)	3
SIGRTN (Signal return)	1
VREF (Reference Voltage)	2

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

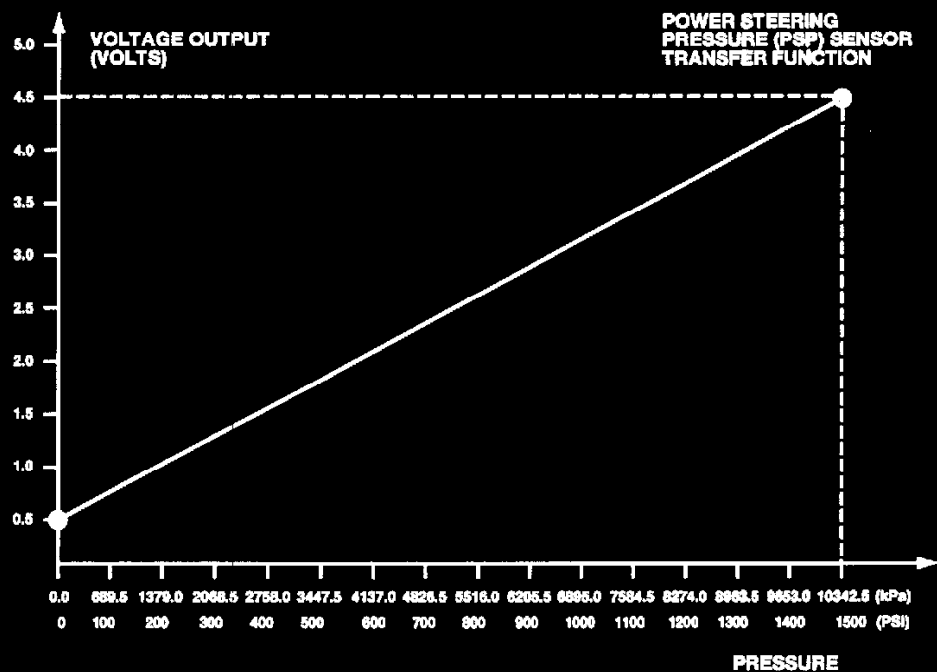
Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	PSP	B37
Escape, Mariner	150 (50-50-50) Pin	PSP	B3
F-150	190 Pin	PSP	E24

(Continued)

Note, Connectors

Power Steering Pressure (PSP) Sensor**DT**

Vehicle	Connector	Circuit	Pin
Focus	150 (50-50-50) Pin	PSP	B15
Freestar/Monterey, Ranger, Sable, Taurus	104 Pin	PSP	31
LS, Thunderbird	150 (60-32-58) Pin	PSP	E5
Mustang	170 Pin	PSP	B33
All other vehicles	150 (50-50-50) Pin	PSP	B46



AA0930-C

Chart And Graph

Power Steering Pressure (PSP) Sensor

DT

Test Step		Results / Action to Take			
DT1	DTC P1550: MAKE SURE THE FOLLOWING ACTION HAS BEEN TAKEN	Yes If there are any symptoms with the power steering system (for example, lack of power assist), REFER to Steering to continue diagnosis of steering system. If no symptoms are present with the power steering system, GO to DT2 . No RERUN the KOER self-test.			
	Did you turn the steering wheel at least one half turn within 20 seconds of starting the KOER self-test?				
DT2	KOEO AND KOER DTCS P0552 OR P0553: CHECK THE VOLTAGE BETWEEN VREF AND SIGRTN AT THE PSP SENSOR	Yes Key in OFF position. GO to DT3 . No Key in OFF position. GO to C1 .			
	- PSP Sensor connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PSP Sensor Connector, Harness Side</td><td>(-) PSP Sensor Connector, Harness Side</td></tr><tr><td>VREF - Pin 2</td><td>SIGRTN - Pin 1</td></tr></table> - Is the voltage between 4 V - 6 V?		(+) PSP Sensor Connector, Harness Side	(-) PSP Sensor Connector, Harness Side	VREF - Pin 2
(+) PSP Sensor Connector, Harness Side	(-) PSP Sensor Connector, Harness Side				
VREF - Pin 2	SIGRTN - Pin 1				
DT3	CHECK THE PSP CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to DT4 . No REPAIR the open circuit.			
	- PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PSP Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>PSP - Pin 3</td><td>PSP</td></tr></table> - Is the resistance less than 5 ohms?		(+) PSP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	PSP - Pin 3
(+) PSP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side				
PSP - Pin 3	PSP				
DT4	CHECK THE PSP CIRCUIT FOR A SHORT TO POWER IN THE HARNESS	Yes Key in OFF position. GO to DT5 . No REPAIR the short circuit.			
	- Key in ON position. - Measure the voltage between:<table><tr><td>(+) PSP Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>PSP - Pin 3</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?		(+) PSP Sensor Connector, Harness Side	(-)	PSP - Pin 3
(+) PSP Sensor Connector, Harness Side	(-)				
PSP - Pin 3	Ground				

DT1-DT4

Power Steering Pressure (PSP) Sensor**DT**

Test Step		Results / Action to Take												
DT5	CHECK THE PSP CIRCUIT FOR A SHORT TO VREF, SIGRTN AND GND IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) PSP Sensor Connector, Harness Side</th><th>(-) PSP Sensor Connector, Harness Side</th></tr><tr><td>PSP - Pin 3</td><td>VREF - Pin 2</td></tr><tr><td>PSP - Pin 3</td><td>SIGRTN - Pin 1</td></tr></table> - Measure the resistance between:<table><tr><th>(+) PSP Sensor Connector, Harness Side</th><th>(-)</th></tr><tr><td>PSP - Pin 3</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PSP Sensor Connector, Harness Side	(-) PSP Sensor Connector, Harness Side	PSP - Pin 3	VREF - Pin 2	PSP - Pin 3	SIGRTN - Pin 1	(+) PSP Sensor Connector, Harness Side	(-)	PSP - Pin 3	Ground	Yes GO to DT6. No REPAIR the short circuit.		
(+) PSP Sensor Connector, Harness Side	(-) PSP Sensor Connector, Harness Side													
PSP - Pin 3	VREF - Pin 2													
PSP - Pin 3	SIGRTN - Pin 1													
(+) PSP Sensor Connector, Harness Side	(-)													
PSP - Pin 3	Ground													
DT6	CHECK SENSOR OPERATION - Connect a 5 amp fused jumper wire between the following:<table><tr><th>Point A PSP Sensor Connector, Harness Side</th><th>Point B PSP Sensor Connector, Component Side</th></tr><tr><td>VREF - Pin 2</td><td>VREF - Pin 2</td></tr><tr><td>SIGRTN - Pin 1</td><td>SIGRTN - Pin 1</td></tr><tr><td>PSP - Pin 3</td><td>PSP - Pin 3</td></tr></table> - Start engine and allow to idle. - Measure the voltage between:<table><tr><th>(+) PSP Sensor Connector, Component Side</th><th>(-)</th></tr><tr><td>PSP - Pin 3</td><td>Ground</td></tr></table> - Observe the voltage while turning the steering wheel at least 1/2 turn right and left. - Is the voltage reading between 0.3 and 4.7 volts and does the voltage change when the steering wheel is turned?	Point A PSP Sensor Connector, Harness Side	Point B PSP Sensor Connector, Component Side	VREF - Pin 2	VREF - Pin 2	SIGRTN - Pin 1	SIGRTN - Pin 1	PSP - Pin 3	PSP - Pin 3	(+) PSP Sensor Connector, Component Side	(-)	PSP - Pin 3	Ground	Yes Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new PSP sensor.
Point A PSP Sensor Connector, Harness Side	Point B PSP Sensor Connector, Component Side													
VREF - Pin 2	VREF - Pin 2													
SIGRTN - Pin 1	SIGRTN - Pin 1													
PSP - Pin 3	PSP - Pin 3													
(+) PSP Sensor Connector, Component Side	(-)													
PSP - Pin 3	Ground													

DT5-DT6

Power Steering Pressure (PSP) Sensor**DT**

Test Step		Results / Action to Take
DT7	CONTINUOUS MEMORY DTC P0552, P0553: CHECK THE POWER STEERING PRESSURE SENSOR CIRCUIT(S) FOR INTERMITTENT CONCERNS	
• Key in ON position. • Access the PCM and monitor the PSP V PID. • Observe the PSP V PID for an indication of a fault while completing the following: (a fault is indicated by a sudden change in the voltage). — Shake, wiggle, and bend the PSP, VREF, SIGRTN circuit(s). — Lightly tap on the power steering pressure sensor to simulate road shock. • Is a fault indicated?		Yes ISOLATE the fault REPAIR as necessary. No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1.

DT7

Test DU: Intake Air Temperature 2 (IAT2) Sensor
PINPOINT TEST DU: INTAKE AIR TEMPERATURE 2 (IAT2) SENSOR

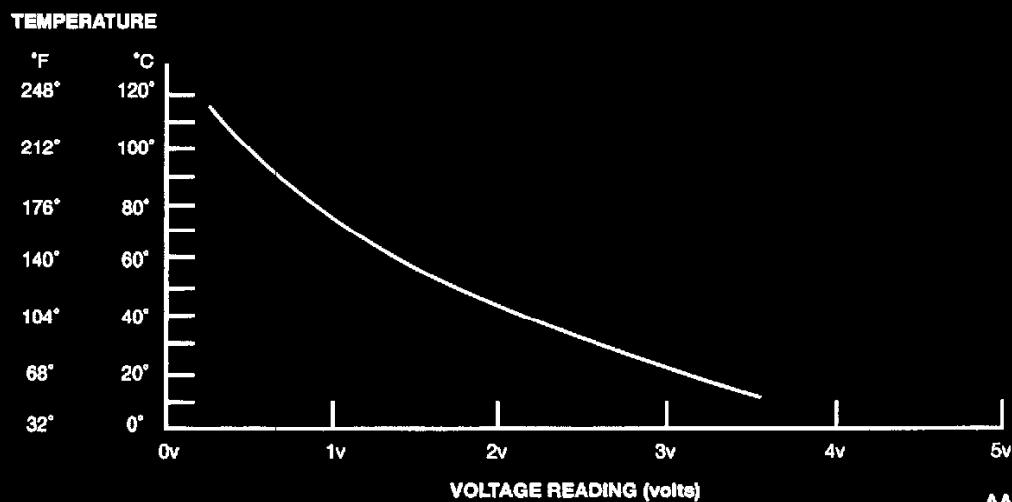
Intake Air Temperature 2 (IAT2) Sensor

DU

This pinpoint test is intended to diagnose the following:

- Intake Air Temperature 2 (IAT2) sensor (12A697).
- Harness circuits: IAT2 and SIGRTN.
- Powertrain Control Module (PCM) (12A650).

Voltage values calculated for VREF = 5 volts. These values can vary by 15% due to sensor and VREF variations.



TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS

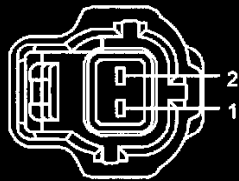
Temperature		Temperature Sensor Values	
°C	°F	Voltage	Resistance (K ohms)
120	248	0.28	1.18
110	230	0.36	1.55
100	212	0.47	2.07
90	194	0.61	2.80
80	176	0.80	3.84
70	158	1.05	5.37
60	140	1.37	7.70
50	122	1.77	10.97
40	104	2.23	16.15
30	86	2.74	24.27
20	68	3.26	37.30

(Continued)

Note, Graph And Table

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

Temperature		Temperature Sensor Values	
°C	°F	Voltage	Resistance (K ohms)
10	50	3.73	58.75
0	32	4.14	95.85
-10	14	4.45	160.31

Intake Air Temperature 2 (IAT2) Connector

A0077547

Circuit	Pin
SIGRTN (Signal return)	2
IAT2 (Intake Air Temperature 2)	1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Connector	Circuit	Pin
104 Pin	VREF SIGRTN IAT2	90 91 37

Intake Air Temperature 2 (IAT2) Sensor

DU

Test Step		Results / Action to Take						
DU1	DTC P1115: SIMULATE AN OPPOSITE SIGNAL TO THE PCM - The DTC indicates the sensor signal is greater than the self-test maximum. - Possible causes: - Open in the harness. - Incorrect harness connections. - Damaged sensor. - Damaged PCM. - IAT2 connector disconnected. - Key in ON position. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A IAT2 Connector, Harness Side</td><td>Point B IAT2 Connector, Harness Side</td></tr><tr><td>IAT2 - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> - Does a diagnostic tool communication concern exist?	Point A IAT2 Connector, Harness Side	Point B IAT2 Connector, Harness Side	IAT2 - Pin 1	SIGRTN - Pin 2	Yes Key in OFF position. REMOVE the jumper. GO to DU4 . No GO to DU2 .		
Point A IAT2 Connector, Harness Side	Point B IAT2 Connector, Harness Side							
IAT2 - Pin 1	SIGRTN - Pin 2							
DU2	CHECK FOR OPPOSITE SIGNAL TO PCM - Jumper installed. - Access the PCM and monitor the IAT2 V PID. - Is the voltage less than 0.2 V?	Yes INSTALL a new IAT2 sensor. No Key in OFF position. REMOVE the jumper. GO to DU3 .						
DU3	CHECK THE SIGNAL AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) IAT2 Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>IAT2 - Pin 1</td><td>IAT2 - Pin 37</td></tr><tr><td>SIGRTN - Pin 2</td><td>SIGRTN - Pin 91</td></tr></table> - Are the resistances less than 5 ohms?	(+) IAT2 Connector, Harness Side	(-) PCM Connector, Harness Side	IAT2 - Pin 1	IAT2 - Pin 37	SIGRTN - Pin 2	SIGRTN - Pin 91	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) IAT2 Connector, Harness Side	(-) PCM Connector, Harness Side							
IAT2 - Pin 1	IAT2 - Pin 37							
SIGRTN - Pin 2	SIGRTN - Pin 91							
DU4	CHECK THE SENSOR SIGNAL FOR A SHORT TO VREF - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>IAT2 - Pin 37</td><td>VREF - Pin 90</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	IAT2 - Pin 37	VREF - Pin 90	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit to VREF.		
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
IAT2 - Pin 37	VREF - Pin 90							

DU1-DU4

Intake Air Temperature 2 (IAT2) Sensor

DU

Test Step		Results / Action to Take							
DU5	DTC P1114: SIMULATE AN OPPOSITE SIGNAL TO THE PCM	Yes Key in OFF position. INSTALL a new IAT2 sensor. No Key in OFF position. GO to DU6 .							
• The DTC Indicates the sensor signal is less than the self-test minimum. • Possible causes: — Grounded circuit in the harness. — Incorrect harness connections. — Damaged sensor. — Damaged PCM. • IAT2 connector disconnected. • Key in ON position. • Access the PCM and monitor the IAT2 V PID. • Is the voltage greater than 4.2 V?									
DU6	CHECK THE SENSOR SIGNAL FOR A SHORT TO GROUND	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.							
• PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>IAT2 - Pin 37</td><td>SIGRTN - Pin 91</td></tr></table> • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) 12 Volt Vehicle Battery</td></tr><tr><td>IAT2 - Pin 37</td><td>Negative terminal</td></tr></table> • Is the resistance greater than 10K ohms?			(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	IAT2 - Pin 37	SIGRTN - Pin 91	(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery	IAT2 - Pin 37
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side								
IAT2 - Pin 37	SIGRTN - Pin 91								
(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery								
IAT2 - Pin 37	Negative terminal								
DU7	DTC P0127: IAT2 TOO HIGH. CHECK CHARGE AIR COOLER PUMP OPERATION	Yes GO to DU8 . No Key in OFF position. Diagnose charge air cooler (CAC) pump. GO to KP8 .							
• Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the outputs ON. • Does the supercharger intercooler pump run?									
DU8	CHECK THE INTERCOOLER SYSTEM	Yes Key in OFF position. REPAIR as necessary. No GO to DU9 .							
• Check Intercooler system for low fluid level, cracked, blocked or misrouted coolant lines, cracked or blocked heat exchanger. • Is a concern present?									

DU5-DU8

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

Test Step		Results / Action to Take				
DU9	SIMULATE THE HIGH IAT2 SIGNAL TO THE PCM • Key in ON position. • Access the PCM and monitor the IAT2 V PID. • Observe the PID while disconnecting the IAT2 sensor. • Is the voltage greater than 4.2 V?	Yes Key in OFF position. GO to DU10 . No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).				
DU10	SIMULATE THE LOW IAT2 SIGNAL TO THE PCM • IAT2 connector disconnected. • Connect a 5 amp fused jumper wire between the following:<table border="1"><tr><td>Point A IAT2 Connector, Harness Side</td><td>Point B IAT2 Connector, Harness Side</td></tr><tr><td>IAT2 - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> • Key in ON position. • Access the PCM and monitor the IAT2 V PID. • Is the voltage less than 0.2 V?	Point A IAT2 Connector, Harness Side	Point B IAT2 Connector, Harness Side	IAT2 - Pin 1	SIGRTN - Pin 2	Yes CONNECT the sensor and GO to Reference Values. COMPARE the IAT2 PID to reference values under different road test conditions. If sensor is not in range INSTALL a new sensor. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
Point A IAT2 Connector, Harness Side	Point B IAT2 Connector, Harness Side					
IAT2 - Pin 1	SIGRTN - Pin 2					

DU9-DU10

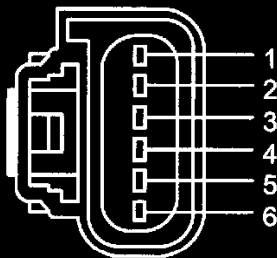
Test DV: Throttle Body Assembly ETC
PINPOINT TEST DV: THROTTLE BODY ASSEMBLY ETC

Throttle Body Assembly ETC**DV**

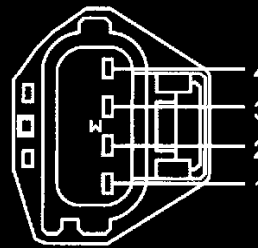
 **WARNING:** Substantial opening and closing torque is applied by this system. To prevent injury, be careful to keep fingers away from throttle mechanism when actuated.

This pinpoint test is intended to diagnose the following:

- Electronic throttle body (ETB) (9F991).
- Harness circuits: ETCRTN, ETCREF, TP1, TP2, TACM+, and TACM-.
- Powertrain control module (PCM) (12A650).

Electronic Throttle Body TPS (ETBTPS) Sensor Connector**A**

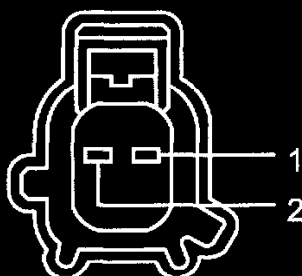
A0094772

B

A0077519

Vehicle	Connector	Circuit	Pin
F-150 4.2L, Five Hundred, Freestyle, Montego	A	TACM+	1
		TACM-	2
		TP2	6
		TP1	3
		ETCRTN	4
		ETCREF	5
All other vehicles	B	TP2	1
		TP1	4
		ETCRTN	3
		ETCREF	2

Warning, Note Ad Connector

Throttle Body Assembly ETC**DV****Electronic Throttle Body Throttle Actuator Control Motor (ETBTACM) Motor Connector**

A0077510

Circuit	Pin
TACM- (TACM-)	2
TACM+ (TACM+)	1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
E-Series 4.6L, E-Series 6.8L, E-Series 5.4L 4R75E, E-Series 5.4L 5R100, F-Super Duty	170 Pin	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1	B16, B4, E66 B18, B6, E59 B35 B47 E51 E34 E60 E61
Expedition, F-150, Navigator	190 Pin	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1	B21, B28, E66 B58, B59, E59 B51 B67 E51 E34 E60 E61

(Continued)

Throttle Body Assembly ETC**DV**

Vehicle	Connector	Circuit	Pin
Explorer, Mountaineer	150 (50-50-50) Pin	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1	B4, B40, E18 B41, B6, E7 B35 B47 E48 E47 E29 E19
LS, Thunderbird	150 (60-32-58) Pin	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1	B20, B23, E24 B17, E15 B32 B24 E27 E35 E57 E32
Mustang	170 Pin	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1	B24, B4, E66 B43, B6, E59 B35 B47 E51 E34 E60 E61
All other vehicles	150 (50-50-50) Pin	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1	B24, B4, E18 B41, B6, E7 B35 B47 E48 E47 E29 E19

Test Step			Results / Action to Take								
DV1	CHECK THE TP OPEN AND CLOSED VOLTAGES										
• Key in ON position. • Access the PCM and monitor the TP1 and TP2 PIDs. • Press the accelerator pedal to the floor and release.											
Electronic Throttle Control Throttle Position Sensor Signal Voltages											
<table><tr><th>Accelerator Pedal Position</th><th>TP1</th><th>TP2</th></tr><tr><td>Pedal fully released</td><td>3.7 - 4.7</td><td>0.3 - 1.9</td></tr><tr><td>Pedal fully applied</td><td>0.7 - 2.9</td><td>4.1 - 4.7</td></tr></table>		Accelerator Pedal Position		TP1	TP2	Pedal fully released	3.7 - 4.7	0.3 - 1.9	Pedal fully applied	0.7 - 2.9	4.1 - 4.7
Accelerator Pedal Position	TP1	TP2									
Pedal fully released	3.7 - 4.7	0.3 - 1.9									
Pedal fully applied	0.7 - 2.9	4.1 - 4.7									
• Are both PIDs within the chart ranges?											
		Yes GO to DV11. No GO to DV2.									

Chart, DV1

Throttle Body Assembly ETC

DV

Test Step		Results / Action to Take																								
DV2	CHECK FOR OBSTRUCTION OF THE THROTTLE BODY  WARNING: Substantial opening and closing torque is applied by this system. To prevent injury, be careful to keep fingers away from throttle mechanism when actuated. Note: Moving the throttle plate manually may cause DTC P2106 to set during the self-test. • Key in OFF position. • Remove the inlet tube from the throttle body. • Visually inspect for throttle plate obstruction. • Slowly, push the throttle plate to wide open and release. • Does the throttle plate move freely to wide open and back?	Yes For continuous memory DTCs P0121, P0122, P0221, or P0222 alone or together, GO to DV3 . For continuous memory DTCs P2100, P2101, P2107, and P2112 together, GO to DV13 . For all other DTCs, GO to DV4 . No Key in OFF position. ISOLATE and REPAIR the obstruction.																								
DV3	CHECK THE VREF VOLTAGE TO TP • ETBTPS Sensor connector disconnected. • Key in ON position. • Measure the voltage between:<table border="1"><tr><td>(+) ETBTPS Sensor Connector, Harness Side</td><td>(-) ETBTPS Sensor Connector, Harness Side</td></tr><tr><td>ETCREF</td><td>ETCRTN</td></tr></table> • Is the voltage between 4 V - 6 V?	(+) ETBTPS Sensor Connector, Harness Side	(-) ETBTPS Sensor Connector, Harness Side	ETCREF	ETCRTN	Yes GO to DV4 . No GO to C1 .																				
(+) ETBTPS Sensor Connector, Harness Side	(-) ETBTPS Sensor Connector, Harness Side																									
ETCREF	ETCRTN																									
DV4	CHECK THE FUNCTIONALITY OF TP SENSOR • Key in OFF position. • ETBTPS Sensor connector disconnected. • Measure the resistance between:<table border="1"><thead><tr><th>(+) ETBTPS Sensor Connector, Component Side</th><th>(-) ETBTPS Sensor Connector, Component Side</th><th>Minimum Resistance (ohms)</th><th>Maximum Resistance (ohms)</th></tr></thead><tbody><tr><td>TP1</td><td>ETCREF</td><td>1,100</td><td>3,500</td></tr><tr><td>TP1</td><td>ETCRTN</td><td>2,500</td><td>5,900</td></tr><tr><td>TP2</td><td>ETCREF</td><td>1,800</td><td>4,900</td></tr><tr><td>TP2</td><td>ETCRTN</td><td>800</td><td>2,800</td></tr><tr><td>ETCREF</td><td>ETCRTN</td><td>1,800</td><td>4,900</td></tr></tbody></table> • Are all the resistances within specifications?	(+) ETBTPS Sensor Connector, Component Side	(-) ETBTPS 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	Yes GO to DV5 . No INSTALL a new ETBTPS sensor.
(+) ETBTPS Sensor Connector, Component Side	(-) ETBTPS 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																							

Throttle Body Assembly ETC

DV

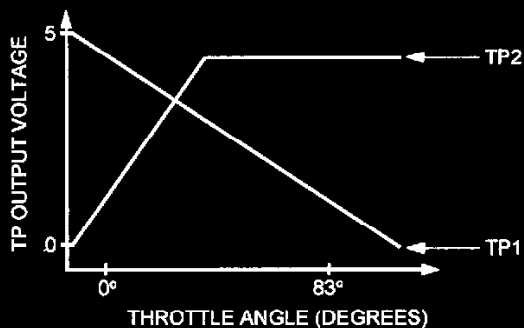
Test Step		Results / Action to Take												
DV5	CHECK THE TP1 AND TP2 CIRCUIT(S) FOR A SHORT TO POWER IN THE HARNESS - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><th>(+) ETBTPS Sensor Connector, Harness Side</th><th>(-)</th></tr><tr><td>TP1</td><td>Ground</td></tr><tr><td>TP2</td><td>Ground</td></tr></table> - Is any voltage present?	(+) ETBTPS Sensor Connector, Harness Side	(-)	TP1	Ground	TP2	Ground	Yes REPAIR the short circuit to PWR. No GO to DV6.						
(+) ETBTPS Sensor Connector, Harness Side	(-)													
TP1	Ground													
TP2	Ground													
DV6	CHECK THE TP1 AND TP2 CIRCUIT(S) FOR AN OPEN IN THE HARNESS - Key in OFF position. - Measure the resistance between:<table><tr><th>(+) ETBTPS Sensor Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>TP1</td><td>TP1</td></tr><tr><td>TP2</td><td>TP2</td></tr></table> - Are the resistances less than 5 ohms?	(+) ETBTPS Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	TP1	TP1	TP2	TP2	Yes GO to DV7. No REPAIR the open circuit.						
(+) ETBTPS Sensor Connector, Harness Side	(-) PCM Connector, Harness Side													
TP1	TP1													
TP2	TP2													
DV7	CHECK THE TP1 AND TP2 CIRCUIT(S) FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) ETBTPS Sensor Connector, Harness Side</th><th>(-) Vehicle Battery</th></tr><tr><td>TP1</td><td>Negative terminal</td></tr><tr><td>TP2</td><td>Negative terminal</td></tr></table> - Are the resistances greater than 10K ohms?	(+) ETBTPS Sensor Connector, Harness Side	(-) Vehicle Battery	TP1	Negative terminal	TP2	Negative terminal	Yes GO to DV8. No REPAIR the short circuit to GND.						
(+) ETBTPS Sensor Connector, Harness Side	(-) Vehicle Battery													
TP1	Negative terminal													
TP2	Negative terminal													
DV8	CHECK THE TPS CIRCUIT FOR A SHORT TOGETHER - Measure the resistance between:<table><tr><th>(+) ETBTPS Sensor Connector, Harness Side</th><th>(-) ETBTPS Sensor Connector, Harness Side</th></tr><tr><td>TP1</td><td>TP2</td></tr><tr><td>TP1</td><td>ETCREF</td></tr><tr><td>TP1</td><td>ETCRTN</td></tr><tr><td>TP2</td><td>ETCREF</td></tr><tr><td>TP2</td><td>ETCRTN</td></tr></table> - Are the resistances greater than 10K ohms?	(+) ETBTPS Sensor Connector, Harness Side	(-) ETBTPS Sensor Connector, Harness Side	TP1	TP2	TP1	ETCREF	TP1	ETCRTN	TP2	ETCREF	TP2	ETCRTN	Yes GO to DV9. No REPAIR the short circuit.
(+) ETBTPS Sensor Connector, Harness Side	(-) ETBTPS Sensor Connector, Harness Side													
TP1	TP2													
TP1	ETCREF													
TP1	ETCRTN													
TP2	ETCREF													
TP2	ETCRTN													

DV5-DV8

Throttle Body Assembly ETC**DV**

Test Step		Results / Action to Take
DV9	CHECK FOR TP2 SIGNAL HIGH VERSUS LOAD WHILE DRIVING THE VEHICLE	
	• ETBTPS Sensor connector connected. • PCM connector connected. • Key on engine running. • Access the PCM and monitor the TP2 and LOAD PIDs. • Drive the vehicle while exercising the throttle and ETCTP sensor and accessing the PIDS. • Is the TP2 PID greater than 2.44 volts and the LOAD PID less than 30%?	Yes LISTEN for air noise around the MAF sensor and throttle body while the engine is running. REPAIR as necessary. If no faults are found: GO to DV10 . No GO to DV10 .
DV10	CHECK FOR TP2 SIGNAL LOW VERSUS LOAD WHILE DRIVING THE VEHICLE	
	• Key on engine running. • Drive the vehicle while exercising the throttle and ETCTP sensor and accessing the PIDS. • Is the TP2 PID less than 0.24 volt and the LOAD PID greater than 55%?	Yes If, after clearing any continuous DTCs, and driving the vehicle while exercising the throttle, continuous DTCs P0068, P0124, or P0224 are set, For continuous memory DTCs P0124 or P0224, GO to Z1 . For continuous memory DTC P0068, GO to DV11 . No GO to DV11 .

Throttle Body Assembly ETC**DV**

Test Step		Results / Action to Take
DV11	CHECK THE TP SENSOR OPERATION • Key in ON position. • Access the PCM and monitor the TP1 and TP2 PIDs. • Slowly press the accelerator pedal from fully released to fully applied while observing the voltage readings. • Use the chart as a reference. TP1 and TP2 Sensor Output Voltages  A0096020 • Do all signal values smoothly change when the accelerator is pressed?	Yes For continuous memory DTC P0068, CHECK the mass air flow (MAF) and manifold absolute pressure (MAP) sensors and connectors for damage and corrosion. REPAIR as necessary. For all others, GO to DV12. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
DV12	CHECK THE TPS CIRCUIT FOR AN INTERMITTENT CONCERN • Access the PCM and monitor the TP1 and TP2 PIDs. • Wiggle, shake, and bend the harness from the TP to the PCM. • Are the voltages between 0.49 V - 4.65 V?	Yes GO to DV21. No REPAIR any faults found, If DTC P2100 or P2101 are present: GO to DV13.
DV13	CHECK THE TACM MOTOR VISUALLY Note: Make sure the TACM harness connector is properly connected. • Key in OFF position. • Inspect the TACM for damaged housing, harness connector, and harness. • Are there any faults with the TACM hardware?	Yes INSTALL a new ETB. No GO to DV14.

Throttle Body Assembly ETC

DV

Test Step		Results / Action to Take																		
DV14	CHECK THE TACM FOR A SHORT OR OPEN - ETBTACM Motor connector disconnected. - Measure the resistance between:<table><tr><td>(+) ETBTACM Motor Connector, Component Side</td><td>(-) ETBTACM Motor Connector, Component Side</td></tr><tr><td>TACM+ - Pin 1</td><td>TACM- - Pin 2</td></tr></table> - Is the resistance between 1 ohm - 900 ohms?	(+) ETBTACM Motor Connector, Component Side	(-) ETBTACM Motor Connector, Component Side	TACM+ - Pin 1	TACM- - Pin 2	Yes Key in OFF position. GO to DV15. No Key in OFF position. INSTALL a new ETB.														
(+) ETBTACM Motor Connector, Component Side	(-) ETBTACM Motor Connector, Component Side																			
TACM+ - Pin 1	TACM- - Pin 2																			
DV15	CHECK THE TACM HARNESS FOR AN OPEN - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) ETBTACM Motor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>TACM+ - Pin 1</td><td>TACM+</td></tr><tr><td>TACM- - Pin 2</td><td>TACM-</td></tr></table> - Are the resistances less than 5 ohms?	(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side	TACM+ - Pin 1	TACM+	TACM- - Pin 2	TACM-	Yes Key in OFF position. GO to DV16. No REPAIR the open circuit.												
(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side																			
TACM+ - Pin 1	TACM+																			
TACM- - Pin 2	TACM-																			
DV16	CHECK THE HARNESS FOR A SHORT TO GND, PWR, ETCREF, AND ETCRTN - Measure the resistance between:<table><tr><td>(+) ETBTACM Motor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>TACM+ - Pin 1</td><td>PWRGND</td></tr><tr><td>TACM+ - Pin 1</td><td>VPWR</td></tr><tr><td>TACM+ - Pin 1</td><td>ETCRTN</td></tr><tr><td>TACM+ - Pin 1</td><td>ETCREF</td></tr><tr><td>TACM- - Pin 2</td><td>PWRGND</td></tr><tr><td>TACM- - Pin 2</td><td>ETCRTN</td></tr><tr><td>TACM- - Pin 2</td><td>VPWR</td></tr><tr><td>TACM- - Pin 2</td><td>ETCREF</td></tr></table> - Are the resistances greater than 10K ohms?	(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side	TACM+ - Pin 1	PWRGND	TACM+ - Pin 1	VPWR	TACM+ - Pin 1	ETCRTN	TACM+ - Pin 1	ETCREF	TACM- - Pin 2	PWRGND	TACM- - Pin 2	ETCRTN	TACM- - Pin 2	VPWR	TACM- - Pin 2	ETCREF	Yes GO to DV17. No REPAIR the short circuit.
(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side																			
TACM+ - Pin 1	PWRGND																			
TACM+ - Pin 1	VPWR																			
TACM+ - Pin 1	ETCRTN																			
TACM+ - Pin 1	ETCREF																			
TACM- - Pin 2	PWRGND																			
TACM- - Pin 2	ETCRTN																			
TACM- - Pin 2	VPWR																			
TACM- - Pin 2	ETCREF																			
DV17	CHECK FOR TACM HARNESS CIRCUITS SHORTED TOGETHER - Measure the resistance between:<table><tr><td>(+) ETBTACM Motor Connector, Harness Side</td><td>(-) ETBTACM Motor Connector, Harness Side</td></tr><tr><td>TACM+ - Pin 1</td><td>TACM- - Pin 2</td></tr></table> - Is the resistance greater than 10K ohms?	(+) ETBTACM Motor Connector, Harness Side	(-) ETBTACM Motor Connector, Harness Side	TACM+ - Pin 1	TACM- - Pin 2	Yes GO to DV18. No REPAIR the short circuit.														
(+) ETBTACM Motor Connector, Harness Side	(-) ETBTACM Motor Connector, Harness Side																			
TACM+ - Pin 1	TACM- - Pin 2																			

DV14-DV17

Throttle Body Assembly ETC

DV

Test Step		Results / Action to Take			
DV18	CHECK FOR SELF-TEST CODES	Yes GO to DV19. No GO to DV21.			
- ETBTACM Motor connector connected. - PCM connector connected. - Key in ON position. - Carry out the self-test. - Is DTC P2101 present?					
DV19	CHECK FOR PROPER TACM+ WIRING IN THE HARNESS CONNECTOR	Yes GO to DV20. No REPAIR the open circuit. Properly wire the TACM harness connector per the TACM and PCM connector diagrams.			
- Key in OFF position. - ETBTACM Motor connector disconnected. - PCM connector disconnected. - Measure the resistance between: <table><tr><td>(+) ETBTACM Motor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>TACM+ - Pin 1</td><td>TACM+</td></tr></table> - Is the resistance less than 5 ohms?			(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side	TACM+ - Pin 1
(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side				
TACM+ - Pin 1	TACM+				
DV20	CHECK FOR PROPER TACM- WIRING IN THE HARNESS CONNECTOR	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No GO to DV21.			
- Measure the resistance between: <table><tr><td>(+) ETBTACM Motor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>TACM- - Pin 2</td><td>TACM-</td></tr></table> - Is the resistance less than 5 ohms?			(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side	TACM- - Pin 2
(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side				
TACM- - Pin 2	TACM-				
DV21	CHECK THE REPAIR THROUGH PROCEDURE	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No GO to Z1.			
- Key in ON position. - Record and clear the DTCs. - Cycle the accelerator pedal to the floor and back several times. - Check for self-test DTCs: - Are any ETC system related DTCs present?					

DV18-DV21

Test DX: Engine Coolant Temperature (ECT) Sensor
PINPOINT TEST DX: ENGINE COOLANT TEMPERATURE (ECT) SENSOR

Engine Coolant Temperature (ECT) Sensor

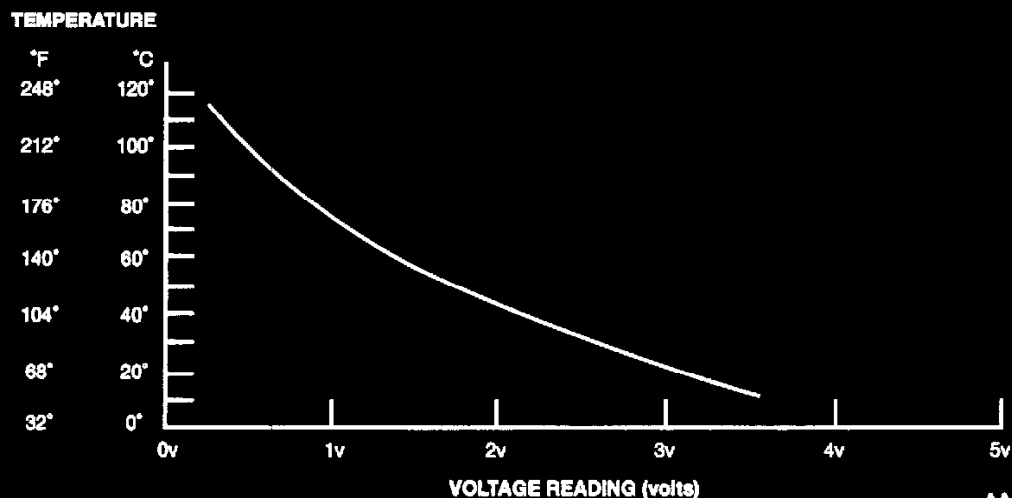
DX

This pinpoint test is intended to diagnose the following:

- Engine coolant temperature (ECT) sensor (12A648).
- Harness circuits: ECT and SIGRTN.
- Powertrain control module (PCM) (12A650).

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.

Voltage values calculated for VREF = 5 volts. These values can vary by 15% due to sensor and VREF variations.



AA4397-A

TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS

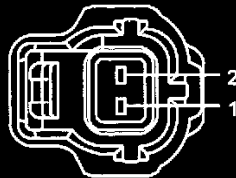
Temperature		Temperature Sensor Values	
°C	°F	Voltage	Resistance (K ohms)
120	248	0.28	1.18
110	230	0.36	1.55
100	212	0.47	2.07
90	194	0.61	2.80
80	176	0.80	3.84
70	158	1.05	5.37
60	140	1.37	7.70
50	122	1.77	10.97
40	104	2.23	16.15

(Continued)

Note, Graph And Table

**Engine Coolant Temperature (ECT)
Sensor****DX****TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS**

Temperature		Temperature Sensor Values	
°C	°F	Voltage	Resistance (K ohms)
30	86	2.74	24.27
20	68	3.26	37.30
10	50	3.73	58.75
0	32	4.14	95.85
-10	14	4.45	160.31

**Engine Coolant Temperature (ECT) Sensor
Connector**

A0077548

Vehicle	Connector	Circuit	Pin
Five Hundred, Freestyle, Montego	A	SIGRTN ECT	1 2
All other vehicles	A	SIGRTN ECT	2 1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Engine Coolant Temperature (ECT) Sensor

DX

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	VREF SIGRTN ECT	E20 E17 E46
Escape, Explorer, Five Hundred, Freestyle, Mariner, Montego, Mountaineer	150 (50-50-50) Pin	VREF SIGRTN ECT	E40 E41 E21
Mustang	170 Pin	VREF SIGRTN ECT	E24 E33 E18
All other vehicles	104 Pin	VREF SIGRTN ECT	90 91 38

Test Step		Results / Action to Take
DX1	DTC P1116: CHECK THE COOLING SYSTEM	Yes GO to DX2. No REFER to Cooling System for cooling system diagnostics. REPAIR as necessary.
 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. • The DTC indicates the temperature sensor is out of self-test range. The engine is not at normal operating temperature. • Possible causes: — Cold engine. — Low engine coolant. — Engine overheat. — Damaged harness. — ECT sensor. — Damaged PCM. • Check the vehicle coolant level. • Is the cooling system OK?		
DX2	CHECK IF THE VEHICLE ENGINE STARTS	Yes GO to DX5. No GO to DX3.
• Attempt to start the engine. • Does the engine start and run normally?		

Chart, DX1-DX2

Engine Coolant Temperature (ECT) Sensor

DX

Test Step		Results / Action to Take				
DX3	CHECK THE RESISTANCE OF THE ECT SENSOR WITH THE ENGINE OFF • Key in OFF position. • ECT Sensor connector disconnected. Note: REFER to the chart at the beginning of this test for resistance specifications. • Measure the resistance between: <table><tr><td>(+) ECT Sensor Con- nector, Component Side</td><td>(-) ECT Sensor Con- nector, Component Side</td></tr><tr><td>ECT</td><td>SIGRTN</td></tr></table> • Is the resistance within specification?	(+) ECT Sensor Con- nector, Component Side	(-) ECT Sensor Con- nector, Component Side	ECT	SIGRTN	Yes GO to DX4 . No INSTALL a new ECT sensor.
(+) ECT Sensor Con- nector, Component Side	(-) ECT Sensor Con- nector, Component Side					
ECT	SIGRTN					
DX4	CHECK CIRCUIT FROM MODULE TO COMPONENT • ECT Sensor connector connected. • Key in ON position. • Access the PCM and monitor the ECT V PID. Note: REFER to the chart at the beginning of this test for resistance specifications. • Using the data collected from the previous step, compare temperature resistance measured at the sensor to the PID temperature voltage measured at the PCM. • Does the measured value at the sensor agree with measured PID value at the PCM?	Yes No Start or Stalls. Concern is elsewhere. RETURN to Symptom Charts for further direction. No CHECK the harness. GO to DX9 .				
DX5	CHECK THE ECT SENSOR OPERATION • Run the engine until the engine temperature stabilizes. • Verify the upper radiator hose is hot and the cooling system is pressurized. • Rerun the KOER self-test. • Check for self-test DTCs: • Is DTC P1116 present?	Yes GO to DX6 . No The engine temperature was not stabilized. REPAIR any other DTCs as necessary.				
DX6	CHECK THE RESISTANCE OF THE ECT SENSOR • Vehicle must be at normal operating temperature. • Key in OFF position. • ECT Sensor connector disconnected. Note: REFER to the chart at the beginning of this test for resistance specifications. • Measure the resistance between: <table><tr><td>(+) ECT Sensor Con- nector, Component Side</td><td>(-) ECT Sensor Con- nector, Component Side</td></tr><tr><td>ECT</td><td>SIGRTN</td></tr></table> • Is the resistance within specification?	(+) ECT Sensor Con- nector, Component Side	(-) ECT Sensor Con- nector, Component Side	ECT	SIGRTN	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new ECT sensor.
(+) ECT Sensor Con- nector, Component Side	(-) ECT Sensor Con- nector, Component Side					
ECT	SIGRTN					

Engine Coolant Temperature (ECT) Sensor

DX

Test Step		Results / Action to Take						
DX7	DTC P0118: CHECK ECT SIGNAL CIRCUIT • The DTC indicates the sensor signal is greater than the self-test maximum. • Possible causes: — Open in the harness. — Incorrect harness connections. — Damaged sensor. — Damaged PCM. • ECT Sensor connector disconnected. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) ECT Sensor Connector, Harness Side</td><td>(-) ECT Sensor Connector, Harness Side</td></tr><tr><td>ECT</td><td>SIGRTN</td></tr></table> • Is the voltage between 4.5 V - 5.5 V?	(+) ECT Sensor Connector, Harness Side	(-) ECT Sensor Connector, Harness Side	ECT	SIGRTN	Yes Key in OFF position. GO to DX8 . No GO to DX9 .		
(+) ECT Sensor Connector, Harness Side	(-) ECT Sensor Connector, Harness Side							
ECT	SIGRTN							
DX8	CHECK THE RESISTANCE OF THE ECT SENSOR WITH THE ENGINE OFF • Key in OFF position. • ECT Sensor connector disconnected. • Note: REFER to the chart at the beginning of this test for resistance specifications. • Measure the resistance between:<table><tr><td>(+) ECT Sensor Connector, Component Side</td><td>(-) ECT Sensor Connector, Component Side</td></tr><tr><td>ECT</td><td>SIGRTN</td></tr></table> • Is the resistance within specification?	(+) ECT Sensor Connector, Component Side	(-) ECT Sensor Connector, Component Side	ECT	SIGRTN	Yes GO to DX10 . No INSTALL a new ECT sensor.		
(+) ECT Sensor Connector, Component Side	(-) ECT Sensor Connector, Component Side							
ECT	SIGRTN							
DX9	CHECK THE SIGNAL AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS • PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) ECT Sensor Connector, Harness Side</td></tr><tr><td>ECT</td><td>ECT</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> • Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) ECT Sensor Connector, Harness Side	ECT	ECT	SIGRTN	SIGRTN	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) ECT Sensor Connector, Harness Side							
ECT	ECT							
SIGRTN	SIGRTN							

Engine Coolant Temperature (ECT) Sensor

DX

Test Step		Results / Action to Take								
DX10	CHECK THE SENSOR SIGNAL FOR A SHORT TO VREF • Key in OFF position. • PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>ECT</td><td>VREF</td></tr></table> • Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	ECT	VREF	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit to VREF.				
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
ECT	VREF									
DX11	DTC P0117: SIMULATE AN OPPOSITE SIGNAL TO THE PCM • The DTC indicates the sensor signal is less than the self-test minimum. • Possible causes: — Grounded circuit in the harness. — Incorrect harness connections. — Damaged sensor. — Damaged PCM. • ECT Sensor connector disconnected. • Key in ON position. • Access the PCM and monitor the ECT V PID. • Is the voltage greater than 4.2 V?	Yes Key in OFF position. INSTALL a new ECT sensor. No Key in OFF position. GO to DX12 .								
DX12	CHECK THE SENSOR SIGNAL FOR A SHORT TO GROUND • PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>ECT</td><td>SIGRTN</td></tr></table> • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) 12 Volt Vehicle Bat- tery</td></tr><tr><td>ECT</td><td>Negative terminal</td></tr></table> • Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	ECT	SIGRTN	(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Bat- tery	ECT	Negative terminal	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
ECT	SIGRTN									
(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Bat- tery									
ECT	Negative terminal									

Engine Coolant Temperature (ECT) Sensor

DX

Test Step		Results / Action to Take				
DX13	DTC P0116: CHECK THE RESISTANCE OF THE ECT SENSOR WITH THE ENGINE OFF Note: Verify the engine temperature is at ambient room temperature before continuing with this test. A soak period of 6 hours may be required. Refer to Section 4, Refer to Diagnostic Trouble Code (DTC) Charts and Descriptions for information concerning P0116. • Key in OFF position. • ECT Sensor connector disconnected. Note: REFER to the chart at the beginning of this test for resistance specifications. • Measure the resistance between:<table><tr><td>(+) ECT Sensor Connector, Component Side</td><td>(-) ECT Sensor Connector, Component Side</td></tr><tr><td>ECT</td><td>SIGRTN</td></tr></table> • Is the resistance within specification?	(+) ECT Sensor Connector, Component Side	(-) ECT Sensor Connector, Component Side	ECT	SIGRTN	Yes Reconnect ECT. GO to DX14 . No INSTALL a new ECT sensor.
(+) ECT Sensor Connector, Component Side	(-) ECT Sensor Connector, Component Side					
ECT	SIGRTN					
DX14	DTC P0116: CHECK THE RESISTANCE OF THE ECT SENSOR • Run the engine until the engine temperature stabilizes. Note: Verify the engine is at operating temperature before taking the ECT reading. • Key in OFF position. • ECT Sensor connector disconnected. Note: Refer to the chart at the beginning of this test for resistance specifications. • Measure the resistance between:<table><tr><td>(+) ECT Sensor Connector, Component Side</td><td>(-) ECT Sensor Connector, Component Side</td></tr><tr><td>ECT</td><td>SIGRTN</td></tr></table> • Is the resistance within specification?	(+) ECT Sensor Connector, Component Side	(-) ECT Sensor Connector, Component Side	ECT	SIGRTN	Yes The fault is not present at this time. CARRY OUT the OBD drive cycle to determine if fuel, HO2S, catalyst and misfire monitors can be executed. REFER to Diagnostic Methods On Board Diagnostic (OBD) Drive Cycle. No INSTALL a new ECT sensor.
(+) ECT Sensor Connector, Component Side	(-) ECT Sensor Connector, Component Side					
ECT	SIGRTN					
DX15	DTCS P0117, P0118, P0119 OR P1117: INTERMITTENT CHECK • Key in ON position. • Access the PCM and monitor the ECT V PID. • While observing the PID, carry out the following: — Tap on the sensor to simulate road shock. — Wiggle the sensor connector. • Is there a large change in the voltage reading?	Yes DISCONNECT and INSPECT the connector. If OK, INSTALL a new ECT sensor. No GO to DX16 .				

Engine Coolant Temperature (ECT) Sensor

DX

Test Step		Results / Action to Take
DX16	CHECK THE ELECTRONIC ENGINE CONTROL (EC) WIRING HARNESS	Yes ISOLATE the fault. REPAIR as necessary. No Key in OFF position. GO to DX17 .
	• Access the PCM and monitor the ECT V PID. • While observing the PID, carry out the following: — Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM. • Is there a large change in the voltage reading?	
DX17	CHECK THE PCM AND VEHICLE HARNESS CONNECTORS	Yes The fault is not present at this time. DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No REPAIR as necessary.
	• PCM connector disconnected. • ECT Sensor connector disconnected. • Are the connectors and terminals OK?	
DX18	DTCS P0125 OR P0128: CHECK THE ENGINE COOLANT LEVEL	Yes GO to DX19 . No REFER to Cooling System for cooling system diagnostics.
	 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. • Diagnostic Trouble Code (DTC) indicates the engine coolant temperature has not achieved the required engine operation temperature level, since start-up within a specified amount of time. • Possible causes: — Insufficient warm up time. — Leaking or stuck-open thermostat. — Low engine coolant. • Check the engine coolant level. • Is the engine coolant fill level correct?	

**Engine Coolant Temperature (ECT)
Sensor****DX**

Test Step		Results / Action to Take
DX19	CHECK SENSOR OPERATION • Run the engine until the engine temperature stabilizes. • Verify the upper radiator hose is hot and the cooling system is pressurized. • Access the PCM and monitor the ECT PID. • Is the temperature greater than 77°C (170.6°F)?	Yes Test complete. DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No REFER to Cooling System for cooling system diagnostics.
DX20	DTC P0217: INDICATES AN ENGINE OVERHEAT CONDITION  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 the engine coolant level. • Is the engine coolant fill level correct?	Yes REFER to Cooling System to diagnose the overheating condition. No REFER to Cooling System to diagnose the loss of coolant.
DX21	DTC P0298: ENGINE OIL OVER TEMPERATURE CONDITION • Engine oil temperature protection strategy in the PCM has been activated. This protects the engine against mechanical damage due to overheating. Check for an overheating condition and base engine concerns. • Are there any overheating or base engine concerns?	Yes ISOLATE the fault. REPAIR as necessary. No GO to DX22 .
DX22	CHECK FOR ECT DTCS • Check for self-test DTCS: • Are DTCS P0117, P0118, P1116 or P1117 present?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to DX23 .

**Engine Coolant Temperature (ECT)
Sensor****DX**

Test Step		Results / Action to Take
DX23	ROAD TEST THE VEHICLE AND MONITOR FOR ENGINE OVER TEMPERATURE	
• Access the Freeze Frame Data (if available) and record the DTC malfunction conditions. • Access the PCM and monitor the ECT PID. • Test drive the vehicle and allow the engine to reach normal operating temperature. • Observe ECT PID. • Does the engine overheat?		Yes REFER to Cooling System for cooling system diagnostics. REPAIR as necessary. No Unable to duplicate or identify the fault at this time.

DX23

Test DY: Engine Oil Temperature (EOT) Sensor
PINPOINT TEST DY: ENGINE OIL TEMPERATURE (EOT) SENSOR

Engine Oil Temperature (EOT) Sensor

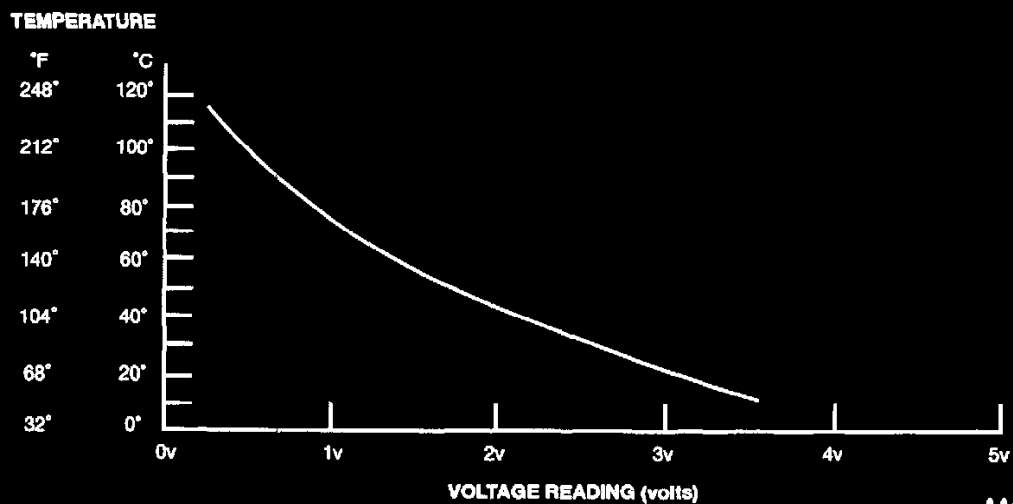
DY

This pinpoint test is intended to diagnose the following:

- Engine oil temperature (EOT) sensor (12A648).
- Harness circuits: EOT and SIGRTN.
- Powertrain control module (PCM) (12A650).

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 calculated for VREF = 5 volts. These values can vary by 15% due to sensor and VREF variations.



TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS

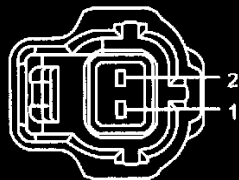
Temperature		Temperature Sensor Values	
°C	°F	Voltage	Resistance (K ohms)
120	248	0.28	1.18
110	230	0.36	1.55
100	212	0.47	2.07
90	194	0.61	2.80
80	176	0.80	3.84
70	158	1.05	5.37
60	140	1.37	7.70
50	122	1.77	10.97
40	104	2.23	16.15
30	86	2.74	24.27

(Continued)

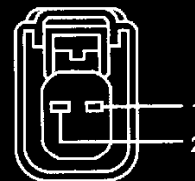
Note, Graph And Table

Engine Oil Temperature (EOT) Sensor**DY****TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS**

Temperature		Temperature Sensor Values	
°C	°F	Voltage	Resistance (K ohms)
20	68	3.26	37.30
10	50	3.73	58.75
0	32	4.14	95.85
-10	14	4.45	160.31

Engine Oil Temperature (EOT) Sensor Connector**A**

A0077548

B

A0077578

Vehicle	Connector	Circuit	Pin
LS, Thunderbird	A	SIGRTN EOT	2 1
All other vehicles	B	SIGRTN EOT	2 1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Engine Oil Temperature (EOT) Sensor**DY**

Vehicle	Connector	Circuit	Pin
F-Super Duty	170 Pin	SIGRTN VPWR VREF EOT	E58 B35 E57 E27
LS, Thunderbird	150 (60-32-58) Pin	SIGRTN VPWR VREF EOT	E17 B32 E14 E39
Mustang	170 Pin	SIGRTN VPWR VREF EOT	E33 B35 E24 E27
All other vehicles	190 Pin	SIGRTN VPWR VREF EOT	E58 B51 E57 E27

Test Step		Results / Action to Take
DY1	DTCS P0196 OR P1184: CHECK THE EOT SENSOR OPERATION	
	Note: Before continuing with this pinpoint test, verify the engine oil condition and level are within specification. - Run the engine until the engine temperature stabilizes. - Verify the upper radiator hose is hot and the cooling system is pressurized. - Carry out the self-test. Are DTCs P0196 or P1184 present?	Yes GO to DY2. No The engine temperature was not stabilized. REPAIR any other DTCs as necessary.
DY2	DTCS P0196, P0197, P0198, P1184 OR P0298: CHECK THE TEMPERATURE SENSOR SIGNAL	
	- Key in ON position. - Access the PCM and monitor the EOT_V PID. Is the voltage less than 0.3 V?	Yes GO to DY3. No GO to DY5.
DY3	SIMULATE AN OPPOSITE SIGNAL TO THE PCM	
	- Key in ON position. - EOT Sensor connector disconnected. - Access the PCM and monitor the EOT_V PID. Is the voltage greater than 4.2 V?	Yes INSTALL a new EOT sensor. No GO to DY4.

Chart, DY1-DY3

Engine Oil Temperature (EOT) Sensor

DY

Test Step		Results / Action to Take								
DY4	CHECK THE SENSOR SIGNAL FOR A SHORT TO GROUND - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) EOT Sensor Connector, Harness Side</td><td>(-) EOT Sensor Connector, Harness Side</td></tr><tr><td>EOT</td><td>SIGRTN</td></tr></table> - Measure the resistance between:<table><tr><td>(+) EOT Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>EOT</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) EOT Sensor Connector, Harness Side	(-) EOT Sensor Connector, Harness Side	EOT	SIGRTN	(+) EOT Sensor Connector, Harness Side	(-) Vehicle Battery	EOT	Negative terminal	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) EOT Sensor Connector, Harness Side	(-) EOT Sensor Connector, Harness Side									
EOT	SIGRTN									
(+) EOT Sensor Connector, Harness Side	(-) Vehicle Battery									
EOT	Negative terminal									
DY5	CHECK FOR HIGH EOT SENSOR VOLTAGE - Access the PCM and monitor the EOT_V PID. - Is the voltage greater than 4.2 V?	Yes GO to DY6. No GO to DY10.								
DY6	CHECK THE EOT CIRCUIT VOLTAGE - EOT Sensor connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) EOT Sensor Connector, Harness Side</td><td>(-) EOT Sensor Connector, Harness Side</td></tr><tr><td>EOT</td><td>SIGRTN</td></tr></table> - Is the voltage greater than 4.2 V?	(+) EOT Sensor Connector, Harness Side	(-) EOT Sensor Connector, Harness Side	EOT	SIGRTN	Yes Key in OFF position. GO to DY7. No Key in OFF position. GO to DY9.				
(+) EOT Sensor Connector, Harness Side	(-) EOT Sensor Connector, Harness Side									
EOT	SIGRTN									
DY7	CHECK THE RESISTANCE OF THE EOT SENSOR WITH THE ENGINE OFF - EOT Sensor connector disconnected. - Measure the resistance between:<table><tr><td>(+) EOT Sensor Connector, Component Side</td><td>(-) EOT Sensor Connector, Component Side</td></tr><tr><td>EOT</td><td>SIGRTN</td></tr></table> - Refer to the chart at the beginning of this test for resistance specifications. - Is the resistance within specification?	(+) EOT Sensor Connector, Component Side	(-) EOT Sensor Connector, Component Side	EOT	SIGRTN	Yes GO to DY8. No INSTALL a new EOT sensor.				
(+) EOT Sensor Connector, Component Side	(-) EOT Sensor Connector, Component Side									
EOT	SIGRTN									

DY4-DY7

Engine Oil Temperature (EOT) Sensor

DY

Test Step		Results / Action to Take						
DY8	CHECK THE SENSOR SIGNAL CIRCUIT FOR SHORTS TO PWR - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>EOT</td><td>VREF</td></tr><tr><td>EOT</td><td>VPWR</td></tr></table> - Are the resistances greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	EOT	VREF	EOT	VPWR	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
EOT	VREF							
EOT	VPWR							
DY9	CHECK THE SIGNAL AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) EOT Sensor Connector, Harness Side</th></tr><tr><td>EOT</td><td>EOT</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) EOT Sensor Connector, Harness Side	EOT	EOT	SIGRTN	SIGRTN	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) EOT Sensor Connector, Harness Side							
EOT	EOT							
SIGRTN	SIGRTN							
DY10	INTERMITTENT CHECK - Key in ON position. - Access the PCM and monitor the EOT_V PID. - While observing the PID, carry out the following: - Tap on the sensor to simulate road shock. - Wiggle the sensor connector. - Is there a large change in the voltage reading?	Yes Key in OFF position. DISCONNECT and INSPECT the connector. If OK, INSTALL a new EOT sensor. No GO to DY11.						
DY11	CHECK THE ELECTRONIC ENGINE CONTROL (EC) WIRING HARNESS - Access the PCM and monitor the EOT_V PID. - While observing the PID, carry out the following: - Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM. - Is there a large change in the voltage reading?	Yes ISOLATE the fault REPAIR as necessary. No GO to DY12.						

Engine Oil Temperature (EOT) Sensor

DY

Test Step		Results / Action to Take			
DY12	CHECK THE RESISTANCE OF THE EOT SENSOR WITH THE ENGINE RUNNING	Yes The fault is not present at this time GO to Z1. No INSTALL a new EOT sensor.			
- Run the engine until the engine temperature stabilizes. - Verify the upper radiator hose is hot and the cooling system is pressurized. - Measure the resistance between:<table><tr><td>(+) EOT Sensor Con- nector, Component Side</td><td>(-) EOT Sensor Con- nector, Component Side</td></tr><tr><td>EOT</td><td>SIGRTN</td></tr></table> - REFER to the chart at the beginning of this test for resistance specifications. - Is the resistance within specification for the given engine temperature?			(+) EOT Sensor Con- nector, Component Side	(-) EOT Sensor Con- nector, Component Side	EOT
(+) EOT Sensor Con- nector, Component Side	(-) EOT Sensor Con- nector, Component Side				
EOT	SIGRTN				
DY13	DTC P0298: ENGINE OIL OVER TEMPERATURE CONDITION	Yes ISOLATE the fault. REPAIR as necessary. REFER to Cooling System for cooling system diagnostics. No GO to DY14.			
- Engine oil temperature protection strategy in the PCM has been activated. — CHECK for an overheating condition and base engine concerns. - Are there any overheating or base engine concerns?					
DY14	CHECK FOR EOT SENSOR HARDWARE	Yes GO to DY2. No GO to DY15.			
- Engine oil temperature protection strategy in the PCM can be activated with or without an EOT sensor. - Does the vehicle have a EOT sensor?					
DY15	IDENTIFY THE CUSTOMER'S DRIVING HABITS	Yes Advise the customer that improper transmission gear selection and high RPM for an extended period initializes the engine protection strategy. No GO to DY16.			
- Identify the customer's driving habits. - Access the Freeze Frame Data (if available) and record the DTC malfunction conditions. - Does the vehicle appear to have been driven in a improper transmission gear or at high RPM for an extended period?					
DY16	TYPE OF ENGINE COOLANT SENSOR	Yes GO to DL25. No GO to DX21.			
Note: When an oil temperature sensor is not present, the PCM uses an oil algorithm to infer actual temperature based on input from the engine temperature sensor. Is the vehicle equipped with Cylinder head temperature (CHT) sensor?					

DY12-DY16

Test EM: Emission Compliance
PINPOINT TEST EM: EMISSION COMPLIANCE

Emission Compliance**EM**

Note: Canada and some states or metropolitan areas in the United States require periodic emission, or I/M tests. All Ford products are designed to pass these tests. If a Ford product fails an I/M test, it is probably because 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 new emission components are installed, carry out the following steps before repeating the I/M test procedure:

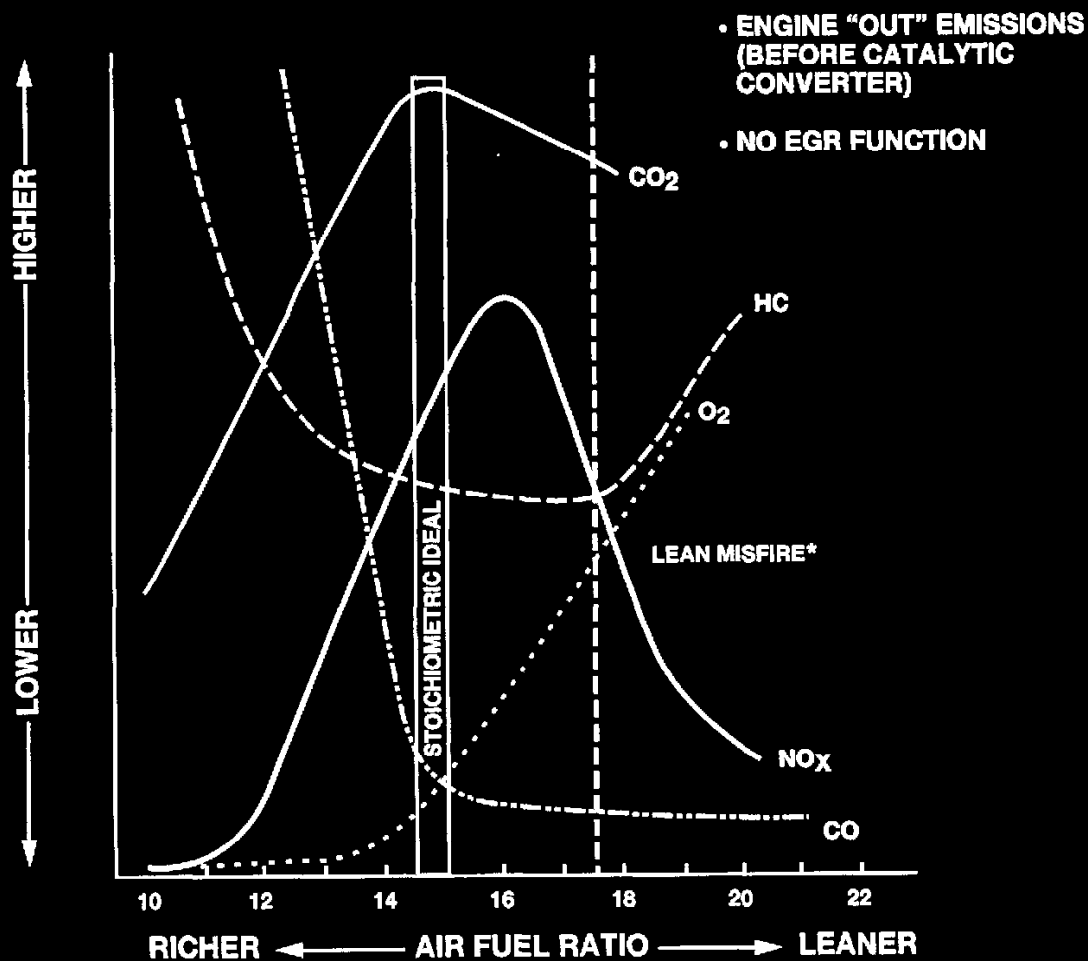
- Reset the keep alive memory (KAM). Refer to Diagnostic Methods, Resetting The Keep Alive Memory (KAM).
- To relearn some basic adaptive learning (trim) values, run the engine at 2,500 RPM for 1 minute and idle the engine for 2 minutes.

Note

Emission Compliance

EM

Exhaust Gas Analysis Chart



* EXACT AIR FUEL RATIO VARIES
DEPENDENT ON ENGINE

AA0215-A

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

For vehicle gas reading(s) that are excessive, compare the actual GPM reading to the gas cutpoint level needed to pass testing. This gives an indication of how much the PPM reading has to be reduced (if the actual reading is twice the cutpoint, the baseline reading has to be cut in half or more).

Test Graph, Description

Emission Compliance

EM

Example:

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

Test Step		Results / Action to Take
EM1	ANALYZE THE I/M TEST REPORT	
	• Analyze the I/M test report for data entry errors. — Model. — Model Year. — Correct calibration, if included on the report. — Correct test weight, if included on the report (this number is less than the vehicle's GVW). - Analyze the I/M test report results. — Identify high and low gas readings. — 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 GO to EM2 . No REPEAT the test step.
EM2	EVAP SYSTEM LEAK OR PURGE FLOW TEST (IF THESE TESTS WERE CARRIED OUT)	
	• Did the vehicle fail only an EVAP system leak or purge flow test (if these tests were carried out).	Yes EVAP concern only. GO to EM22 . No GO to EM3 .
EM3	BASELINE VEHICLES	
	Note: Baseline the vehicle exhaust gas readings is important so the baseline readings can be used for comparison after any repair is made. • Baseline the 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 GO to EM4 . No REPEAT the test step.

Description, EM1-EM3

Emission Compliance

EM

Test Step		Results / Action to Take
EM4	SYMPTOM CHECKS	
	- Check if any of the following symptoms are present. - Transmission concerns. - Idle concerns. - Driveability concerns. - Exhaust smoke. - Cooling system concerns. Are any of the symptoms present?	Yes CARRY OUT the PCM Quick Test. GO to Quick Test QT1. REFER to the Exhaust Gas Analysis Chart at the beginning of this pinpoint test. After any repair, GO to EM26. No GO to EM5.
EM5	PRELIMINARY CHECKS	
	- Carry out the following checks: - Vacuum lines (leak/blockage). - Electrical connections. - Proper scheduled maintenance. - Ford authorized emission controls and components installed on vehicle. - Intake air tube and air cleaner concerns (such as obstructions, leaks, or a dirty air cleaner element). Is a concern present?	Yes REPAIR as necessary. After any repair, GO to EM26. No GO to EM6.
EM6	CARRY OUT THE PCM QUICK TEST	
	- Carry out the PCM Quick Test to access any PCM DTCs. For the procedure information, GO to Pinpoint Test QT in Symptom Charts. Is a concern present?	Yes FOLLOW the Symptom Charts Quick Test direction. After any repair, GO to EM26. No GO to EM7.
EM7	CHECK FOR EXCESSIVE CARBON MONOXIDE (CO) LEVELS	
	Does the vehicle have excessive CO levels?	Yes Excessive CO levels indicate the engine is running rich. GO to EM10. No GO to EM8.
EM8	CHECK FOR EXCESSIVE HYDROCARBON (HC) LEVELS	
	Does the vehicle have excessive HC levels?	Yes Excessive HC levels with low to normal CO levels indicate the engine is running lean. GO to EM16. No GO to EM9.

Emission Compliance**EM**

Test Step		Results / Action to Take
EM9	CHECK FOR EXCESSIVE OXIDES OF NITROGEN (NOX) LEVELS	
	Does the vehicle have excessive NOx levels?	Yes GO to EM20 . No VERIFY the test step results.
EM10	HIGH CO LEVELS: CHECK THE HC LEVELS	
	Does the vehicle have excessive HC levels?	Yes CHECK for the engine running rich and incomplete combustion. GO to EM11 . No GO to EM12 .
EM11	CHECK THE SECONDARY IGNITION SYSTEM	
	- GO to JB1 and follow the Pinpoint Test direction. - Is a concern present?	Yes FOLLOW the pinpoint test direction. After any repair, GO to EM26 . No GO to EM12 .
EM12	CHECK THE FUEL DELIVERY SYSTEM FOR CONCERNS SUCH AS HIGH FUEL PRESSURE AND THE ABILITY TO HOLD PRESSURE	
	- GO to Pinpoint Test HC and follow the Pinpoint Test direction. - Is a concern present?	Yes FOLLOW the pinpoint test direction. After any repair, GO to EM26 . No GO to EM13 .
EM13	CHECK FOR VACUUM LEAKS/OBSTRUCTION IN THE PCV SYSTEM (SUCH AS OIL CAP, PCV VALVE, HOSES, CUT GROMMETS, VALVE COVER BOLT TORQUE/GASKET LEAK)	
	- GO to HG1 and follow the Pinpoint Test direction. - Is a concern present?	Yes FOLLOW the pinpoint test direction. After any repair, GO to EM26 . No GO to EM14 .

Emission Compliance

EM

Test Step		Results / Action to Take
EM14	CHECK THE EXHAUST SYSTEM	Yes FOLLOW the pinpoint test direction. After any repair, GO to EM26 . No GO to EM15 .
	- GO to HF1 and follow the Pinpoint Test direction. - Is a concern present?	
EM15	CHECK THE BASE ENGINE	Yes REPAIR as necessary. After any repair, GO to EM26 . No GO to EM27 .
	- Check for base engine concerns. Refer to Engine. - Is a concern present?	
EM16	HIGH HC WITH A NORMAL TO LOW CO LEVEL	Yes FOLLOW the pinpoint test direction. After any repair, GO to EM26 . No GO to EM17 .
	- Check the fuel delivery system for concerns. - GO to Pinpoint Test HC and follow the Pinpoint Test direction. - Is a concern present?	
EM17	CHECK THE SECONDARY IGNITION	Yes FOLLOW the pinpoint test direction. After any repair, GO to EM26 . No GO to EM18 .
	- GO to JB1 and follow the Pinpoint Test direction. - Is a concern present?	
EM18	CHECK FOR VACUUM LEAKS/OBSTRUCTION IN THE PCV SYSTEM (SUCH AS OIL CAP, PCV VALVE, HOSES, CUT GROMMETS, VALVE COVER BOLT TORQUE/GASKET LEAK)	Yes FOLLOW the pinpoint test direction. After any repair, GO to EM26 . No GO to EM19 .
	- GO to HG1 and follow the Pinpoint Test direction. - Is a concern present?	

Emission Compliance

EM

Test Step		Results / Action to Take
EM19	CHECK THE BASE ENGINE	
	- Check for base engine concerns such as intake manifold leaks, improper compression, or valvetrain or camshaft damage. Refer to Engine. - Is a concern present?	Yes REPAIR as necessary. After any repair, GO to EM26 . No GO to EM27 .
EM20	HIGH NOX WITH NORMAL TO LOW HC AND CO LEVELS: CHECK THE BASE ENGINE	
	- Check for base engine concerns such as excessive carbon build up in the combustion chamber. Refer to Engine. - Is a concern present?	Yes REPAIR as necessary. After any repair, GO to EM26 . No GO to EM21 .
EM21	ADDITIONAL CHECKS	
	- Check the following: - Transmission torque converter clutch operation. - Cooling system concerns (such as an aftermarket front fascia covering the intake air or intake air system modifications). - Engine running lean (concerns such as vacuum leaks or low fuel pressure). - Is a concern present?	Yes REPAIR as necessary. After any repair, GO to EM26 . No GO to EM27 .
EM22	EVAP SYSTEM CONCERN: PRELIMINARY CHECKS	
	- Analyze the I/M test report to determine when the concern is present. Attempt to verify the concern. - Check the following: - Fuel filler cap. - EVAP system lines/hoses (check for proper connections, damage or blockage). - Fuel vapor storage canister damage. - Is a concern present?	Yes REPAIR as necessary. After any repair, GO to EM25 . No GO to EM23 .
EM23	CARRY OUT THE PCM QUICK TEST	
	- Carry out the PCM Quick Test to access any PCM DTCs. For the procedure information, GO to Pinpoint Test QT in Symptom Charts. - Is a concern present?	Yes FOLLOW the Symptom Charts Quick Test direction. After any repair, GO to EM25 . No GO to EM24 .

Emission Compliance**EM**

Test Step		Results / Action to Take
EM24	EVAP SYSTEM CHECK • Check the EVAP system for leaks. Refer to Evaporative Emissions System. • Is a concern present?	Yes REPAIR as necessary. After any repair, GO to EM25 . No VERIFY the test step results. If all the test steps are OK, GO to Z1 . For additional symptoms, refer to Symptom Charts. After any repair, GO to EM25 .
EM25	EVAP SYSTEM REPAIR VERIFICATION • Confirm the vehicle repair. • Reset the keep alive memory (KAM). Refer to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). 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 2,500 RPM for 1 minute and idle the engine for 2 minutes. • Carry out the PCM Quick Test to access any PCM DTCs. For the procedure information, GO to Pinpoint Test QT in Symptom Charts. • Carry out the EVAP system leak test and flow check. • Does the vehicle pass the EVAP system leak test and flow check?	Yes SAVE any repair documentation that may be required by local/federal laws. RETURN the vehicle to the customer. No The original concern was not repaired, or another concern exists. GO to EM1 .

Emission Compliance**EM**

Test Step		Results / Action to Take
EM26	REPAIR AND VERIFICATION • Confirm the vehicle repair. • Reset the keep alive memory (KAM). Refer to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). 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 2,500 RPM for 1 minute and idle the engine for 2 minutes. • Carry out the PCM Quick Test to access any PCM DTCs. For the procedure information, GO to Pinpoint Test QT in Symptom Charts. — Repair any other DTCs. • Carry out the baseline test using the exhaust gas analyzer. Note: If vehicle needs to be driven for the baseline test, it may be necessary to drive the vehicle first up to 8 km (5 mi) to relearn some additional adaptive learning (trim) values. Also, during the baseline make sure to use the same drive mode that was used for the original baseline test. • For I/M 240 emission testing areas: — 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 the gas levels are within the acceptable range. • Are all gases within the acceptable range?	Yes SAVE any repair documentation that may be required by local/federal laws. RETURN the vehicle to the customer. No The gas level is still high, or another gas level is above the acceptable range. GO to EM1.

Emission Compliance**EM**

Test Step		Results / Action to Take
EM27	CATALYST DELTA TEMPERATURE TEST • Complete all previous testing. • Disable the AIR system, if equipped. • Run the engine for 2 minutes at 2,500 RPM to heat the exhaust system. • Key in OFF position. • Disconnect and ground 1 spark plug wire from each cylinder bank (for coil-on-plug applications, disconnect the coil connector). • Run the engine at approximately 1,000 RPM. • Disconnect the IAC valve and maintain 1,000 RPM (if equipped). • Measure the surface temperature at both the inlet and outlet of each catalytic converter. • Compare the difference in temperature between the inlet and outlet readings of each catalytic converter. • Does each catalytic converter have a difference of more than 28°C (50°F) between its inlet and outlet reading?	Yes The catalytic converter(s) is operating correctly. CONNECT the spark plug wire(s), the IAC, and the AIR system (if equipped). CLEAR the DTCs. VERIFY the test step results. If all test steps are OK, GO to Z1. For additional symptoms, refer to Symptom Charts. After any repair, GO to EM26. No For catalytic converter(s) that have less than 28°C (50°F) difference, testing indicates the catalytic converter(s) is not working. REPEAT the test to verify the results. If the temperature difference is still less than required, INSTALL a new catalytic converter. After any repair, GO to EM26.

EM27

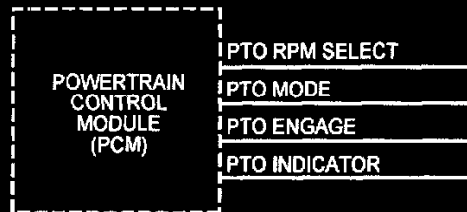
Test FB: Power Take Off (PTO)
PINPOINT TEST FB: POWER TAKE OFF (PTO)

Power Take Off (PTO)

FB

This pinpoint test is intended to diagnose the following:

- PTO switch.
- Harness circuit: PTO, PTOIL.
- Powertrain control module (PCM) (12A650).



N0012401

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Connector	Circuit	Pin
170 Pin	PTORPM PTOIL PTOENG PTO	B7 B42 B9 B26

Note, Diagram And Connector

Power Take Off (PTO)

FB

Test Step		Results / Action to Take
FB1	PTO NOT WORKING CORRECTLY: CHECK THE PTO INDICATOR LAMP OPERATION	
	Note: The following conditions must be met before the PTO will engage: — Engine at normal operating temperature. — Accelerator pedal is released. — TFT within normal operating temperature. — Parking brake is applied. — Brake pedal is released. — Automatic transmission is in the PARK position. — Manual transmission - the clutch pedal is released. Note: This step requires operating the PTO component. Refer to the aftermarket manufacturer for the PTO operating instructions. Follow all safety precautions. • Key on engine running. • Activate the PTO switch. • Does the PTO light illuminate?	Yes GO to the aftermarket PTO mechanical manual. No GO to FB2.
FB2	CHECK THE INTEGRITY OF THE PTO SWITCH AND THE PTO SWITCH CIRCUIT	
	• Access the PCM and monitor the PTO PID. • Cycle the PTO switch. From off to on to off. • Does the PTO PID change state?	Yes GO to FB3. No REPAIR the PTO circuit or switch as necessary
FB3	CHECK THE PTO LOAD PID STATE IN THE PCM	
	• Access the PCM and monitor the PTO LOAD PID. • Cycle the PTO switch. • Does the PTO LOAD PID change state?	Yes GO to FB4. No REPAIR the PTO ENG circuit or switch as necessary.
FB4	CHECK THE PTOIR_V PID STATE IN THE PCM	
	• Access the PCM and monitor the PTOIR_V PID. • Cycle the PTO switch. • Does the PTOIR_V PID change state?	Yes GO to FB5. No REPAIR the PTO RPM circuit or switch as necessary.
FB5	CHECK THE PTOIL PID STATE IN THE PCM	
	• Access the PCM and monitor the PTOIL PID. • Cycle the PTO switch. • Does the PTOIL PID change state?	Yes GO to FB6. No VERIFY no DTCs are present. VERIFY the vehicle conditions in step FB1 are correct for PTO operation.

Power Take Off (PTO)**FB**

Test Step		Results / Action to Take
FB6	PTO INDICATOR LAMP ALWAYS OFF OR ON: CHECK THE PTOIL_F PID	
- Access the PCM and monitor the PTOIL_F PID. - Is a fault present?		Yes Key in OFF position. REPAIR the circuit as necessary. No Key in OFF position. GO to the aftermarket PTO mechanical manual.

FB6

Test FD: Brake Pedal Inputs

PINPOINT TEST FD: BRAKE PEDAL INPUTS

Brake Pedal Inputs

FD

This pinpoint test is intended to diagnose the following:

- Brake pedal position (BPP) (13480).
- Brake pedal switch (BPS) (9F490).
- Harness circuits: B+, BPP, BPS.
- Powertrain control module (PCM) (12A650).

Refer to the Wiring Diagrams Manual for specific vehicle application and pin locations.

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator, LS, Thunderbird	150 (60-32-58) Pin	BPS BPP	B28 B40
Crown Victoria, Explorer, Grand Marquis, Mountaineer	150 (50-50-50) Pin	BPS BPP	B7 B8
E-Series, F-Super Duty, Mustang	170 Pin	BPS BPP	E65 B8
Escape, Focus, Mariner	150 (50-50-50) Pin	BPP	B8
Expedition, F-150, Navigator	190 Pin	BPS BPP	B47 B46
Five Hundred, Freestyle, Montego, Town Car	150 (50-50-50) Pin	BPS	B7
All other vehicles	104 Pin	BPP	92

Note And Connector

Brake Pedal Inputs

FD

Test Step		Results / Action to Take
FD1	KOER DTCS P0703 AND P1703: VERIFY THE BRAKE PEDAL WAS APPLIED	
	Was the brake pedal applied and released during the KOER self-test?	Yes GO to FD2 . No RERUN KOER Self-Test. Apply and release the brake pedal during the KOER test.
FD2	DTCS P0703, P1572 AND P1703: CHECK THE OPERATION OF THE STOPLAMPS	
	- Key in ON position. - Apply and release the brake pedal and check the stop lamp operation. - Do the stoplamps operate correctly?	Yes GO to FD3 . No REFER to Lighting and Horns to diagnose the stoplamps.
FD3	CHECK SPEED CONTROL OPERATION	
	- Check for correct speed control operation (if equipped). - Does speed control operate correctly?	Yes GO to FD4 . No REFER to Cruise Control to diagnose the speed control system.
FD4	CHECK FOR BPP NETWORK MESSAGE	
	- Is the vehicle one of the following: — Five Hundred. — Freestar. — Freestyle. — Montego. — Monterey. — Town Car. - Is vehicle listed above?	Yes GO to FD5 . No GO to FD6 .
FD5	CHECK BRAKE SWITCH OPERATION	
	- Key in ON position. - Access the PCM and monitor the BPP/BOO PID. - Apply and release the brake pedal while monitoring the brake position PID. - Does the PID cycle ON and OFF?	Yes Key in OFF position. For vehicles with BPS GO to FD7 . For vehicles without BPS GO to FD9 . No REFER to Information Bus (Module Communications Network) to diagnose the communication network.

Brake Pedal Inputs

FD

Test Step		Results / Action to Take				
FD6	CHECK FOR BPP CIRCUIT CYCLING • Key in OFF position. • PCM connector disconnected. • Key in ON position. • Apply and release the brake pedal while monitoring the voltage. • Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>BPP</td><td>Ground</td></tr></table> • Is voltage less than 1 volt with the brake pedal released and greater than 10 volts with the brake pedal fully applied?	(+) PCM Connector, Harness Side	(-)	BPP	Ground	Yes For vehicles with BPS GO to FD7 . For vehicles without BPS GO to FD9 . No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-)					
BPP	Ground					
FD7	CHECK FOR BPS CIRCUIT CYCLING • Key in ON position. • PCM connector disconnected. • Apply and release the brake pedal while monitoring the voltage. • Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>BPS</td><td>Ground</td></tr></table> • Is voltage greater than 10 volts with the brake pedal released and less than 1 volt with the brake pedal fully applied?	(+) PCM Connector, Harness Side	(-)	BPS	Ground	Yes Key in OFF position. GO to FD9 . No GO to FD8 .
(+) PCM Connector, Harness Side	(-)					
BPS	Ground					
FD8	CHECK THE BPS CIRCUIT VOLTAGE • Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>BPS</td><td>Ground</td></tr></table> • Is the voltage reading greater than 10.5 volts?	(+) PCM Connector, Harness Side	(-)	BPS	Ground	Yes Key in OFF position. REPAIR the short circuit. No Key in OFF position. REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-)					
BPS	Ground					
FD9	CHECK FOR CORRECT PCM OPERATION • Visually inspect for: — pushed out pins. — corrosion. • Connect all the PCM connectors and make sure they seat correctly. • Carry out the PCM self-test and verify the concern is still present. • Is the concern still present?	Yes INSTALL a new PCM. REFER to Diagnostic Methods,Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. GO to Pinpoint Test Z.				

FD6-FD9

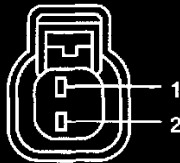
Test FF: Power Steering Pressure (PSP) Switch

PINPOINT TEST FF: POWER STEERING PRESSURE (PSP) SWITCH

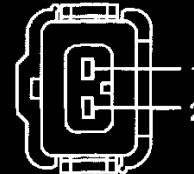
Power Steering Pressure (PSP) Switch**FF**

This pinpoint test is intended to diagnose the following:

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

Power Steering Pressure (PSP) Switch Connector**A**

A0077564

B

A0077534

Vehicle	Connector	Circuit	Pin
Escape 2.3L, Town Car	A	SIGRTN PSP	2 1
All other vehicles	B	SIGRTN PSP	1 2

The PSP and SIGRTN circuits may be reversed in the harness connector. Refer to Vehicle/Diagrams for more information.

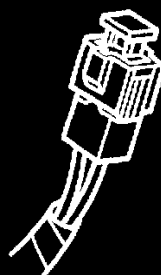
Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Note And Connectors

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

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	SIGRTN PSP	B17 B37
Escape, Mariner	150 (50-50-50) Pin	SIGRTN PSP	B41 B3
F-150	190 Pin	SIGRTN PSP	E58 E24
Focus	150 (50-50-50) Pin	SIGRTN PSP	B41 B15
Freestar/Monterey, Ranger, Sable, Taurus	104 Pin	SIGRTN PSP	91 31
LS, Thunderbird	150 (60-32-58) Pin	SIGRTN PSP	E17 E5
Mustang	170 Pin	SIGRTN PSP	E33 B33
All other vehicles	150 (50-50-50) Pin	SIGRTN PSP	E41 B46

Shorting Bar for Harness Circuit without PSP Switch (typical)**A24595-A**

Connector, Schematic

Power Steering Pressure (PSP) Switch

FF

Test Step		Results / Action to Take						
FF1	KOER DTC P1650: DID YOU TURN THE STEERING WHEEL AT LEAST ONE HALF TURN WITHIN 20 SECONDS OF STARTING THE KOER SELF-TEST?							
Did you turn the steering wheel at least one half turn within 20 seconds of starting the KOER self-test?		Yes GO to FF2. No CARRY OUT the KOEO self-test.						
FF2	DTC P1650: CHECK THE PSP PID							
- Key on engine running. - Access the PCM and monitor the PSP PID. - Turn the steering wheel back and forth. - Does the PID state change?		Yes GO to FF6. No Key in OFF position. GO to FF3.						
FF3	CHECK THE PSP CIRCUITS TO THE PSP SWITCH FOR CYCLING							
- PSP Switch connector disconnected. - Key in ON position. - Access the PCM and monitor the PSP PID. - Connect a 5 amp fused jumper wire between the following: <table><tr><td>Point A PSP Switch Connector, Harness Side</td><td>Point B PSP Switch Connector, Harness Side</td></tr><tr><td>PSP</td><td>SIGRTN</td></tr></table> - Remove the jumper wire(s) - Does the PID state change?		Point A PSP Switch Connector, Harness Side	Point B PSP Switch Connector, Harness Side	PSP	SIGRTN	Yes INSTALL a new PSP switch. No Key in OFF position. GO to FF4.		
Point A PSP Switch Connector, Harness Side	Point B PSP Switch Connector, Harness Side							
PSP	SIGRTN							
FF4	CHECK THE PSP & SIGRTN CIRCUIT FOR AN OPEN IN THE HARNESS							
- PCM connector disconnected. - Measure the resistance between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PSP Switch Connector, Harness Side</td></tr><tr><td>PSP</td><td>PSP</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> - Are the resistances less than 5 ohms?		(+) PCM Connector, Harness Side	(-) PSP Switch Connector, Harness Side	PSP	PSP	SIGRTN	SIGRTN	Yes GO to FF5. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) PSP Switch Connector, Harness Side							
PSP	PSP							
SIGRTN	SIGRTN							

FF1-FF4

Power Steering Pressure (PSP) Switch

FF

Test Step		Results / Action to Take								
FF5	CHECK THE PSP CIRCUIT(S) FOR A SHORT TO SIGRTN OR GND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) PSP Switch Connector, Harness Side</td><td>(-)</td></tr><tr><td>PSP</td><td>Ground</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PSP Switch Connector, Harness Side</td><td>(-) PSP Switch Connector, Harness Side</td></tr><tr><td>PSP</td><td>SIGRTN</td></tr></table> - Is the resistance less than 10K ohms?	(+) PSP Switch Connector, Harness Side	(-)	PSP	Ground	(+) PSP Switch Connector, Harness Side	(-) PSP Switch Connector, Harness Side	PSP	SIGRTN	Yes REPAIR the short circuit. No INSTALL a new PCM. REFER to Diagnostic Methods,Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
(+) PSP Switch Connector, Harness Side	(-)									
PSP	Ground									
(+) PSP Switch Connector, Harness Side	(-) PSP Switch Connector, Harness Side									
PSP	SIGRTN									
FF6	DTC P1651: CHECK THE PSP CIRCUIT(S) 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 is present. - Key in ON position. - Access the PCM and monitor the PSP PID. - Check for open circuits while carrying out the following (a fault will be indicated by a sudden change in the PCM-PSP PID): - Shake, wiggle, and bend the PSP and SIGRTN circuit(s). - Lightly tap on the PSP to simulate road shock. - PSP Switch connector disconnected. - Check the PSP circuit for short to ground while carrying out the following: - Shake, wiggle, and bend the PSP circuit(s). - Is a concern present?	Yes Key in OFF position. ISOLATE the fault. REPAIR as necessary. No Key in OFF position. CONNECT the PSP switch. Unable to duplicate or identify the fault at this time. GO to Z1.								

FF5-FF6

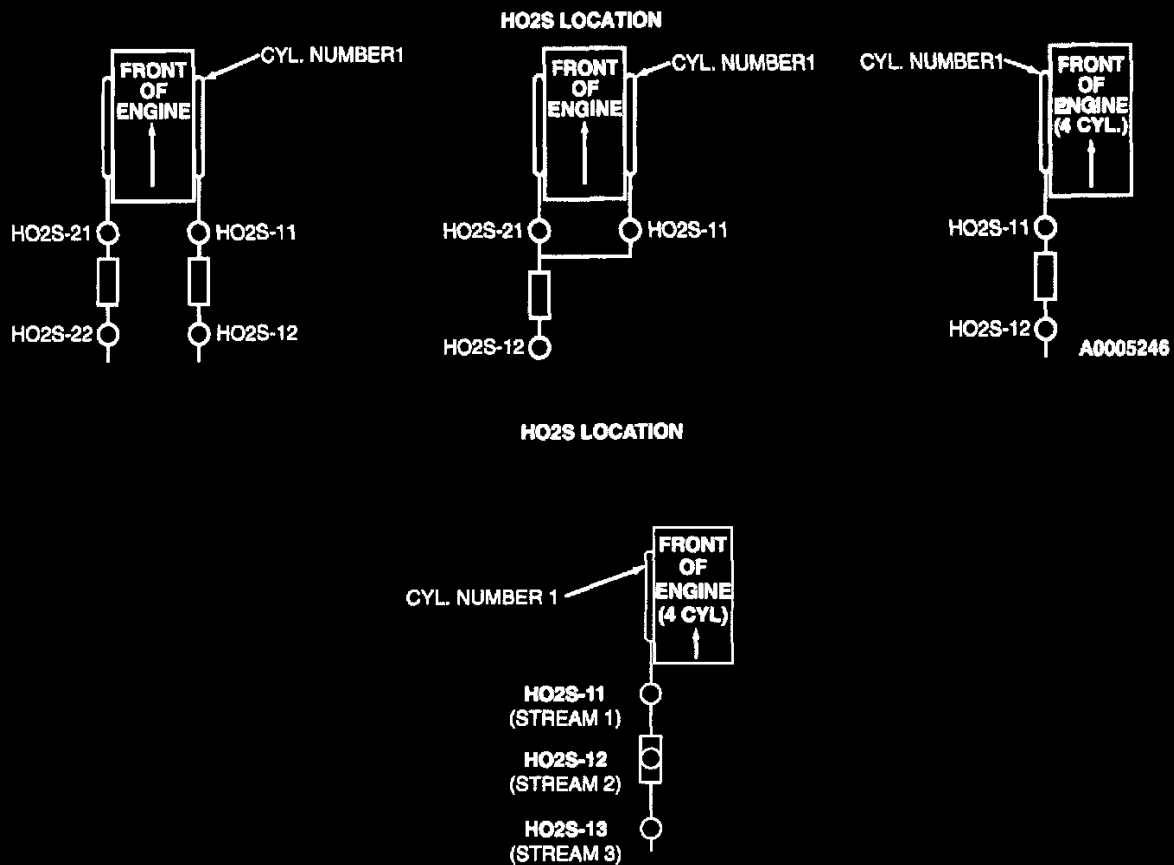
Test H: Fuel Control
PINPOINT TEST H: FUEL CONTROL

Fuel Control

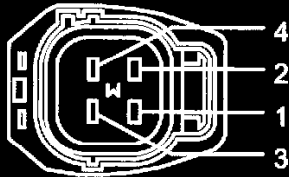
H

This pinpoint test is intended to diagnose the following:

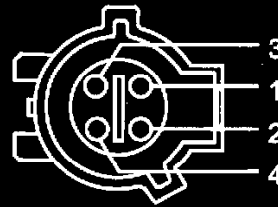
- HO2S/O2S (9F472).
- HO2S/O2S (9G444).
- Fuel injector(s) (9F593).
- Harness circuits: HO2S, SIGRTN, VPWR, HO2S Heater, and INJ 1 - 10.
- Vacuum systems.
- Powertrain control module (PCM) (12A650).



Note

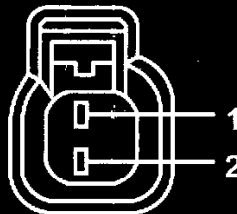
Fuel Control**H****Heated Exhaust Oxygen Sensor (HO2S) Connector****A**

A0077521

B

A0077561

Vehicle	Connector	Circuit	Pin
Focus 2.0L	A	HO2S Heater	2
		SIGRTN	3
		VPWR	1
		HO2S Signal	4
All other vehicles	B	HO2S Heater	1
		SIGRTN	4
		VPWR	2
		HO2S Signal	3

Injector (INJ) Connector

A0077525

Fuel Control**H**

Circuit	Pin
VPWR (Power Supply)	2
INJ (Injector)	1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ8 INJ7 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T16 E8 T15 E7 T29 E44 T28 E45 E37 E29 E21 E11 E32 E24 E14 E2 E20 B32 B17, E17, T17
Crown Victoria, Grand Marquis, Town Car	150 (50-50-50) Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ8 INJ7 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T48 E50 T47 E49 T25 E31 T24 E30 E11 E10 E9 E8 E5 E4 E3 E2 E40 B35 B41, E41, T41

(Continued)

Fuel Control**H**

Vehicle	Connector	Circuit	Pin
E-Series 4.6L, E-Series 5.4L 4R75E, E-Series 5.4L 5R100, F-Super Duty 5.4L	170 Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ8 INJ7 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T48 E70 T47 E69 T25 E29 T24 E28 E38 E55 E37 E54 E36 E53 E35 E52 E57 B35 B41, E58, T41
E-Series 6.8L	170 Pin	HTR22 HTR21 HTR13 HTR12 HTR11 HO2S22 HO2S21 HO2S13 HO2S12 HO2S11 INJ10 INJ9 INJ8 INJ7 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T48 E70 T38 T47 E69 T25 E29 B14 T24 E28 E39 E56 E38 E55 E37 E54 E36 E53 E35 E52 E57 B35 B41, E58, T41

(Continued)

Chart

Fuel Control**H**

Vehicle	Connector	Circuit	Pin
Escape 3.0L, Mariner 3.0L	150 (50-50-50) Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T48 E48 T47 E49 T25 E26 T24 E30 E15 E3 E4 E13 E5 E2 E40 B35 B41, E41, T41
Escape 2.3L, Focus 2.3L, Focus 2.0L, Mariner 2.3L	150 (50-50-50) Pin	HTR12 HTR11 HO2S12 HO2S11 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T47 E49 T24 E30 E5 E4 E3 E2 E40 B35 B41, E41, T41
Excursion 5.4L	104 Pin	HTR21 HTR12 HTR11 HO2S21 HO2S12 HO2S11 INJ8 INJ7 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	94 95 93 87 35 60 98 72 99 73 100 74 101 75 90 71 91

(Continued)

Chart

Fuel Control**H**

Vehicle	Connector	Circuit	Pin
Excursion 6.8L	104 Pin	HTR21 HTR12 HTR11 HO2S21 HO2S12 HO2S11 INJ10 INJ9 INJ8 INJ7 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	94 95 93 87 35 60 42 68 98 72 99 73 100 74 101 75 90 71 91
Expedition, F-150 4.6L, F-150 5.4L	190 Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ8 INJ7 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T12 E70 T1 E69 T21 E28 T22 E29 E38 E55 E37 E54 E36 E53 E35 E52 E57 B51 B58, E58, T43
Explorer SportTrac	104 Pin	HTR21 HTR12 HTR11 HO2S21 HO2S12 HO2S11 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	94 95 93 87 35 60 99 73 100 74 101 75 90 71 91

(Continued)

Chart

Fuel Control**H**

Vehicle	Connector	Circuit	Pin
Explorer 4.0L, Mountaineer 4.0L	150 (50-50-50) Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T48 E50 T47 E49 T25 E31 T24 E30 E9 E8 E5 E4 E3 E2 E40 B35 B41, E41, T41
Explorer 4.6L, Mountaineer 4.6L	150 (50-50-50) Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ8 INJ7 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T48 E50 T47 E49 T22 E31 T24 E30 E11 E10 E9 E8 E5 E4 E3 E2 E40 B35 B41, E41, T41
F-150 4.2L	190 Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T12 E70 T1 E69 T21 E28 T22 E29 E37 E54 E36 E53 E35 E52 E57 B51 B58, E58, T43

(Continued)

Chart

Fuel Control**H**

Vehicle	Connector	Circuit	Pin
F-Super Duty 6.8L	170 Pin	HTR22 HTR21 HTR13 HTR12 HTR11 HO2S22 HO2S21 HO2S13 HO2S12 HO2S11 INJ10 INJ9 INJ8 INJ7 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T48 E70 B38 T47 E69 T25 E29 B14 T24 E28 E39 E56 E38 E55 E37 E54 E36 E53 E35 E52 E57 B35 B41, E58, T41
Five Hundred, Freestyle, Montego	150 (50-50-50) Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T48 E50 T47 E49 T25 E31 T24 E30 E9 E8 E5 E4 E3 E2 E40 B35 B41, E41
Focus 2.0L PZEV	150 (50-50-50) Pin	HTR13 HTR12 HTR11 HO2S13 HO2S12 HO2S11 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T48 T47 E49 T25 T24 E30 E5 E4 E3 E2 E40 B35 B41, E41, T41

(Continued)

Chart

Fuel Control**H**

Vehicle	Connector	Circuit	Pin
Ford GT	104 Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ8 INJ7 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	96 94 95 93 61 87 35 60 98 72 99 73 100 74 101 75 90 71 91
LS 3.0L	150 (60-32-58) Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T16 E8 T15 E7 T29 E44 T28 E45 E28 E20 E11 E21 E46 E47 E14 B32 B5, E17, T14
LS 3.9L, Thunderbird	150 (60-32-58) Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ8 INJ7 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T16 E8 T15 E7 T29 E44 T28 E45 E37 E29 E21 E11 E46 E28 E20 E47 E14 B32 B5, E17, T14

(Continued)

Chart

Fuel Control**H**

Vehicle	Connector	Circuit	Pin
Mustang 4.0L	170 Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T48 E70 T47 E69 T25 E29 T24 E28 E37 E54 E36 E53 E35 E52 E24 B35 B43, E33, T41
Mustang 4.6L	170 Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ8 INJ7 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T48 E70 T47 E69 T25 E29 T24 E28 E38 E55 E37 E54 E36 E53 E35 E52 E24 B35 B43, E33, T41
Navigator	190 Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ8 INJ7 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	T12 E70 T1 E69 T21 E28 T22 E29 E38 E55 E37 E54 E36 E53 E35 E52 E57 B51 B58, E58

(Continued)

Chart

Fuel Control

H

Vehicle	Connector	Circuit	Pin
Ranger 2.3L	104 Pin	HTR12 HTR11 HO2S12 HO2S11 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	95 93 35 60 100 74 101 75 90 71 91
All other vehicles	104 Pin	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 INJ6 INJ5 INJ4 INJ3 INJ2 INJ1 VREF VPWR SIGRTN	96 94 95 93 61 87 35 60 99 73 100 74 101 75 90 71 91

Test Step		Results / Action to Take
H1	CARRY OUT THE KOER SELF-TEST	
	- Engine at normal operating temperature. - Check for self-test DTCs: Are DTCs P0040, P0041, P1127, P1128, P1129 or P2278 present?	Yes Key in OFF position. DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to H2.
H2	CONTINUOUS MEMORY DTC P0133: HO2S RESPONSE TEST	
	- Key in ON position. - Access the diagnostic monitoring test results for the HO2S11. Is the indicated value greater than the minimum threshold?	Yes Key in OFF position. CLEAR the DTCs. GO to H1. No GO to H3.

Chart And H1-H2

Fuel Control

H

Test Step		Results / Action to Take						
H3	CHECK FOR UNMETERED AIR LEAKS Note: Fuel calculations can be affected by unmetered air leaks. - Carefully inspect the following areas for potential air leaks: - Hoses connecting to the MAF sensor assembly. - Hoses connecting to the throttle body. - Intake manifold gasket leaks. - PCV disconnected. - The vacuum lines are disconnected. - Improperly seated engine oil dipstick, tube or oil fill cap. - Exhaust leaks at flanges and gaskets. Are any air leaks present?	Yes REPAIR the source of the air leak. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No GO to H4.						
H4	CHECK HO2S CIRCUIT CONTINUITY - HO2S connector disconnected. - Check the connector (both halves) for any water contamination. - Connect a 5 amp fused jumper wire between the following:<table border="1"><tr><th>Point A HO2S Connector, Harness Side</th><th>Point B HO2S Connector, Harness Side</th></tr><tr><td>HO2S Signal</td><td>VPWR</td></tr></table> - Key on engine running. Note: HO2S is displayed as O2S on the diagnostic tool. - Access the PCM and monitor the HO2S Signal PID. Is the voltage greater than 1 V?	Point A HO2S Connector, Harness Side	Point B HO2S Connector, Harness Side	HO2S Signal	VPWR	Yes Key in OFF position. INSTALL a new HO2S. INSTALL a new engine oil filter. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No Key in OFF position. GO to H5.		
Point A HO2S Connector, Harness Side	Point B HO2S Connector, Harness Side							
HO2S Signal	VPWR							
H5	CHECK THE HO2S CIRCUIT(S) FOR AN OPEN IN THE HARNESS - Remove the jumper wire(s). Note: A vehicle hoist may be required to access the HO2S harness. - Visually inspect the HO2S harness for exposed wiring, water contamination, corrosion, and proper assembly. - PCM connector disconnected. - Measure the resistance between:<table border="1"><tr><th>(+) PCM Connector, Harness Side</th><th>(-) HO2S Connector, Harness Side</th></tr><tr><td>HO2S Signal</td><td>HO2S Signal</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side	HO2S Signal	HO2S Signal	SIGRTN	SIGRTN	Yes GO to H6. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side							
HO2S Signal	HO2S Signal							
SIGRTN	SIGRTN							

Fuel Control

H

Test Step		Results / Action to Take					
H6	CHECK THE HO2S CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS	Yes GO to H7. No GO to H9.					
- Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>HO2S Signal</td><td>VPWR</td></tr></table> - Is the resistance greater than 10K ohms?			(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	HO2S Signal	VPWR	
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side						
HO2S Signal	VPWR						
H7	DTCS P0131, P0135, P0141, P0147, P0151, P0155, P0161 OR P0167: CHECK FOR A SOURCE OF POTENTIAL HO2S CONTAMINATION	Yes REPAIR the source of the contamination. CHANGE the engine oil filter. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No GO to H8.					
- Investigate the following items as potential sources of HO2S contamination: - Use of unapproved silicon sealers. - Fuel contaminated by silicon additives. - Excessive oil burning. (rings, valve seals, oil overfill). - Glycol leaking internally in the engine. - Lead-contaminated fuel. - Short drive cycles in cold weather. - Use of unapproved cleaning agents. - Is a concern present?							
H8	VISUALLY INSPECT THE HO2S HARNESS	Yes REPAIR as necessary. No GO to H9.					
- PCM connector connected. - Visually inspect the HO2S harness for exposed wiring, water contamination, corrosion, and proper assembly. - Is a concern present?							
H9	CHECK THE HO2S AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS	Yes GO to H10. No REPAIR as necessary.					
Note: Verify the harness pins are in the proper location. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) HO2S Connector, Harness Side</td></tr><tr><td>HO2S Signal</td><td>HO2S Signal</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> - Are the resistances less than 5 ohms?			(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side	HO2S Signal	HO2S Signal	SIGRTN
(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side						
HO2S Signal	HO2S Signal						
SIGRTN	SIGRTN						
H10	CARRY OUT THE KOEO ON DEMAND SELF-TEST	Yes Key in OFF position. GO to H11. No Key in OFF position. GO to H12.					
- Key in ON position. - Check for KOEO DTCs: - Are DTCs P0135, P0141, P0147, P0155, P0161 or P0167 present?							

Fuel Control

H

Test Step		Results / Action to Take												
H11	DTCS P0053, P0054, P0055, P0059, P0060 AND P0061: CHECK FOR VPWR IN THE HARNESS	Yes Key in OFF position. GO to H12. No REPAIR the open circuit. Check fuses.												
Note: If DTCs are present, test their related circuits individually. - HO2S connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) HO2S Connector, Harness Side</td><td>(-) HO2S Connector, Harness Side</td></tr><tr><td>VPWR</td><td>SIGRTN</td></tr></table> - Is the voltage greater than 10.5 V?			(+) HO2S Connector, Harness Side	(-) HO2S Connector, Harness Side	VPWR	SIGRTN								
(+) HO2S Connector, Harness Side	(-) HO2S Connector, Harness Side													
VPWR	SIGRTN													
H12	CHECK THE HO2S HEATER FOR SHORTS IN THE HARNESS													
- HO2S connector disconnected. - PCM connector disconnected. Note: If DTCs P0053, P0054, P0055, P0059, P0060 or P0061 are present, test their related circuits individually. - Measure the resistance between:<table><tr><td>(+) HO2S Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>HO2S Heater</td><td>Negative terminal</td></tr></table> - Measure the resistance between:<table><tr><td>(+) HO2S Connector, Harness Side</td><td>(-) HO2S Connector, Harness Side</td></tr><tr><td>HO2S Heater</td><td>VPWR</td></tr><tr><td>HO2S Heater</td><td>SIGRTN</td></tr><tr><td>HO2S Heater</td><td>HO2S Signal</td></tr></table> - Are the resistances greater than 10K ohms?		(+) HO2S Connector, Harness Side	(-) Vehicle Battery	HO2S Heater	Negative terminal	(+) HO2S Connector, Harness Side	(-) HO2S Connector, Harness Side	HO2S Heater	VPWR	HO2S Heater	SIGRTN	HO2S Heater	HO2S Signal	Yes GO to H13. No REPAIR the short circuit.
(+) HO2S Connector, Harness Side	(-) Vehicle Battery													
HO2S Heater	Negative terminal													
(+) HO2S Connector, Harness Side	(-) HO2S Connector, Harness Side													
HO2S Heater	VPWR													
HO2S Heater	SIGRTN													
HO2S Heater	HO2S Signal													
H13	CHECK THE HO2S HEATER CIRCUIT FOR AN OPEN IN THE HARNESS													
- Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) HO2S Connector, Harness Side</td></tr><tr><td>HO2S Heater</td><td>HO2S Heater</td></tr></table> - Is the resistance less than 5 ohms?		(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side	HO2S Heater	HO2S Heater	Yes GO to H14. No REPAIR the open circuit.								
(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side													
HO2S Heater	HO2S Heater													

Fuel Control

H

Test Step		Results / Action to Take								
H14	CHECK THE INTERNAL RESISTANCE OF HO2SHTR - Measure the resistance between:<table><tr><td>(+) HO2S Connector, Component Side</td><td>(-) HO2S Connector, Component Side</td></tr><tr><td>HO2S Heater</td><td>VPWR</td></tr></table> - Is the resistance between 3 ohms - 30 ohms?	(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side	HO2S Heater	VPWR	Yes GO to H15. No INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM).				
(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side									
HO2S Heater	VPWR									
H15	CHECK THE HO2S HEATER CIRCUIT FOR AN INTERNAL SHORT TO SIGRTN OR GND - Measure the resistance between:<table><tr><td>(+) HO2S Connector, Component Side</td><td>(-) HO2S Connector, Component Side</td></tr><tr><td>HO2S Heater</td><td>SIGRTN</td></tr></table> - Measure the resistance between:<table><tr><td>(+) HO2S Connector, Component Side</td><td>(-) Vehicle Battery</td></tr><tr><td>HO2S Heater</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side	HO2S Heater	SIGRTN	(+) HO2S Connector, Component Side	(-) Vehicle Battery	HO2S Heater	Negative terminal	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM).
(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side									
HO2S Heater	SIGRTN									
(+) HO2S Connector, Component Side	(-) Vehicle Battery									
HO2S Heater	Negative terminal									
H16	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). - Access the PCM 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 the following: P0171, P0174, P1130, P1131, P1150, P1151, P2195 or P2197?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to H17.								
H17	CARRY OUT A VISUAL INSPECTION ON 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 GO to H20. No GO to H18.								

Fuel Control**H**

Test Step		Results / Action to Take
H18	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 the PCM and monitor the ECT, CHT and IAT PIDs. • Access the PCM and monitor the 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 2,500 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 2,500 RPM. • Is the total fuel correction value change, between idle and 2,500 RPM, less than 15 percent?		Yes No vacuum leak is present. GO to DC26. No GO to H19.

Fuel Control**H**

Test Step		Results / Action to Take
H19	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 the PCM 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 GO to H20. No INSPECT the intake air system for a vacuum leak in the intake manifold or intake gaskets. REPAIR as necessary. For repair verification, GO to H20.
H20	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 the PCM 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 in OFF position. • Repair the vacuum leak. • Key on engine running. • Allow the engine to stabilize at the temperature necessary to recreate the concern. • Access the PCM 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 Fault found. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No A vacuum leak is still present, GO to H19.

Fuel Control**H**

Test Step		Results / Action to Take					
H21	DTCS P0172, P0175, P1132, P1152, P2196 OR P2198: HO2S PERFORMANCE	Yes REPAIR as necessary. No GO to DC26.					
Note: Address all continuous memory ignition and misfire DTCs before any KOER HO2S DTCs. • Check the intake air system for leaks, obstructions, and damage. — Check the air filter element and housing for blockage. — Verify the integrity of the PCV system. — Check for vacuum leaks. • Were there any concerns found during the visual inspection?							
H22	CARRY OUT THE KOER ON DEMAND SELF-TEST	Yes Key in OFF position. DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No CONNECT the fuel vapor hose. For DTCs P1131, P2195, P1151 or P2197, GO to H23. For DTCs P1132, P2196, P1152 or P2198, GO to H27. For continuous memory DTCs P0171, P0172, P0174, P0175, P1130 or P1150, GO to H29. For all others, Unable to identify the fault at this time. GO to Z1.					
• Disconnect the fuel vapor hose from the intake manifold and the plug fitting at the intake manifold. • Start the engine and run at 2,000 RPM for 5 minutes and return to idle. • Key on engine running. • Check for KOER DTCs: • Are DTCs P0040, P1128, P0041, P1129, P1127 or P0402 present?							
H23	CHECK THE HO2S AND SIGRTN CIRCUIT(S) FOR AN OPEN IN THE HARNESS	Yes GO to H24. No REPAIR the open circuit.					
• Key in OFF position. • Disconnect the HO2S related to the current DTC. • PCM connector disconnected. • Measure the resistance between: <table><tr><td>(+) HO2S Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>HO2S Signal</td><td>HO2S Signal</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> • Are the resistances less than 5 ohms?			(+) HO2S Connector, Harness Side	(-) PCM Connector, Harness Side	HO2S Signal	HO2S Signal	SIGRTN
(+) HO2S Connector, Harness Side	(-) PCM Connector, Harness Side						
HO2S Signal	HO2S Signal						
SIGRTN	SIGRTN						

Fuel Control

H

Test Step		Results / Action to Take				
H24	CHECK THE HO2S CIRCUIT FOR A SHORT TO SIGRTN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) HO2S Connector, Harness Side</td><td>(-) HO2S Connector, Harness Side</td></tr><tr><td>HO2S Signal</td><td>SIGRTN</td></tr></table> - Is the resistance greater than 10K ohms?	(+) HO2S Connector, Harness Side	(-) HO2S Connector, Harness Side	HO2S Signal	SIGRTN	Yes GO to H25. No REPAIR the short circuit.
(+) HO2S Connector, Harness Side	(-) HO2S Connector, Harness Side					
HO2S Signal	SIGRTN					
H25	CHECK THE HO2S CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) HO2S Connector, Harness Side</td><td>(-)</td></tr><tr><td>HO2S Signal</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) HO2S Connector, Harness Side	(-)	HO2S Signal	Ground	Yes GO to H26. No REPAIR the short circuit to GND.
(+) HO2S Connector, Harness Side	(-)					
HO2S Signal	Ground					
H26	HO2S CIRCUIT TEST (WITH LEAN DTCS) - PCM connector connected. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A HO2S Connector, Harness Side</td><td>Point B HO2S Connector, Harness Side</td></tr><tr><td>HO2S Signal</td><td>VPWR</td></tr></table> - Key in ON position. - Access the PCM and monitor the HO2S Signal PID. - Is the voltage greater than 1.3 V?	Point A HO2S Connector, Harness Side	Point B HO2S Connector, Harness Side	HO2S Signal	VPWR	Yes INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
Point A HO2S Connector, Harness Side	Point B HO2S Connector, Harness Side					
HO2S Signal	VPWR					
H27	HO2S CIRCUIT TEST (WITH RICH DTCS) - Disconnect the HO2S related to the current DTC. - Key in ON position. - Access the PCM and monitor the HO2S Signal PID. - Is the voltage less than 0.2 V?	Yes INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No GO to H28.				

Fuel Control

H

Test Step		Results / Action to Take						
H28	CHECK THE HO2S CIRCUIT FOR A SHORT TO THE VPWR OR HEATER IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>HO2S Signal</td><td>HO2S Heater</td></tr><tr><td>HO2S Signal</td><td>VPWR</td></tr></table> - Are the resistances greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	HO2S Signal	HO2S Heater	HO2S Signal	VPWR	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
HO2S Signal	HO2S Heater							
HO2S Signal	VPWR							
H29	CHECK THE FUEL PRESSURE  WARNING: When checking the fuel system remember that the fuel system may still be pressurized when the engine is switched off. Always follow the instructions related to fuel system pressure relief. All fuel handling safety precautions must be observed. - Connect the battery charger to the vehicle. - Mechanical fuel pressure gauge connected. - Key in ON position. - Access the PCM and control the FP PID. - Run the fuel pump to obtain maximum fuel pressure. Note: For vehicle specific fuel pressure ranges, refer to the Fuel System Specification Chart in pinpoint test HC, GO to Pinpoint Test HC. - Is the fuel pressure within range for the vehicle being diagnosed?	Yes Key in OFF position. GO to H30. No GO to Pinpoint Test HC.						
H30	CHECK THE FUEL SYSTEM FOR PRESSURE STABILITY - FAST LEAKDOWN - Key in ON position. - Cycle the key several times to charge the fuel system. - Does the fuel pressure remain within 34 kPa (5 psi) of the highest reading after 10 seconds?	Yes GO to H32. No GO to H31.						
H31	CHECK FOR AN EXTERNAL FUEL LEAK - Inspect the fuel tank, lines, and filler pipe for a fuel leak. - Is a concern present?	Yes REPAIR as necessary. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC. No GO to H33.						

Fuel Control

H

Test Step		Results / Action to Take				
H32	CHECK THE FUEL SYSTEM FOR PRESSURE STABILITY - SLOW LEAKDOWN					
	• Key in ON position. • Cycle the key several times to charge the fuel system. • Does the fuel pressure remain within 34 kPa (5 psi) of the highest reading after 1 minute?	Yes For HO2S DTCs in combination with misfire DTCs, GO to H33 . For all others, GO to H39 . No GO to HC5 .				
H33	CHECK THE INJECTOR FAULT PIDS AND ASSOCIATED DTCS					
	• Access the PCM and monitor all the INJxF PIDs. • Are DTCs P0201 through P0210 or an associated injector fault flag PID present?	Yes GO to H34 . No For DTCs P0301 through P0310, GO to HD18 . For all others, GO to H39 .				
H34	DTCS P0201 THROUGH P0210: CHECK THE FUEL INJECTOR(S) AND HARNESS RESISTANCE					
	Note: Continuous memory DTCs are erased during this test. Note: Test all the fuel injectors identified by DTC or PID interpretation. • Key in OFF position. • PCM connector disconnected. • Measure the resistance between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VPWR</td><td>Suspect INJ</td></tr></table> • Is the resistance between 11 ohms - 18 ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	VPWR	Suspect INJ	Yes GO to H36 . No GO to H35 .
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side					
VPWR	Suspect INJ					
H35	CHECK THE INJ CIRCUIT FOR AN OPEN IN THE HARNESS					
	Note: Disconnect the suspect fuel injector harness connector. Only the suspect injector needs to be diagnosed. • INJ connector disconnected. • Measure the resistance between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) INJ Connector, Harness Side</td></tr><tr><td>Suspect INJ</td><td>INJ - Pin 1</td></tr></table> • Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) INJ Connector, Harness Side	Suspect INJ	INJ - Pin 1	Yes GO to H36 . No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) INJ Connector, Harness Side					
Suspect INJ	INJ - Pin 1					

Fuel Control**H**

Test Step		Results / Action to Take				
H36	CHECK THE VPWR CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to H37. No REPAIR the open circuit.				
Note: Disconnect the suspect fuel injector harness connector. Only the suspect injector needs to be diagnosed. • INJ connector disconnected. • Key in ON position. • Measure the voltage between: <table><tr><td>(+) INJ Connector, Har- ness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 2</td><td>Ground</td></tr></table> • Is the voltage greater than 10.5 V?			(+) INJ Connector, Har- ness Side	(-)	VPWR - Pin 2	Ground
(+) INJ Connector, Har- ness Side	(-)					
VPWR - Pin 2	Ground					
H37	CHECK THE INJ CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS	Yes For continuous memory DTCs P0201 through P0210, GO to H38 For all others, GO to H39. No REPAIR the short circuit.				
• Key in OFF position. • Measure the resistance between: <table><tr><td>(+) INJ Connector, Har- ness Side</td><td>(-)</td></tr><tr><td>INJ - Pin 1</td><td>Ground</td></tr></table> • Is the resistance greater than 10K ohms?			(+) INJ Connector, Har- ness Side	(-)	INJ - Pin 1	Ground
(+) INJ Connector, Har- ness Side	(-)					
INJ - Pin 1	Ground					
H38	CARRY OUT A THOROUGH WIGGLE TEST ON THE FUEL INJECTOR HARNESS	Yes ISOLATE the fault and REPAIR as necessary. No Unable to duplicate or identify the fault at this time. GO to Z1.				
• PCM connector connected. • Fuel Injector connector connected. • Key on engine running. • Engine at normal operating temperature. • Access the PCM and monitor the INJ PID. • Wiggle, shake, and bend small sections of the wiring harness while working from the fuel injector to the PCM. • Are any injector values fluctuating in and out of range?						

Fuel Control**H**

Test Step		Results / Action to Take
H39 FLOW TEST	• Key in OFF position. • PCM connector connected. • Flow test the injector using the Fuel Injector Tester. • Is the flow rate for each injector within specification?	Yes For DTCs P0201 through P0212 or for the presence of an associated injector fault flag PID, INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). For misfire related DTCs, GO to HD10. For all other DTCs, GO to H40. No INSTALL a new fuel injector. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM).
H40 DETERMINE VEHICLE EQUIPMENT	• Is a secondary air pump equipped on this vehicle?	Yes GO to H41. No GO to H42.
H41 CHECK FOR SECONDARY AIR LEAKS	Note: An HO2S always lean condition can be caused by: — Leaks in the hoses from the secondary air injection pump to the engine. — Secondary air diverted upstream of the HO2S. • Disconnect the secondary air injection hose(s) from the engine and the plug side of the secondary air injection system. • Key on engine running. • Carry out the KOER self-test. • Are DTCs P1131, P2195, P1151 or P2197 present?	Yes GO to H42. No GO to HM17.
H42 INSPECT THE INDUCTION SYSTEM FOR LEAKS	• Carefully inspect the following areas for potential air leaks: — Inlet tube(s) from the air cleaner to the throttle body. — Gaskets sealing the upper to lower intake manifold. — Vacuum hoses and lines for cracks, breaks, and proper connections. • Is a concern present?	Yes REPAIR as necessary. No For DTC P0171, GO to Z1. For DTC P0174, GO to Z1. For misfire related DTCs, GO to HD19. For all other DTCs, GO to H43.

Fuel Control

H

Test Step		Results / Action to Take				
H43	CYLINDER COMPRESSION CHECK					
Note: Use the misfire DTC(s) displayed or prior retrieval to determine which cylinder's compression to check. - Carry out a cylinder compression check on the engine. Refer to Engine. - Is the suspect cylinder's compression within specification?		Yes For DTCs P1132, P1151, P2195, or P2197, GO to H44. For DTCs P1132, P1152, P2196, or P2198, GO to H45. For misfire related DTCs, GO to HD19. No REPAIR as necessary.				
H44	CHECK HO2S OUTPUT VOLTAGE					
Note: Fuel calculations can be affected by unmetered air leaks. DTC P2195 may result. - Check the following: - Water contamination in the connector. - Leaking vacuum actuators. - Engine sealing (intake manifold and IAC). - EGR system. - PCV system. - Unmetered air leaks between the throttle body and mass air flow (MAF) sensor assembly. - Visually inspect the HO2S circuit for exposed wiring, contamination, corrosion and correct assembly. Repair as necessary. - HO2S connector disconnected. - Measure the voltage between: <table><tr><td>(+) HO2S Connector, Component Side</td><td>(-) HO2S Connector, Component Side</td></tr><tr><td>HO2S Signal</td><td>SIGRTN</td></tr></table> - Run the engine at approximately 2,000 RPM. Maintain engine speed for 3 minutes. Monitor the HO2S voltage. - Is the voltage greater than 0.4 V?		(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side	HO2S Signal	SIGRTN	Yes Key in OFF position. GO to H47. No Key in OFF position. INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM).
(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side					
HO2S Signal	SIGRTN					
H45	ATTEMPT TO RETRIEVE DTC P1131, P2195, P1151, OR P2197					
- HO2S connector disconnected. - Connect a 5 amp fused jumper wire between the following: <table><tr><td>Point A HO2S Connector, Harness Side</td><td>Point B Vehicle Battery</td></tr><tr><td>HO2S Signal</td><td>Negative terminal</td></tr></table> - Carry out the KOER self-test. - Are DTCs P1131, P2195, P1151 or P2197 present?		Point A HO2S Connector, Harness Side	Point B Vehicle Battery	HO2S Signal	Negative terminal	Yes Key in OFF position. Remove the jumper wire(s) GO to H46. No Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). Remove the jumper wire(s)
Point A HO2S Connector, Harness Side	Point B Vehicle Battery					
HO2S Signal	Negative terminal					

Fuel Control

H

Test Step		Results / Action to Take				
H46	HO2S VOLTAGE CHECK - HO2S connector disconnected. - Disconnect the vacuum line from the vacuum tree. - Run the engine at approximately 2,000 RPM for 30 seconds. - Measure the voltage between:<table><tr><td>(+) HO2S Connector, Component Side</td><td>(-) HO2S Connector, Component Side</td></tr><tr><td>HO2S Signal</td><td>SIGRTN</td></tr></table> - Is the voltage less than 0.4 V?	(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side	HO2S Signal	SIGRTN	Yes Key in OFF position. CONNECT all the hoses. GO to H47. No Key in OFF position. INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM).
(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side					
HO2S Signal	SIGRTN					
H47	CARRY OUT A THOROUGH WIGGLE TEST ON THE HO2S HARNESS - HO2S connector connected. - Key on engine running. - Engine at normal operating temperature. - Access the PCM and monitor the HO2S Signal PID. - Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM. - While monitoring the HO2S PID, did the HO2S stop switching?	Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No Key in OFF position. GO to H48.				
H48	TEST DRIVE WHILE MONITORING HO2S PID SWITCHING  CAUTION: This test requires an observer to monitor the HO2S PID. - Access the PCM and monitor the HO2S Signal and OL PIDs. - Start engine and let idle until vehicle goes into the closed loop fuel condition. - While an observer monitors the PIDs, test drive the vehicle in a manner consistent with the freeze frame data in an attempt to simulate the original fault. - Does the HO2S PID switch?	Yes Key in OFF position. Unable to duplicate or identify the fault at this time. No Key in OFF position. INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM).				
H49	KOER DTCS P1137, P2270, P1157, P2272, P1138, P2271, P1158, P2273, P2274 OR P2275: HO2S LACK OF SWITCHES STUCK LEAN OR RICH Note: Address all continuous memory ignition and misfire DTCs before any KOER HO2S DTCs. - Visually inspect for: - Pinched, shorted, and corroded wiring and pins. - Oil or water contamination. - Crossed sensor wires. - Contaminated or damaged sensor. - Is a concern present?	Yes REPAIR as necessary. No GO to H50.				

Fuel Control**H**

Test Step		Results / Action to Take
H50	KOER DTCS P1137, P2270, P1157, P2272, P1138, P2271, P1158, P2273, P2274 OR P2275: CHECK FOR KOER DTCS	Yes Key in OFF position. GO to H51. No Key in OFF position. Unable to duplicate or identify the fault at this time.
	• Key on engine running. • Run the engine at approximately 2,000 RPM. Maintain the engine speed for 3 minutes. • Carry out the KOER self-test. • Are any of the above listed DTCs present?	
H51	DTCS P0132, P0138 AND P0144: CHECK THE HO2S SIGNAL LEVEL TOO HIGH	Yes REPAIR as necessary. No GO to H52.
	Note: Fuel calculations can be affected by unmetered air leaks. • Carefully inspect the following areas for potential air leaks: — Hoses connecting to the MAF sensor assembly. — Hoses connecting to the throttle body. — Intake manifold gasket leaks. — PCV disconnected. — The vacuum lines are disconnected. — Improperly seated engine oil dipstick, tube or oil fill cap. — Exhaust leaks at flanges and gaskets. Note: Any exhaust leaks between the engine and the output of the catalyst can cause DTCs P0136 or P0156. • With the vehicle in NEUTRAL, position it on a hoist. Refer to Maintenance/Service and Repair. • Visually inspect for: — Exhaust leaks at flanges and gaskets. — HO2S not tightened to specification. — Physical exhaust system concerns. — Aftermarket exhaust. — Punctures or cracks in the catalyst. • Is a concern present?	

Fuel Control**H**

Test Step		Results / Action to Take												
H52	CHECK FOR SHORTS BETWEEN CIRCUITS IN THE HO2S HARNESS - PCM connector disconnected. - Disconnect the HO2S harness connector. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>HO2S Signal</td><td>Negative terminal</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>HO2S Signal</td><td>SIGRTN</td></tr><tr><td>HO2S Signal</td><td>VPWR</td></tr><tr><td>HO2S Signal</td><td>HO2S Heater</td></tr></table> - Are the resistances greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	HO2S Signal	Negative terminal	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	HO2S Signal	SIGRTN	HO2S Signal	VPWR	HO2S Signal	HO2S Heater	Yes GO to H53. No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) Vehicle Battery													
HO2S Signal	Negative terminal													
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side													
HO2S Signal	SIGRTN													
HO2S Signal	VPWR													
HO2S Signal	HO2S Heater													
H53	CHECK THE HO2S CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) HO2S Connector, Harness Side</td></tr><tr><td>HO2S Heater</td><td>HO2S Heater</td></tr><tr><td>VPWR</td><td>VPWR</td></tr><tr><td>HO2S Signal</td><td>HO2S Signal</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side	HO2S Heater	HO2S Heater	VPWR	VPWR	HO2S Signal	HO2S Signal	SIGRTN	SIGRTN	Yes GO to H54. No REPAIR the open circuit.		
(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side													
HO2S Heater	HO2S Heater													
VPWR	VPWR													
HO2S Signal	HO2S Signal													
SIGRTN	SIGRTN													
H54	CHECK THE HO2S CIRCUIT VOLTAGE - PCM connector connected. - HO2S connector connected. - Key on engine running. - Access the PCM and monitor the HO2S Signal PID. - Is the voltage greater than 1.5 V?	Yes Key in OFF position. For PZEV GO to H57. For All Others: GO to H56. No Key in OFF position. GO to H55.												

Fuel Control

H

Test Step		Results / Action to Take						
H55	CHECK THE HO2S CIRCUIT VOLTAGE - PCM connector connected. - HO2S connector disconnected. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A HO2S Connector, Harness Side</td><td>Point B HO2S Connector, Harness Side</td></tr><tr><td>HO2S Signal</td><td>VPWR</td></tr></table> - Key in ON position. - Access the PCM and monitor the HO2S Signal PID. - Is the voltage greater than 1.5 V?	Point A HO2S Connector, Harness Side	Point B HO2S Connector, Harness Side	HO2S Signal	VPWR	Yes INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).		
Point A HO2S Connector, Harness Side	Point B HO2S Connector, Harness Side							
HO2S Signal	VPWR							
H56	CHECK FOR OVER VOLTAGE IN THE PCM - Key on engine running. - HO2S connector disconnected. - Measure the voltage between:<table><tr><td>(+) HO2S Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>SIGRTN</td><td>Negative terminal</td></tr><tr><td>HO2S Signal</td><td>Negative terminal</td></tr></table> - Are the voltages less than 1.5 V?	(+) HO2S Connector, Harness Side	(-) Vehicle Battery	SIGRTN	Negative terminal	HO2S Signal	Negative terminal	Yes INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
(+) HO2S Connector, Harness Side	(-) Vehicle Battery							
SIGRTN	Negative terminal							
HO2S Signal	Negative terminal							
H57	CHECK THE HO2S CIRCUIT FOR A SHORT TO VREF AND VPWR IN THE HARNESS - PCM connector disconnected. - HO2S connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) HO2S Connector, Harness Side</td></tr><tr><td>HO2S Signal</td><td>VPWR</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side	HO2S Signal	VPWR	Yes GO to H58. No REPAIR the short circuit.		
(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side							
HO2S Signal	VPWR							
H58	CHECK THE HO2S CIRCUIT VOLTAGE - PCM connector connected. - HO2S connector disconnected. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A HO2S Connector, Harness Side</td><td>Point B HO2S Connector, Harness Side</td></tr><tr><td>HO2S Signal</td><td>VPWR</td></tr></table> - Key on engine running. - Access the PCM and monitor the HO2S Signal PID. - Is the voltage greater than 1.5 V?	Point A HO2S Connector, Harness Side	Point B HO2S Connector, Harness Side	HO2S Signal	VPWR	Yes INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).		
Point A HO2S Connector, Harness Side	Point B HO2S Connector, Harness Side							
HO2S Signal	VPWR							

Fuel Control

H

Test Step		Results / Action to Take
H59	KOER DTC P1127: EXHAUST TEMPERATURE OUT OF RANGE	Yes CARRY OUT the KOER self-test. No RUN the engine until the PID indicates ON. CARRY OUT the KOER self-test.
	Note: Address all other DTCs before proceeding. Engine at normal operating temperature. • Key on engine running. • Access the PCM and monitor the HO2S Heater PID. • Is the PID state ON?	
H60	KOER DTCS P0040, P0041, P1128, P1129 AND P2278: CROSSED SENSOR WIRES	Yes REPAIR as necessary. Clear the DTCs. REPEAT the self-test. No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1 .
	 WARNING: While conducting tests on a hot engine take all safety precautions to prevent skin contact with hot engine components. • Key in OFF position. Note: Sensor wiring swapped bank to bank. • Confirm the wiring is connected to the opposite bank. • Are there any crossed connections or wires?	
H61	KOER DTCS P0132, P0138, P0152 AND P0158: CHECK THE HO2S CIRCUIT FOR HIGH AND INTERMITTENT FAULTS	Yes GO to H63 . No GO to H62 .
	• HO2S connector disconnected. • Visually inspect the HO2S harness. Check the connector (both halves) for any water contamination. A vehicle hoist may be required to access the HO2S harness. Be sure the connectors are fully seated. • HO2S connector connected. • Key on engine running. Note: If DTCs are present, test their related circuits individually. • Access the PCM and monitor the O2S11, O2S12 and O2S13 PIDs. • Is the suspect PID voltage greater than 1.5 volts?	
H62	CARRY OUT A THOROUGH WIGGLE TEST ON THE HO2S HARNESS	Yes REPAIR as necessary. No GO to Z1 .
	• Carry out a thorough wiggle test on the HO2S harness. • Does the voltage change during the wiggle test?	

Fuel Control

H

Test Step		Results / Action to Take						
H63	CHECK THE SIGRTN CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - HO2S connector disconnected. - Measure the resistance between:<table><tr><td>(+) HO2S Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>SIGRTN</td><td>Negative terminal</td></tr></table> - Is the resistance less than 5 ohms?	(+) HO2S Connector, Harness Side	(-) Vehicle Battery	SIGRTN	Negative terminal	Yes GO to H65. No GO to H64.		
(+) HO2S Connector, Harness Side	(-) Vehicle Battery							
SIGRTN	Negative terminal							
H64	CHECK THE SIGRTN CIRCUIT FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) HO2S Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> - Is the resistance less than 5 ohms?	(+) HO2S Connector, Harness Side	(-) PCM Connector, Harness Side	SIGRTN	SIGRTN	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.		
(+) HO2S Connector, Harness Side	(-) PCM Connector, Harness Side							
SIGRTN	SIGRTN							
H65	CHECK THE HO2S SIGNAL FOR A SHORT TO POWER INSIDE THE SENSOR - HO2S connector disconnected. - Key on engine running. - Access the PCM and monitor the HO2S Signal PID. - Is the voltage greater than 0.4 V?	Yes GO to H66. No INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM).						
H66	CHECK THE HO2S CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Key in OFF position. - HO2S connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>HO2S Signal</td><td>VPWR</td></tr><tr><td>HO2S Signal</td><td>VREF</td></tr></table> - Are the resistances greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	HO2S Signal	VPWR	HO2S Signal	VREF	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
HO2S Signal	VPWR							
HO2S Signal	VREF							

H63-H66

Test HC: Fuel Delivery System
PINPOINT TEST HC: FUEL DELIVERY SYSTEM

Fuel Delivery System**HC**

 **WARNING:** The fuel system remains under pressure after the engine is off. Relieve pressure before repairing. Highly flammable mixtures present. To release pressure from the fuel system, carry out the following:

- Connect a Rotunda fuel pressure gauge 134R0087 or equivalent.
- Gradually open the testing kit valve to relieve the 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.

Warning

Fuel Delivery System**HC**

 **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 the eye/wash shower facilities. Know how to use them.
- Use a B or AFFF (light water) type fire extinguisher to fight flammable liquid fires.

FIRST AID.

- If gasoline has been swallowed, do not induce vomiting. Seek medical attention immediately!
- If methanol or methanol/gasoline blend has been swallowed, induce vomiting under the direction of a physician or a Poison Control Center. Seek medical attention immediately!
- When overcome by vapors move the victim to fresh air, if safe. If not breathing, give artificial respiration or cardiopulmonary resuscitation (CPR) 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 immediately!
- 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 the onset of serious health effects can be delayed 12 to 24 hours.
- Fuels and products containing methanol (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.

Caution

Fuel Delivery System

HC

- 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 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 smoke, eat, or drink where these products are handled, processed, or stored.
- Never siphon by mouth.
- Wash hands thoroughly after handling any fuel.

SPILLS.

- Notify the proper authorities in the event of any spill you are not trained to clean up.
- Stop, contain, and clean up small spills with an absorbent material.

This pinpoint test is intended to diagnose the following:

- Chassis components.
- Engine vacuum.
- Fuel pressure.
- Fuel supply line.
- Fuel supply.
- Fuel injector(s) (9F593).

Fuel System Specification Chart

Application	Engine	Fuel Sys-tem Type	FRP PID Fuel Pressure (kPa)	FRP PID Fuel Pressure (psi)	External Pres-sure Gauge (kPa)	External Pres-sure Gauge (psi)
Focus	2.0L	ERFS (3)	240-450	35-65	-	-
Focus	2.0L PZEV	ERFS (3)	240-450	35-65	-	-
Focus	2.3L	ERFS (3)	240-450	35-65	-	-
Five Hundred / Freestyle / Montego	3.0L	ERFS (3)	270-450	39-65	-	-
Taurus	3.0L 2V FFV	ERFS (3)	210-450	30-65	-	-

(Continued)

Caution, Note And Chart

Fuel Delivery System**HC****Fuel System Specification Chart**

Application	Engine	Fuel Sys-tem Type	FRP PID Fuel Pressure (kPa)	FRP PID Fuel Pressure (psi)	External Pres-sure Gauge (kPa)	External Pres-sure Gauge (psi)
Taurus/Sable	3.0L 2V	ERFS (3)	270-450	39-65	-	-
Taurus/Sable	3.0L 4V	ERFS (3)	270-380	39-55	-	-
LS	3.0L	ERFS (3)	270-380	39-55	-	-
LS/Thunderbird	3.9L	ERFS (3)	270-450	39-65	-	-
Mustang	4.0L	ERFS (3)	240-380	35-55	-	-
Mustang GT	4.6L 3V	ERFS (3)	275-485	40-70	-	-
Crown Victoria / Grand Marquis / Town Car	4.6L	ERFS (3)	275-485	40-70	-	-
Ford GT	5.4L	ERFS (3)	275-485	40-70	-	-
Escape/Mariner	2.3L	ERFS (3)	240-450	35-65	-	-
Escape/Mariner	3.0L	ERFS (3)	240-450	35-65	-	-
Ranger	2.3L	MRFS (2)	-	-	345-450	50-65
Ranger	3.0L	MRFS (2)	-	-	345-450	50-65
Ranger	3.0L FFV	MRFS (2)	-	-	275-380	40-55
Ranger	4.0L	MRFS (2)	-	-	345-450	50-65
Freestar	3.9L	ERFS (3)	275-485	40-70	-	-
Freestar/Monterey	4.2L	ERFS (3)	275-485	40-70	-	-
Explorer Sport Trac	4.0L	ERFS (3)	275-485	40-70	-	-
Explorer/Mountaineer	4.0L	ERFS (3)	345-485	50-70	-	-
Explorer/Mountaineer	4.6L	ERFS (3)	345-485	50-70	-	-
F-Series	4.2L	ERFS (3)	275-485	40-70	-	-
E/F-Series	4.6L	ERFS (3)	275-485	40-70	-	-

(Continued)

Chart

Fuel Delivery System

HC

Fuel System Specification Chart

Application	Engine	Fuel System Type	FRP PID Fuel Pressure (kPa)	FRP PID Fuel Pressure (psi)	External Pressure Gauge (kPa)	External Pressure Gauge (psi)
Aviator	4.6L 4V	ERFS (3)	275-485	40-70	-	-
E-Series	5.4L 2V	ERFS (3)	240-485	35-70	-	-
Excursion	5.4L 2V	RFS (1)	-	-	193-310	28-45
Expedition/Navigator	5.4L 3V	ERFS (3)	275-485	40-70	-	-
F-Series	5.4L 3V	ERFS (3)	275-485	40-70	-	-
E-Series	6.8L 2V	ERFS (3)	275-485	40-70	-	-
Excursion	6.8L 2V	RFS (1)	-	-	193-310	28-45
F-Series	6.8L 3V	ERFS (3)	275-485	40-70	-	-

Fuel System Type Definitions:

(1) Return Fuel System:

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 use 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 use a 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 use a fuel rail pressure (FRP) sensor.

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

Fuel Delivery System**HC**

 **WARNING:** If you see or smell gasoline at any time other than during fueling, do not reset the inertia fuel shutoff (IFS) switch.

Inertia Fuel Shutoff (IFS) Switch - Reset Instructions

- Key in OFF position.
- 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 the Owner's Literature for IFS switch location).
- In the closed position, the button can be pressed an additional 1.57 mm (1/16 in) against a spring.
- Key in ON position.
- Key in OFF position.
- Key in ON position.
- Key in OFF position.
- Check for leaking fuel.

Warning

Fuel Delivery System

HC

Test Step		Results / Action to Take
HC1	CHECK THE SYSTEM INTEGRITY	
• Visually inspect the complete fuel delivery system for damage. 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. A new fuel filter should have been installed 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's Literature for location. • Verify the fuse integrity. • Verify the battery is fully charged. • Verify clean sufficient fuel. • Is a concern present?		
HC2	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 in pinpoint test HC. • Key in OFF position. • Relieve the fuel pressure. • Mechanical fuel pressure gauge connected. • Key in ON position. Note: During Output State Control, the fuel pump stays commanded on for only about 5 seconds. • Access the PCM and control the FP PID. • Compare the recorded fuel pressure reading to the Fuel System Specification Chart. • Is the fuel pressure within range?		Yes REPAIR as necessary. No GO to HC2. Yes GO to HC5. No GO to HC3.

Yes
REPAIR as necessary.
No
GO to HC2.

Yes
GO to HC5.
No
GO to HC3.

Fuel Delivery System

HC

Test Step		Results / Action to Take				
HC3	CHECK THE FUEL PUMP GROUND CIRCUIT FOR AN OPEN IN THE HARNESS - FP connector disconnected. Note: Refer to Vehicle/Diagrams for correct pin location. - Measure the voltage between:<table><tr><td>(+) Vehicle Battery</td><td>(-) FP Connector, Har- ness Side</td></tr><tr><td>Positive terminal</td><td>FPGND</td></tr></table> Is the voltage greater than 10 V?	(+) Vehicle Battery	(-) FP Connector, Har- ness Side	Positive terminal	FPGND	Yes GO to HC4. No Key in OFF position. REPAIR the open circuit.
(+) Vehicle Battery	(-) FP Connector, Har- ness Side					
Positive terminal	FPGND					
HC4	CHECK THE FUEL PUMP POWER CIRCUIT FOR AN OPEN IN THE HARNESS - Verify the inertia fuel shutoff (IFS) switch is set (button pushed in). Refer to the Owner's Literature for location. - FP connector disconnected. - Key in ON position. Note: During Output State Control, the fuel pump stays commanded on for only about 5 seconds. - Access the PCM and control the FP PID. - Be aware that Output State Control turns off the FP after a calibrated time. If this happens, command the outputs on again to continue testing. - Measure the voltage between:<table><tr><td>(+) FP Connector, Har- ness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>FPPWR</td><td>Negative terminal</td></tr></table> Is the voltage greater than 10 V?	(+) FP Connector, Har- ness Side	(-) Vehicle Battery	FPPWR	Negative terminal	Yes Key In OFF position. EXIT the Output State Control. GO to HC9. No Key in OFF position. REPAIR the open circuit.
(+) FP Connector, Har- ness Side	(-) Vehicle Battery					
FPPWR	Negative terminal					
HC5	CHECK ALL SYSTEM RELATED DEVICES (SENSOR, DAMPER OR REGULATOR) FOR LEAKAGE - Install the fuel pressure tester. - Key on engine running. - Check for manifold vacuum at each system related component with a vacuum line. - Key in OFF position. - Wait 10 seconds. - Key on engine running. - Run the engine for approximately 10 seconds. - Key in OFF position. - 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. Are all vacuum lines for system related devices indicating no fuel present?	Yes GO to HC6. No If the vacuum line connected to a component, indicates that a fuel leak is present INSTALL a new component.				

Fuel Delivery System

HC

Test Step		Results / Action to Take
HC6	CHECK THE FUEL PRESSURE LEAKDOWN	
	- Mechanical fuel pressure gauge connected. - Key in ON position. Note: During Output State Control, the fuel pump stays commanded on for only about 5 seconds. - Access the PCM and control the FP PID. - Run the fuel pump to obtain maximum fuel pressure. - Verify fuel pressure remains within 34 kPa (5 psi) of the maximum pressure for 1 minute after turning pump off. Does the fuel pressure remain within 34 kPa (5 psi) of the highest reading after 1 minute?	Yes GO to HC7. No Fuel rail pressure leakdown GO to HC13.
HC7	DETERMINE THE FUEL SYSTEM TYPE	
	Note: All vehicles equipped with a return fuel system (RFS) use a pressure regulator with fuel return at the fuel rail. Is the vehicle equipped with RFS?	Yes GO to HC8. No GO to HC13.
HC8	CHECK FOR A VACUUM SOURCE	
	- Key on engine running. Is the vacuum level at the fuel pressure regulator equal to manifold vacuum?	Yes GO to HC9. No REPAIR as necessary.
HC9	CHECK THE FUEL PRESSURE REGULATOR RESPONSE	
	- 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 GO to HC10. No GO to HC14.
HC10	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 GO to HC11. No INSTALL a new fuel pressure regulator assembly.

Fuel Delivery System

HC

Test Step		Results / Action to Take
HC11	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 in ON position. Note: During Output State Control, the fuel pump stays commanded on for only about 5 seconds. - 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 Key in OFF position. GO to HC12. No Key in OFF position. INSTALL a new fuel pressure regulator assembly.
HC12	CHECK THE FUEL RETURN SYSTEM	
	Note: Observe the Warnings, Cautions, and Notes. - 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 GO to HC13. No REPAIR the fuel return line.
HC13	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. Are test results satisfactory?	Yes Test passed. Concern is elsewhere. RETURN to Symptom Charts for further direction. No INSTALL a new fuel injector as necessary.
HC14	CHECK THE FUEL SUPPLY LINE FOR RESTRICTION	
	Note: Observe the Warnings, Cautions, and Notes. - 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 INSTALL a new FP module. No REPAIR the cause of the restriction.

HC11-HC14

Test HD: Misfire Detection Monitor

PINPOINT TEST HD: MISFIRE DETECTION MONITOR

Misfire Detection Monitor**HD**

This pinpoint test is intended to diagnose the misfire detection monitor.

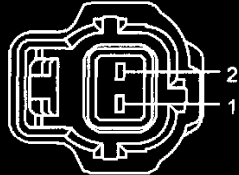
Clearing the PCM DTCs will erase any PCM recorded freeze frame data. Make sure to record any PCM freeze frame information before proceeding any further. REFER to Diagnostic Methods, Freeze Frame Data.

Powertrain Control Module (PCM) Connector

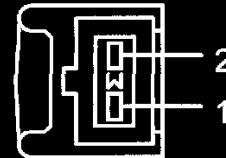
For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator, LS, Thunderbird	150 (60-32-58) Pin	CMP VPWR	E53 B32, B33
E-Series 4.6L, E-Series 5.4L 4R75E, Mustang	170 Pin	CMP VPWR	E45 B35, B36
E-Series 6.8L, E-Series 5.4L 5R100, F-Super Duty	170 Pin	CMP VPWR	E45 B35, B36, T39
Excursion, Explorer SportTrac, Freestar/Monterey, Ford GT, Ranger, Sable, Taurus	104 Pin	CMP VPWR	85 71, 97
Expedition, F-150, Navigator	190 Pin	CMP VPWR	E45 B51, B52, B53
All other vehicles	150 (50-50-50) Pin	CMP VPWR	E25 B35, B36

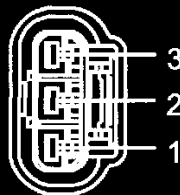
Note And Connector

Misfire Detection Monitor**HD****Camshaft Position (CMP) Sensor Connector****A**

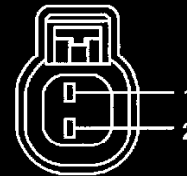
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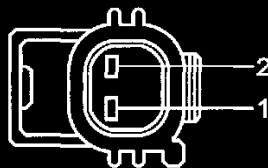
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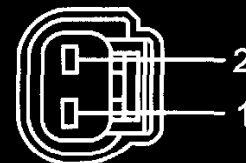
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Connector

Misfire Detection Monitor

HD

Vehicle	Connector	Circuit	Pin
Escape, Focus, Mariner	A	CMP	2
Explorer 4.0L, Explorer SportTrac 4.0L, Mountaineer 4.0L, Mustang 4.0L, Ranger 4.0L	B	CMP	1
F-150 4.2L	C	CMP	2
LS 3.0L	D	CMP	2
LS 3.9L, Thunderbird	E	CMP	2
All other vehicles	F	CMP	2

Test Step		Results / Action to Take
HD1	CHECK FOR ADAPTIVE FUEL MONITOR AND HEGO MONITOR DTCS (CONTINUOUS MEMORY)	
	- Check the PCM for self-test DTCS: - Are DTCS P0136, P0156, P0171, P0172, P0175, P2270, P2271, P2272 or P2273 present?	Yes GO to HD3 . No GO to HD2 .
HD2	CHECK FOR OTHER NON-MISFIRE CONTINUOUS MEMORY DTCS	
	Are there any non-misfire continuous memory DTCS present?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to HD3 .
HD3	VIEW THE PCM MISFIRE FREEZE FRAME DATA	
	- The misfire freeze frame data may be used to determine the operating conditions when the misfire DTC was set. - Retrieve and record any available misfire freeze frame data PID values from the PCM. - Compare recorded freeze frame data PID values to the typical reference values in Reference Values. - Are any values out of range?	Yes For out of range PIDS REFER to the table in the pinpoint test Z to find corresponding circuit, and proceed with the intermittent diagnosis. GO to Pinpoint Test Z. No GO to HD4 .

Connector And HD1-HD3

Misfire Detection Monitor

HD

Test Step		Results / Action to Take
HD4	CHECK THE IGNITION SYSTEM	Yes FOLLOW the ignition pinpoint test direction and REPAIR as necessary. No GO to HD5 .
	- For coil-on-plug (COP) equipped vehicles GO to Pinpoint Test JB and follow the Pinpoint Test direction. - For ignition coil pack equipped vehicles GO to Pinpoint Test JC and follow the Pinpoint Test direction. - Is an ignition related concern present?	
HD5	CHECK FOR ANY OTHER KOEO SELF-TEST DTCS	Yes (If misfire or coil DTCs are present, and WDS or an equivalent tool is available, use the scope function to verify the suspect coil.) DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No Key in OFF position. For spark plug wires that are OK: GO to HD6 . For spark plug wires that need evaluation: GO to JB1 .
	Are any other KOEO DTCs present?	
HD6	CHECK FOR ANY OTHER CODES THAT MAY CAUSE A MISFIRE	Yes GO to HD8 . No GO to HD7 .
	- Check for self-test DTCs: - Are DTCs P1131, P1132, P1137, P1138, P1151, P1152, P1157 or P1158 present?	
HD7	CHECK FOR ANY OTHER KOER DTCS	Yes Key in OFF position. DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to HD8 .
	Are any other KOER DTCs present?	

HD4-HD7

Misfire Detection Monitor

HD

Test Step		Results / Action to Take				
HD8	CHECK THE INJECTOR DRIVER PIDS INJ1F THROUGH INJ10F					
• Key in ON position. • Access the appropriate INJxF PIDs for the suspect injector. • Are the PIDs status YES?		Yes For Vehicles with FICM: GO to HL1. For all others: GO to HD9. No Key in OFF position. GO to HD10.				
HD9	CHECK THE FUEL INJECTORS AND HARNESS FOR AN OPEN					
• PCM connector disconnected. • Measure the resistance between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VPWR</td><td>Suspect INJ</td></tr></table> • Is the resistance between 11 ohms - 18 ohms?		(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	VPWR	Suspect INJ	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No GO to H35.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side					
VPWR	Suspect INJ					
HD10	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 in pinpoint test HC.  WARNING: The fuel system remains pressurized when the engine is not running. To prevent injury or fire, use caution when working on the fuel system. • Fuel pressure gauge connected. • Start and run engine at idle, check and record the fuel pressure. • Increase the engine speed to a minimum of 2,000 RPM and maintain for 2 minutes. • Note and compare the fuel pressure. • Is the fuel pressure within specification (refer to the fuel pressure chart in Pinpoint Test HC)?		Yes Key in OFF position. GO to HD11. No REFER to Fuel Delivery and Air Induction to determine which area within the fuel system is at fault.				

Misfire Detection Monitor

HD

Test Step		Results / Action to Take
HD11	VERIFY THE FUEL SYSTEM HOLDS PRESSURE	
	• Key on engine running. • Check the fuel pressure. • Increase the engine speed to a minimum of 2,000 RPM and maintain for 2 minutes. • Check for fuel leaking at the fuel injector O-ring, fuel pressure regulator, and the fuel lines to the fuel charging assembly. • Did the fuel pressure remain within 34 kPa (5 psi) for 60 seconds?	Yes Key in OFF position. For vehicles equipped with differential pressure feedback EGR system, GO to HD12. For vehicles equipped with electric EGR (EEGR) system, GO to HD13. For vehicles equipped with EGR system module (ESM) EGR system, GO to HD14. For all others, GO to HD18. No REFER to Fuel Delivery and Air Induction to determine which area within the fuel system is at fault.
HD12	MONITOR DPFEGR SYSTEM RELATED PIDS	
	• Key on engine running. • Bring the engine to normal operating temperature. • Access the PCM and monitor the DPFEGR and EGRVR PIDs. • Record the PID values with the engine idling. • Key in ON position. • Record the PID values with the engine off. • Compare recorded PID values to the typical reference values in Reference Values. • Are any values out of range?	Yes GO to Pinpoint Test HE and diagnose the EGR system. No GO to HD15.
HD13	MONITOR EGR SYSTEM RELATED PIDS	
	• Key on engine running. • Bring the engine to normal operating temperature. • Access the PCM and monitor the EGRMC1, EGRMC2, EGRMC3, EGRMC4 and MAP_V PIDs. • Record the PID values with the engine idling. • Key in ON position. • Record the PID values with the engine off. • Compare recorded PID values to the typical reference values in Reference Values. • Are any values out of range?	Yes GO to Pinpoint Test KD and diagnose the EGR system. No GO to HD16.

Misfire Detection Monitor

HD

Test Step		Results / Action to Take
HD14	MONITOR ESM SYSTEM RELATED PIDS	Yes GO to Pinpoint Test HH and diagnose the EGR system. No GO to HD17.
	• Key on engine running. • Bring the engine to normal operating temperature. • Access the PCM and monitor the DPFEGR, EGRVR and MAP_V PIDs. • Record the PID values with the engine idling. • Key in ON position. • Record the PID values with the engine off. • Compare recorded PID values to the typical reference values in Reference Values. • Are any values out of range?	
HD15	RECREATE THE MISFIRE SYMPTOM WITH DPFEGR SYSTEM DISABLED	Yes CONNECT the EVR solenoid and CLEAR the PCM DTCs. GO to HD18. No REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding or other damage. REFER to Engine for more EGR system information. REPAIR as necessary.
	Note: The PCM may store EGR system related DTCs during this procedure. • Key in OFF position. • EVR Solenoid connector disconnected. • Access the misfire freeze frame data (if available) and record the DTC malfunction conditions. • Obtain information from the customer information worksheet or any other available data from the customer. • Recreate the misfire symptom using freeze frame and customer information. Note: To recreate the original conditions that set the DTC or caused the symptom, the vehicle may require driving. • Could the symptom be recreated?	
HD16	RECREATE THE MISFIRE SYMPTOM WITH EEGR SYSTEM DISABLED	Yes CONNECT the EEGR assembly and CLEAR the PCM DTCs. GO to HD18. No REMOVE and INSPECT the EEGR for signs of contamination, unusual wear, carbon deposits, binding or other damage. REFER to Engine for more EGR system information. REPAIR as necessary.
	Note: The PCM may store EGR system related DTCs during this procedure. • Key in OFF position. • EEGR Assembly connector disconnected. • Access the misfire freeze frame data (if available) and record the DTC malfunction conditions. • Obtain information from the customer information worksheet or any other available data from the customer. • Recreate the misfire symptom using freeze frame and customer information. Note: To recreate the original conditions that set the DTC or caused the symptom, the vehicle may require driving. • Could the symptom be recreated?	

Misfire Detection Monitor

HD

Test Step		Results / Action to Take
HD17	RECREATE THE MISFIRE SYMPTOM WITH ESM SYSTEM DISABLED	
	Note: The PCM may store EGR system related DTCs during this procedure. • Key in OFF position. • ESM connector disconnected. • Access the misfire freeze frame data (if available) and record the DTC malfunction conditions. • Obtain information from the customer information worksheet or any other available data from the customer. • Recreate the misfire symptom using freeze frame and customer information. Note: To recreate the original conditions that set the DTC or caused the symptom, the vehicle may require driving. • Could the symptom be recreated?	Yes CONNECT the ESM connector and CLEAR the PCM DTCs. GO to HD18. No REMOVE and INSPECT the ESM for signs of contamination, unusual wear, carbon deposits, binding or other damage. REFER to Engine for more EGR system information. REPAIR as necessary.
HD18	CHECK THE FUEL INJECTORS ABILITY TO DELIVER FUEL	
	Note: The fuel delivery system is not likely to have caused the misfire DTC if the flow test is within specification. • Go to Pinpoint Test HC for reference to the warning, caution, and handling to prevent accident. • Verify the flow rate for each injector is within specification. Use the injector flow tester. • Is the flow rate for each injector within specification?	Yes GO to HD19. No INSTALL a new Fuel Injector.
HD19	CHECK THE VACUUM SYSTEM	
	Note: Some vacuum leaks can be heard. • Visually inspect the vacuum hoses for signs of damage or deterioration. A collapsed vacuum hose may cause a blockage to one of the various actuators or sensors. If a blockage is found remove the blockage or install new parts as necessary. • Is the vehicle vacuum system OK?	Yes GO to HD20. No REPAIR the vacuum system.
HD20	CHECK THE DAMPER AND PULLEY ASSEMBLY	
	Note: This 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 dampener. • Does the crank pulley wobble or is the pulse ring loose or damaged?	Yes DISCONNECT the battery for 5 minutes to allow the PCM to learn the new profile. INSTALL a new pulley or damper assembly. No GO to HD21.

Misfire Detection Monitor

HD

Test Step		Results / Action to Take
HD21	CHECK THE EVAPORATIVE EMISSION SYSTEM	Yes INSTALL a new EVAP canister. No GO to HD22.
	- The misfire monitor can be influenced by the evaporative emission system. The next 5 pinpoint test steps diagnose the evaporative emission system. - Check the EVAP canister for fuel saturation. - Is there an excess amount of liquid fuel present in the canister?	
HD22	PRESSURE TEST THE EVAPORATIVE EMISSION SYSTEM	Yes GO to HD23. No REPAIR as necessary.
	- Install the Rotunda Evaporative Emission System Tester, or equivalent, at the EVAP test port, then at the fuel filler cap. - Follow the test instructions from the tester kit. - Is the evaporative emission system holding pressure?	
HD23	CHECK VACUUM IN THE EVAPORATIVE EMISSION SYSTEM	Yes INSTALL a new vacuum hoses in place of the damaged hoses, or REMOVE the blockage/restrictions. No GO to HD24.
	- Check the vacuum system between the engine vacuum port and the EVAP canister. - Check the EVAP system lines/hoses (check for proper connections, damage or blockage). - Check for blockage in the fuel tank vent system. - Is there a fault indicated?	
HD24	CHECK THE EVAP CANISTER PURGE VALVE HOUSING LEAKS	Yes GO to HD25. No REMOVE the vacuum pump. INSTALL a new EVAP canister purge valve.
	- The EVAP canister purge valve is electrically connected. - Install a hand vacuum pump to the fuel vapor port from the EVAP canister on the EVAP canister purge vacuum valve at the line. - Apply 53 kPa (16 in-Hg) of vacuum with the vacuum pump. - Does the EVAP canister purge valve hold vacuum at room temperature?	
HD25	CHECK FOR FILTER CONTAMINATION ON THE EVAP CANISTER PURGE VALVE	Yes REPAIR the EVAP canister purge valve filter. If unable to clean the filter or remove blockage to the filter, INSTALL a NEW EVAP canister purge valve. No GO to HD26.
	- The vacuum line from the input vacuum port to the intake manifold on the EVAP canister purge valve (the control vacuum solenoid part of the valve) is removed. - Install a hand vacuum to the open vacuum port on the EVAP canister purge valve. - Apply 48 - 52 kPa (10 - 15 in-Hg) of vacuum to the canister purge valve. - Does the EVAP canister purge valve hold vacuum, or is the valve very slow to release vacuum to the atmosphere?	

HD21-HD25

Misfire Detection Monitor

HD

Test Step		Results / Action to Take
HD26	CHECK FOR BASE ENGINE CONCERNS	Yes REPAIR as necessary. REFER to Engine. No GO to Z1. If unable to identify the fault in Pinpoint Test Z, GO to HD27.
	- This step determines if there are any base engine concerns that may have caused the Misfire DTC or drive concern. Note: The engine temperature may affect the results. - Carry out the following tests in order to evaluate base engine integrity: - Carry out engine compression and leakdown tests. Refer to Engine. - Carry out valve train analysis. Refer to Engine. - Check the positive crankcase ventilation (PCV) system. Refer to Engine. - Check possible leakage points. Refer to Engine. - Is any repair required?	
HD27	CHECK Z1 TO IDENTIFY A FAULT	Yes Test Complete No GO to HD28.
	Did Pinpoint Test Z find a fault?	
HD28	CHECK FOR ADDITIONAL MISFIRE DTCS	Yes GO to HD1. No GO to HD29.
	- Diagnostic trouble code P0300 indicates multiple cylinders are misfiring or the PCM cannot identify which cylinder is misfiring. - Are any other misfire DTCs present?	
HD29	CHECK FOR OTHER NON-MISFIRE CONTINUOUS MEMORY DTCS	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions . No GO to HD30.
	Are other continuous memory DTCs present?	
HD30	IDENTIFY THE CAMSHAFT POSITION (CMP) SENSOR TYPE	Yes GO to HD31. No GO to HD32.
	- Identify which type of CMP sensor the vehicle uses. - Does the vehicle use a Hall-effect sensor?	

Misfire Detection Monitor

HD

Test Step		Results / Action to Take				
HD31	CHECK THE CMP SENSOR LOW RANGE OUTPUT WITH THE PCM DISCONNECTED Note: DTCS P1309, P1336, and or P0606 indicate the misfire monitor is not enabled. • PCM connector disconnected. • Connect the digital multimeter. • Bump the engine with a short burst from the starter, without starting the engine for at least 10 engine revolutions. • Measure the voltage between: <table><tr><td>(+) CMP Sensor Connector, Harness Side</td><td>(-) 12 Volt Vehicle Battery</td></tr><tr><td>CMP</td><td>Negative terminal</td></tr></table> • Is the voltage less than 2 V?	(+) CMP Sensor Connector, Harness Side	(-) 12 Volt Vehicle Battery	CMP	Negative terminal	Yes If DTC P0606 is present in an electronic throttle control equipped vehicle, GO to DK1. A Hall-type CMP that is installed out of synchronization produces a DTC. To verify the correct installation, REFER to Engine. If the CMP is installed properly, INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). GO to DK1. No INSTALL a new CMP sensor.
(+) CMP Sensor Connector, Harness Side	(-) 12 Volt Vehicle Battery					
CMP	Negative terminal					
HD32	CHECK THE CMP SENSOR HIGH RANGE OUTPUT VOLTAGE • Key in OFF position. • PCM connector connected. • CMP Sensor connector disconnected. Note: Diagnostic trouble code P1309 indicates the misfire detection monitor is not enabled. • Digital multimeter on low voltage AC scale. • Key on engine running. • Measure the voltage between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) 12 Volt Vehicle Battery</td></tr><tr><td>CMP</td><td>Negative terminal</td></tr></table> • Is the voltage greater than 0.25 V?	(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery	CMP	Negative terminal	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new CMP sensor.
(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery					
CMP	Negative terminal					

Misfire Detection Monitor**HD**

Test Step		Results / Action to Take
HD33	CHECK THE PHYSICAL CONDITION OF THE CRANKSHAFT PULSE WHEEL	
	Note: DTC P0315 is set when the PCM is unable to learn and correct for the mechanical variations in the crankshaft pulse wheel tooth spacing (the allowable correction tolerances are exceeded). • Inspect the crankshaft pulse wheel for damaged teeth. • Inspect the crankshaft pulsewheel for wobble. • Check for a loose crankshaft pulse wheel. • Check the CKP sensor for damage. • Are the CKP sensor and crankshaft pulse wheel OK?	Yes If the CKP is installed properly, INSTALL a new PCM. REFER to Diagnostic Methods,Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR as necessary. REFER to Engine to check for correct crankshaft position (CKP) sensor installation. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM).

HD33

Test HE: Exhaust Gas Recirculation (EGR) Systems
PINPOINT TEST HE: EXHAUST GAS RECIRCULATION (EGR) SYSTEMS

Exhaust Gas Recirculation (EGR) Systems

HE

This pinpoint test is intended to diagnose the following:

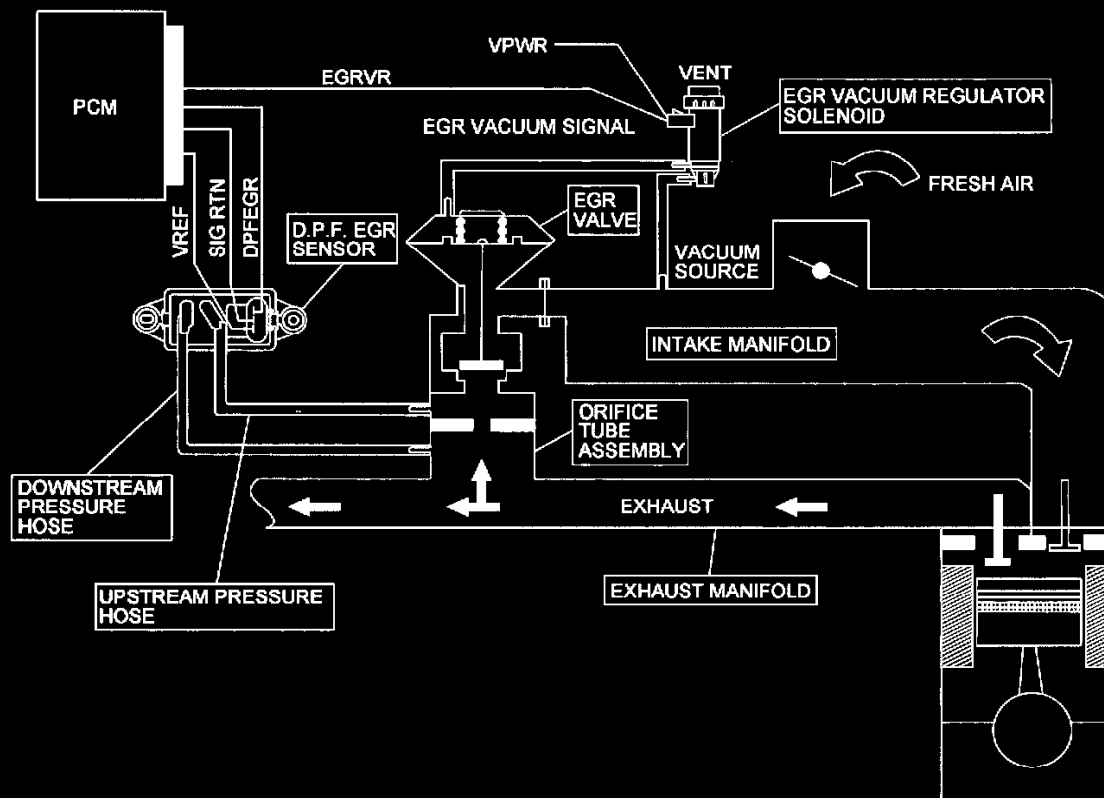
- Differential pressure feedback EGR (DPFE) sensor (9J460).
- Exhaust gas recirculation (EGR) valve (9D460) (9D475).
- EGR vacuum regulator (EVR) solenoid (9J459).
- Orifice tube assembly (9D477).
- Differential pressure feedback EGR (DPFE) sensor pressure hoses.
- Vacuum lines.
- Harness circuits: VREF,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

Note

Exhaust Gas Recirculation (EGR) Systems

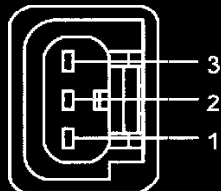
HE

Typical DPFE EGR System



N0012056

Schematic

**Exhaust Gas Recirculation (EGR)
Systems****HE****Differential Pressure Feedback EGR (DPFEGR)
Sensor Connector****A**

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B

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Vehicle	Connector	Circuit	Pin
Tube mount	A	DPFEGR SIGRTN VREF	3 2 1
All other vehicles	B	DPFEGR SIGRTN VREF	1 2 3

**Electronic Vacuum Regulator (EVR) Solenoid
Connector**

A0077544

Connectors

Exhaust Gas Recirculation (EGR) Systems

HE

Circuit	Pin
EVR (Electronic Vacuum Regulator)	2
VPWR (Power Supply)	1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	PWRGND EVR VREF SIGRTN DPFEGR	B24 B16 E20 E17 E41
Crown Victoria, Explorer, Five Hundred, Freestyle, Grand Marquis, Montego, Mountaineer, Town Car	150 (50-50-50) Pin	PWRGND EVR VREF SIGRTN DPFEGR	B47 E6 E40 E41 E44
E-Series, F-Super Duty	170 Pin	PWRGND EVR VREF SIGRTN DPFEGR	B47 E63 E57 E58 E21
Escape, Mariner	150 (50-50-50) Pin	PWRGND EVR VREF SIGRTN DPFEGR	B47 E27 E40 E41 E44
Excursion	104 Pin	PWRGND EVR VREF SIGRTN DPFEGR	3 47 90 91 65
F-150	190 Pin	PWRGND EVR VREF SIGRTN DPFEGR	B67 E63 E57 E58 E21
LS, Thunderbird	150 (60-32-58) Pin	PWRGND EVR VREF SIGRTN DPFEGR	B24 E16 E14 E17 E41

(Continued)

Connectors

Exhaust Gas Recirculation (EGR) Systems

HE

Vehicle	Connector	Circuit	Pin
Mustang	170 Pin	PWRGND EVR VREF SIGRTN DPFEGR	B47 E63 E24 E33 E21
All other vehicles	104 Pin	PWRGND EVR VREF SIGRTN DPFEGR	103 47 90 91 85

Test Step		Results / Action to Take							
HE1	DTCS P0405 AND P1400: DETERMINE THE PRESENT DPFEGR PID VOLTAGE	Yes GO to HE2. No An intermittent fault is suspected in the EGR system GO to HE11.							
Note: Depending on the application, verify a prior repair has not resulted in the DPFE sensor being installed backwards or the vacuum hoses being installed on the opposite ports. • Key in ON position. • Access the PCM and monitor the DPFEGR PID. • Is the voltage less than 0.2 V?									
HE2	CHECK THE VREF AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS	Yes GO to HE3. No GO to C1.							
• Key in OFF position. • DPFEGR Sensor connector disconnected. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) DPFEGR Sensor Connector, Harness Side</td><td>(-) DPFEGR Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> • Is the voltage between 4 V - 5.5 V?			(+) DPFEGR Sensor Connector, Harness Side	(-) DPFEGR Sensor Connector, Harness Side	VREF	SIGRTN			
(+) DPFEGR Sensor Connector, Harness Side	(-) DPFEGR Sensor Connector, Harness Side								
VREF	SIGRTN								
HE3	CHECK THE DPFEGR CIRCUIT(S) FOR A SHORT TO SIGRTN OR GND IN THE HARNESS	Yes GO to HE4. No REPAIR the short circuit.							
• Key in OFF position. • PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>DPFEGR</td><td>SIGRTN</td></tr></table> • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>DPFEGR</td><td>Negative terminal</td></tr></table> • Is the resistance greater than 10K ohms?			(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	DPFEGR	SIGRTN	(+) PCM Connector, Harness Side	(-) Vehicle Battery	DPFEGR
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side								
DPFEGR	SIGRTN								
(+) PCM Connector, Harness Side	(-) Vehicle Battery								
DPFEGR	Negative terminal								

Connector And HE1-HE3

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take						
HE4	INDUCE THE OPPOSITE DPFEGR SENSOR VOLTAGE • PCM connector connected. • Key in ON position. • Access the PCM and monitor the DPFEGR PID. • Is the voltage between 4 V - 5.5 V?	Yes INSTALL a new DPFEGR sensor. Note: After installing a new DPFEGR sensor, it is important to turn the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new DPFEGR sensor. Failure to do this may result in a false DTC P0402. No INSTALL a new PCM. REFER to Diagnostic Methods,Flash Electrically Erasable Programmable Read Only Memory (EEPROM).						
HE5	DTCS P0406 AND P1401: DETERMINE THE PRESENT DPFEGR PID VOLTAGE • Key in ON position. • Access the PCM and monitor the DPFEGR PID. • Is the voltage greater than 4 V?	Yes GO to HE6. No An intermittent fault is suspected in the EGR system GO to HE11.						
HE6	CHECK THE VREF VOLTAGE TO DPFE SENSOR • Key in OFF position. • DPFEGR Sensor connector disconnected. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) DPFEGR Sensor Connector, Harness Side</td><td>(-) DPFEGR Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> • Is the voltage between 4 V - 5.5 V?	(+) DPFEGR Sensor Connector, Harness Side	(-) DPFEGR Sensor Connector, Harness Side	VREF	SIGRTN	Yes GO to HE7. No GO to C1.		
(+) DPFEGR Sensor Connector, Harness Side	(-) DPFEGR Sensor Connector, Harness Side							
VREF	SIGRTN							
HE7	CHECK THE DPFEGR AND SIGRTN CIRCUIT(S) FOR AN OPEN IN THE HARNESS • Key in OFF position. • PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) DPFEGR Sensor Connector, Harness Side</td></tr><tr><td>DPFEGR</td><td>DPFEGR</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> • Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) DPFEGR Sensor Connector, Harness Side	DPFEGR	DPFEGR	SIGRTN	SIGRTN	Yes GO to HE8. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) DPFEGR Sensor Connector, Harness Side							
DPFEGR	DPFEGR							
SIGRTN	SIGRTN							

HE4-HE7

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take				
HE8	CHECK THE DPFEGR CIRCUIT FOR A SHORT TO VREF - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VREF</td><td>DPFEGR</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	VREF	DPFEGR	Yes GO to HE9. No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side					
VREF	DPFEGR					
HE9	CHECK THE DPFEGR CIRCUIT FOR A SHORT TO POWER - Key in ON position. - Measure the voltage between:<table><tr><td>(+) DPFEGR Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>DPFEGR</td><td>Negative terminal</td></tr></table> - Is the voltage less than 0.2 V?	(+) DPFEGR Sensor Connector, Harness Side	(-) Vehicle Battery	DPFEGR	Negative terminal	Yes GO to HE10. No REPAIR the short circuit to PWR.
(+) DPFEGR Sensor Connector, Harness Side	(-) Vehicle Battery					
DPFEGR	Negative terminal					
HE10	CHECK THE DPFEGR PID - Key in OFF position. - PCM connector connected. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A DPFEGR Sensor Connector, Harness Side</td><td>Point B</td></tr><tr><td>DPFEGR</td><td>Ground</td></tr></table> - Key in ON position. - Access the PCM and monitor the DPFEGR PID. - Is the DPFEGR PID greater than 4.5 volts with the jumper wire removed and is the DPFEGR PID less than 0.1 volt with the jumper wire installed?	Point A DPFEGR Sensor Connector, Harness Side	Point B	DPFEGR	Ground	Yes INSTALL a new DPFEGR sensor. No INSTALL a new PCM. Refer to Diagnostic Methods,Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
Point A DPFEGR Sensor Connector, Harness Side	Point B					
DPFEGR	Ground					
HE11	CARRY OUT A THOROUGH WIGGLE TEST ON THE DPFEGR HARNESS - Access the PCM and monitor the 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 voltage reading, or is a concern present?	Yes REPAIR as necessary. No Unable to duplicate or identify the fault at this time. GO to Z1.				
HE12	DTCS P0402 AND P1405: CHECK FOR SIMULTANEOUS PRESENCE Is DTC P0402 present with DTC P1405?	Yes GO to HE28. No GO to HE13.				

HE8-HE12

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE13	DTC P0402: CHECK FOR EGR FLOW AT IDLE WITH THE EGR VACUUM HOSE DISCONNECTED	
	Note: Disregard P1408 if it is generated as a result of carrying out the KOER self-test with the EGR vacuum source hose disconnected. • Disconnect and plug the vacuum hose connected to the EGR valve. • Carry out the KOER self-test. • Did KOER DTC P0402 appear or are you unable to run the KOER self-test due to an engine stall or no start?	Yes Key in OFF position. INSPECT the pressure hoses for pinching, icing or other blockage. If OK, REMOVE and INSPECT the EGR valve and tube for signs of contamination, unusual wear, carbon deposits, binding or other damage. REPAIR as necessary. GO to HE14. No CONNECT the EGR valve vacuum hose. GO to HE15.
HE14	CARRY OUT THE KOER SELF-TEST	
	• Clear the DTCs. • Carry out the KOER self-test. • Is DTC P0402 present?	Yes GO to HE18. No Test is complete and no faults were found. Clear the DTCs. REPEAT the self-test.
HE15	CHECK FOR EGR FLOW AT IDLE WITH THE EGR VACUUM HOSE CONNECTED	
	• Key in OFF position. • Connect the EGR valve vacuum hose. • Carry out the KOER self-test. • Did KOER DTC P0402 appear or are you unable to run the KOER self-test due to an engine stall or no start?	Yes GO to HE16. No INSPECT the pressure hoses for pinching, icing or other blockage. REPAIR as necessary. GO to HE23.
HE16	CHECK THE EGR SYSTEM HOSES FOR INTEGRITY AND CONNECTION	
	Note: A pinched or plugged EGR vacuum hose can trap vacuum between the EVR solenoid and EGR valve, not allowing the EGR valve to close. • Trace each vacuum hose from the EVR solenoid and verify each hose is connected correctly. • Verify the EGR vacuum hose is not pinched or plugged and is routed properly. • Are all of the vacuum hoses OK?	Yes CONNECT the vacuum hose(s). GO to HE17. No REPAIR as necessary.

HE13-HE16

Exhaust Gas Recirculation (EGR) Systems

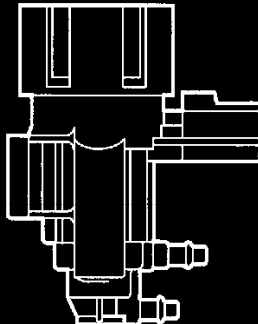
HE

Test Step		Results / Action to Take
HE17	CHECK THE DPFE SENSOR OUTPUT BY APPLYING VACUUM WITH THE HAND PUMP	Yes INSTALL a new DPFEGR sensor. Note: After installing a new DPFEGR sensor, it is important to turn the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new DPFEGR sensor. Failure to do this may result in a false DTC P0402. No CONNECT the DPFEGR. GO to HE18.
	• Disconnect the pressure hoses at the DPFEGR sensor. • Connect the vacuum pump to the downstream connection at the sensor (intake manifold side of the sensor or the smaller diameter pickup tube). • Key in ON position. • Access the PCM and monitor the 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 volt with the key ON and no vacuum applied. — The DPFEGR PID voltage must increase to greater than 4 volts with the vacuum applied. — The DPFEGR PID must drop 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?	
HE18	CHECK EGR FLOW AT IDLE WITH THE EVR HARNESS CONNECTOR OFF	Yes GO to HE19. No GO to HE20.
	• Disconnect the vacuum hose at the EGR valve and connect the hose to the vacuum gauge. • Start the engine. • EVR Solenoid connector disconnected. • Observe the vacuum gauge: — 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 EVR solenoid is disconnected, a fault may be present in the EVR solenoid. • Does the EGR vacuum remain greater than 5.4 kPa (1.6 in Hg) at Idle after the EVR is disconnected?	

HE17-HE18

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE19	INSPECT THE EVR SOLENOID VENT FOR BLOCKAGE Note: A plugged electronic vacuum regulator (EVR) solenoid vent does not allow EGR vacuum to vent to the atmosphere. • Key in OFF position. • EVR vacuum hoses disconnected. • Remove the EVR solenoid vent cap (if removable). • Remove the filter and inspect for blockage or icing. • Plug the EGR vacuum supply port. • Connect a hand vacuum pump to the EVR source port. • Apply 34 to 51 kPa (10 to 15 in Hg) vacuum.  N0009442 • Is the EVR solenoid vent or filter plugged or restricted?	

HE19-HE21

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take				
HE22	CHECK EVR CIRCUIT FOR SHORT TO VREF - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>EVR</td><td>VREF</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	EVR	VREF	Yes INSTALL a new PCM. REFER to Diagnostic Methods,Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side					
EVR	VREF					
HE23	CHECK THE DPFE SENSOR OUTPUT BY APPLYING VACUUM WITH THE HAND PUMP - Disconnect the pressure hoses at the DPFEGR sensor. - Connect the vacuum pump to the downstream connection at the sensor (intake manifold side of the sensor or the smaller diameter pickup tube). - Key in ON position. - Access the PCM and monitor the 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 volt with the key ON and no vacuum applied. - The DPFEGR PID voltage must increase to greater than 4 volts with the vacuum applied. - The DPFEGR PID must drop 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 INSTALL a new DPFEGR sensor. Note: After installing a new DPFEGR sensor, it is important to turn the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new DPFEGR sensor. Failure to do this may result in a false DTC P0402. No CONNECT the DPFEGR. GO to HE24.				

Exhaust Gas Recirculation (EGR) Systems

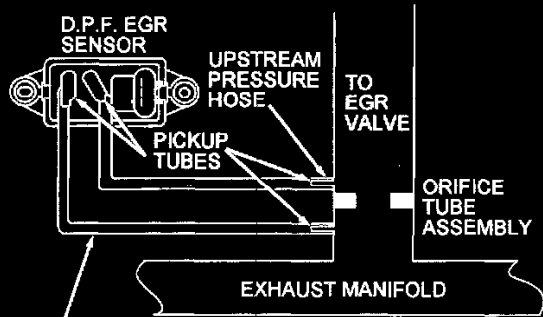
HE

Test Step		Results / Action to Take
HE24	CHECK THE EGR VALVE OPERATION • Key in ON position. • Access the PCM and monitor the DPFEGR PID. Note: Typical sensor voltage with no EGR flow is between 0.2 volt and 1.3 volts. • Disconnect the vacuum hose at the EGR valve and plug the hose. • Connect the vacuum pump to the EGR valve. • Start the engine. • Observe the DPFEGR PID at idle and compare it to the KOEO voltage. Note: A higher voltage at idle may be due to a non-seating or heavily carboned EGR valve pintle. • Apply just enough vacuum to the EGR valve to open it without stalling the engine. • Quickly release vacuum. • Repeat this 3 times. • Observe the DPFEGR PID. Note: DPFEGR PID voltage must increase as the valve opens and decrease as the valve closes. A slow return voltage is an indication of a binding or slow closing EGR valve. • Does the DPFEGR PID voltage indicate an open, binding or slow closing EGR valve?	Yes REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding or other damage. REPAIR as necessary. No GO to HE25.
HE25	CARRY OUT A THOROUGH WIGGLE TEST ON THE EVR HARNESS Note: An intermittent short to GND in the EVR circuit causes the vacuum applied to the EGR valve to be higher than normal when the short is present. The vacuum available at the EGR valve at idle is normally below 3.4 kPa (1.6 in. Hg) for the valve to begin to open. • Key in OFF position. • Remove the vacuum pump. • Connect the vacuum gauge to the EGR valve vacuum hose. • Connect a vacuum gauge to the EGR valve vacuum hose using a vacuum tee. • Key on engine running. • Observe the vacuum gauge. — Lightly tap on the EVR solenoid. — Carry out a thorough wiggle test on the EVR harness. • Note: A fault is indicated by a sudden jump in the vacuum reading. • Is a concern present?	Yes ISOLATE the fault and REPAIR as necessary. No CONNECT the vacuum hose(s). GO to HE26.

HE24-HE25

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE26	INSPECT THE EVR SOLENOID AND VACUUM HOSES FOR PLUGGING - Key in OFF position. - Remove the EVR solenoid vent cap (if removable). - Remove the filter and inspect for blockage or icing. - Inspect the pressure hoses for pinching, icing or other blockage. Is the EVR solenoid vent or filter plugged or restricted?	Yes REPAIR, or if not repairable, INSTALL a new EVR solenoid. No GO to Z1.
HE27	DTC P1405: INSPECT THE UPSTREAM PRESSURE HOSE CONNECTIONS - Inspect the upstream hose at the DPFEGR sensor and orifice tube assembly for a disconnect or a poor connection.  N0009380 Is vacuum hose off or poorly connected?	
HE28	INSPECT THE UPSTREAM PRESSURE HOSE FOR PLUGGING Note: It is essential that only the correct Ford replacement pressure hose be used. - Visually inspect the upstream pressure hose routing. The hose must not be pinched or have dips in it where water could settle or freeze. - Remove the upstream pressure hose and carefully inspect for plugging, water, or leaks. Is a concern present?	Yes REPAIR or INSTALL a new pressure hose as necessary. No GO to HE29.

Exhaust Gas Recirculation (EGR) Systems

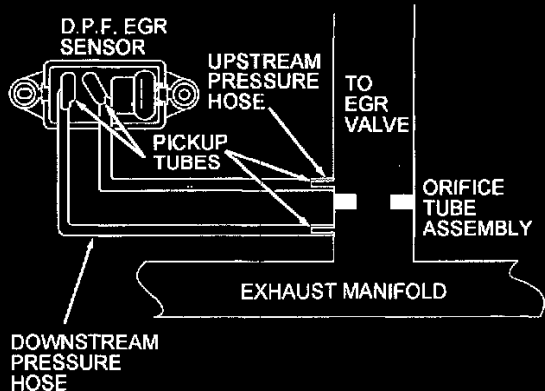
HE

Test Step		Results / Action to Take
HE29	CHECK THE ORIFICE TUBE ASSEMBLY AND THE DPFEGR SENSOR	Yes REPAIR or INSTALL a new DPFEGR sensor or orifice tube assembly as necessary. Note: After installing a new DPFEGR sensor, it is important to turn the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new DPFEGR sensor. Failure to do this may result in a false DTC P0402. No GO to HE30 .
	- Inspect the upstream connection on the DPFEGR sensor for damage or plugging at the sensor. - Inspect the exhaust manifold side pressure tube at the orifice tube assembly for plugging or damage. - Is the DPFEGR sensor or orifice tube assembly plugged or damaged?	
HE30	CHECK THE DPFE SENSOR OUTPUT BY APPLYING VACUUM WITH THE HAND PUMP	Yes INSTALL a new DPFEGR sensor. Note: After installing a new DPFEGR sensor, it is important to turn the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new DPFEGR sensor. Failure to do this may result in a false DTC P0402. No GO to Z1 .
	- Disconnect the pressure hoses at the DPFEGR sensor. - Connect the vacuum pump to the downstream connection at the sensor (intake manifold side of the sensor or the smaller diameter pickup tube). - Key in ON position. - Access the PCM and monitor the 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 volt with the key ON and no vacuum applied. - The DPFEGR PID voltage must increase to greater than 4 volts with the vacuum applied. - The DPFEGR PID must drop 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?	

HE29-HE30

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE31	DTC P1406: INSPECT THE DOWNSTREAM PRESSURE HOSE CONNECTIONS Note: If the fault is currently present, DTC P1408 appears when running the KOER self-test. - Verify the EGR valve is securely attached and exhaust gases are not leaking from the sealing surface. - Inspect the downstream hose at the DPFEGR sensor and orifice tube assembly for a disconnect or a poor connection.  N0009380 - Is vacuum hose off or poorly connected?	Yes REPAIR as necessary. No GO to HE32.
HE32	INSPECT THE DOWNSTREAM PRESSURE HOSE FOR PLUGGING Note: It is essential that only the correct Ford replacement pressure hose be used. - Visually inspect the downstream pressure hose routing. - Remove the upstream pressure hose and carefully inspect for plugging, water, or leaks. - Is a concern present?	Yes REPAIR or INSTALL a new pressure hose as necessary. No GO to HE33.

Exhaust Gas Recirculation (EGR) Systems

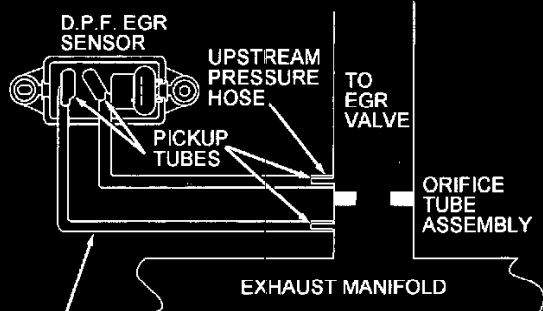
HE

Test Step		Results / Action to Take							
HE33	CHECK THE ORIFICE TUBE ASSEMBLY AND THE DPFEGR SENSOR	Yes REPAIR or INSTALL a new DPFEGR sensor or orifice tube assembly as necessary. Note: After installing a new DPFEGR sensor, it is important to turn the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new DPFEGR sensor. Failure to do this may result in a false DTC P0402. No GO to HE34.							
	- Inspect the connections at the DPFEGR sensor for plugging or damage. - Inspect the intake manifold side pressure tube at the orifice tube assembly for plugging or damage. - Is the DPFEGR sensor or orifice tube assembly plugged or damaged?								
HE34	CHECK THE DPFE SENSOR OUTPUT BY APPLYING VACUUM WITH THE HAND PUMP	Yes GO to HE35. No GO to Z1.							
	- Disconnect the pressure hoses at the DPFEGR sensor. - Connect the vacuum pump to the downstream connection at the sensor (intake manifold side of the sensor or the smaller diameter pickup tube). - Key in ON position. - Access the PCM and monitor the 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 volt with the key ON and no vacuum applied. - The DPFEGR PID voltage must increase to greater than 4 volts with the vacuum applied. - The DPFEGR PID must drop 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?								
HE35	CHECK THE DPFEGR CIRCUIT(S) FOR AN OPEN IN THE HARNESS	Yes REPAIR the open circuit. No INSTALL a new DPFEGR sensor. Note: After installing a new DPFEGR sensor, it is important to turn the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new DPFEGR sensor. Failure to do this may result in a false DTC P0402.							
	- Key in OFF position. - PCM connector disconnected. - Measure the resistance between: <table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) DPFEGR Sensor Connector, Harness Side</th></tr><tr><td>DPFEGR</td><td>DPFEGR</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr><tr><td>VREF</td><td>VREF</td></tr></table> - Are the resistances greater than 5 ohms?		(+) PCM Connector, Harness Side	(-) DPFEGR Sensor Connector, Harness Side	DPFEGR	DPFEGR	SIGRTN	SIGRTN	VREF
(+) PCM Connector, Harness Side	(-) DPFEGR Sensor Connector, Harness Side								
DPFEGR	DPFEGR								
SIGRTN	SIGRTN								
VREF	VREF								

HE33-HE35

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE36	DTC P0401: CARRY OUT THE KOER SELF-TEST • Carry out the KOER self-test. • Did DTC P1408 appear?	Yes GO to HE37 . No GO to HE53 .
HE37	KOER AND CONTINUOUS MEMORY DTC P1408: RETRIEVE CONTINUOUS MEMORY DTC Note: If any DTC other than P1406 appears, note the DTC and refer to Diagnostic Trouble Code (DTC) Charts and Descriptions after completing this pinpoint test. • Retrieve all continuous memory DTCs. • Is DTC 1406 present?	Yes GO to HE31 . No GO to HE38 .
HE38	INSPECT THE DPFEGR PRESSURE HOSES • Inspect the pressure hoses for a reverse connection at the DPFEGR sensor or at the orifice tube assembly. • Inspect the hoses for improper routing. • Inspect both hoses for leaks and blockage. • Inspect the DPFEGR sensor and orifice tube assembly for blockage or damage at the pick-up tubes.  N0009380 • Is a concern present?	Yes REPAIR or INSTALL a new pressure hose as necessary. No GO to HE39 .

HE36-HE38

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take				
HE39	CHECK THE DPFE SENSOR OUTPUT BY APPLYING VACUUM WITH THE HAND PUMP • Disconnect the pressure hoses at the DPFEGR sensor. • Connect the vacuum pump to the downstream connection at the sensor (intake manifold side of the sensor or the smaller diameter pickup tube). • Key in ON position. • Access the PCM and monitor the 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 volt with the key ON and no vacuum applied. — The DPFEGR PID voltage must increase to greater than 4 volts with the vacuum applied. — The DPFEGR PID must drop 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 INSTALL a new DPFEGR sensor. Note: After installing a new DPFEGR sensor, it is important to turn the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new DPFEGR sensor. Failure to do this may result in a false DTC P0402. No CONNECT all the hoses. GO to HE40.				
HE40	CHECK THE VREF VOLTAGE TO DPFE SENSOR • Key in OFF position. • DPFEGR Sensor connector disconnected. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) DPFEGR Sensor Connector, Harness Side</td><td>(-) DPFEGR Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> • Is the voltage between 4 V - 5.5 V?	(+) DPFEGR Sensor Connector, Harness Side	(-) DPFEGR Sensor Connector, Harness Side	VREF	SIGRTN	Yes GO to HE41. No GO to C1.
(+) DPFEGR Sensor Connector, Harness Side	(-) DPFEGR Sensor Connector, Harness Side					
VREF	SIGRTN					
HE41	CHECK THE DPFEGR CIRCUIT FOR A SHORT TO VREF • Key in OFF position. • PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VREF</td><td>DPFEGR</td></tr></table> • Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	VREF	DPFEGR	Yes GO to HE42. No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side					
VREF	DPFEGR					

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE42	CARRY OUT THE KOER SELF-TEST WHILE MONITORING THE EGR VACUUM	Yes GO to HE43. No GO to HE44.
• PCM connector connected. • DPFEGR Sensor connector connected. • Disconnect the vacuum hose at the EGR valve and connect the hose to the vacuum gauge. Note: Since the EGR vacuum hose is disconnected, ignore the DTCs during this KOER self-test. • Carry out the KOER self-test. Observe the vacuum gauge. Approximately 30 seconds into the test, EGR flow will be requested for a few seconds. Vacuum at this time should increase to greater than 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 the KOER self-test?		
HE43	CHECK THE EGR VALVE FUNCTION BY APPLYING VACUUM WITH THE HAND PUMP	Yes GO to HE47. No GO to HE44.
• Key in OFF position. • Disconnect the vacuum hose at the EGR valve and plug the hose. • Connect the vacuum pump to the EGR valve. • Key on engine running. • Access the PCM and monitor the DPFEGR and RPM PIDs. • Apply 27 - 30 kPa (8 - 9 in Hg) vacuum to the DPFEGR sensor and hold for 10 seconds. If the engine wants to stall, increase the engine speed to approximately 1,000 RPM and hold steady. • Look for the following: — The EGR valve starts opening at about 5.4 kPa (1.6 in Hg) vacuum, indicated by an increasing DPFEGR PID voltage. — The DPFE PID voltage increases until the valve is fully open. The DPFEGR PID voltage must read at least 2.5 volts with full vacuum applied. — The DPFEGR PID voltage remains steady with steady vacuum. If voltage drops within a few seconds, the EGR valve or vacuum source may be leaking. — The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when the vacuum is released. • Does the DPFEGR PID voltage indicate the EGR valve is operating as described in the test step?		

HE42-HE43

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take			
HE44	PHYSICALLY INSPECT ALL VACUUM LINES BETWEEN THE EGR VALVE, EVR AND VACUUM SOURCE	Yes REPAIR as necessary. If the EVR is damaged, INSTALL a new EVR. No GO to HE45.			
	- Key in OFF position. - Inspect all vacuum lines for leaks, kinks, pinches, disconnects, blockage, misrouting or physical damage of any type. - Inspect the EVR for cracks or other physical damage. - Is a concern present?				
HE45	PHYSICALLY INSPECT THE EGR VALVE	Yes REPAIR as necessary. If repair is not possible, INSTALL a new EGR valve. No GO to HE46.			
	- Remove and inspect the EGR valve for signs of contamination, unusual wear, carbon deposits, binding or other damage. - Is a concern present?				
HE46	CHECK THE ENGINE VACUUM	Yes GO to HE47. No ISOLATE the base engine concern and REPAIR as necessary.			
	- EVR vacuum hoses disconnected. - Connect a hand held vacuum gauge to the vacuum source. - Key on engine running. - Engine warm and at idle. - Observe the vacuum gauge. - Is the vacuum gauge steadily reading at least 51 kPa (15 in-Hg)?				
HE47	CHECK THE VPWR VOLTAGE TO EVR SOLENOID	Yes GO to HE48. No REPAIR the open circuit.			
	- Key in OFF position. - EVR Solenoid connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) EVR Solenoid Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VPWR - Pin 1</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 10.5 V?		(+) EVR Solenoid Connector, Harness Side	(-) Vehicle Battery	VPWR - Pin 1
(+) EVR Solenoid Connector, Harness Side	(-) Vehicle Battery				
VPWR - Pin 1	Negative terminal				
HE48	CHECK THE EVR SOLENOID COIL RESISTANCE	Yes GO to HE49. No INSTALL a new EVR solenoid.			
	- Key in OFF position. - Measure the resistance between:<table><tr><td>(+) EVR Solenoid Connector, Component Side</td><td>(-) EVR Solenoid Connector, Component Side</td></tr><tr><td>VPWR - Pin 1</td><td>EVR - Pin 2</td></tr></table> - Is the resistance between 26 ohms - 40 ohms?		(+) EVR Solenoid Connector, Component Side	(-) EVR Solenoid Connector, Component Side	VPWR - Pin 1
(+) EVR Solenoid Connector, Component Side	(-) EVR Solenoid Connector, Component Side				
VPWR - Pin 1	EVR - Pin 2				

HE44-HE48

Exhaust Gas Recirculation (EGR) Systems

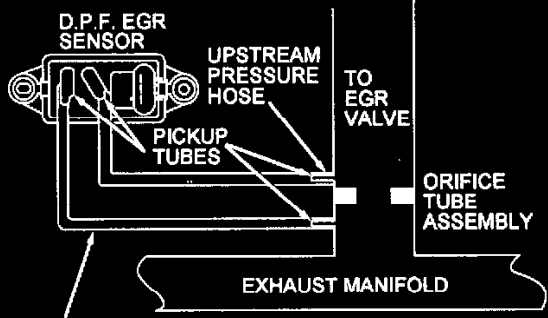
HE

Test Step		Results / Action to Take				
HE49	CHECK EVR CIRCUIT FOR SHORT TO POWER IN HARNESS - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>EVR</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 1 V?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	EVR	Negative terminal	Yes REPAIR the short circuit. No GO to HE50.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
EVR	Negative terminal					
HE50	CHECK THE EVR CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) EVR Solenoid Connector, Harness Side</td></tr><tr><td>EVR</td><td>EVR - Pin 2</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) EVR Solenoid Connector, Harness Side	EVR	EVR - Pin 2	Yes CONNECT the PCM and EVR. GO to HE51. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) EVR Solenoid Connector, Harness Side					
EVR	EVR - Pin 2					
HE51	INSPECT EGR SYSTEM FOR LEAKS, RESTRICTIONS AND POOR CONNECTIONS - Visually inspect the EGR system for signs of intermittent failure. - Is a concern present?	Yes REPAIR as necessary. No GO to HE52.				
HE52	CHECK THE EVR SOLENOID VACUUM FLOW BY GROUNDING THE EVR CIRCUIT - PCM connector connected. - Disconnect the vacuum hose at the EGR valve and connect the hose to the vacuum gauge. - Key on engine running. - Engine warm and at idle. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A EVR Solenoid Connector, Harness Side</td><td>Point B Vehicle Battery</td></tr><tr><td>EVR - Pin 2</td><td>Negative terminal</td></tr></table> Note: If the EVR does not react within 2 seconds, an EVR fault may be present. - Does the vacuum gauge indicate 13.5 kPa (4.0 in Hg) or greater within 2 seconds?	Point A EVR Solenoid Connector, Harness Side	Point B Vehicle Battery	EVR - Pin 2	Negative terminal	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new EVR solenoid.
Point A EVR Solenoid Connector, Harness Side	Point B Vehicle Battery					
EVR - Pin 2	Negative terminal					

HE49-HE52

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE53	INSPECT THE DPFEGR PRESSURE HOSES - Visually inspect the upstream pressure hose routing. Visually inspect the downstream pressure hose routing. Inspect for a reversed connection at the DPFEGR sensor or orifice tube assembly. - The hose must not be pinched or have dips in it where water could settle or freeze. - Inspect both hoses for leaks and blockage. - Inspect the DPFEGR sensor and orifice tube assembly for blockage or damage at the pick-up tubes.  N0009380 - Is a concern present?	Yes REPAIR as necessary. No GO to HE54.
HE54	CHECK THE EGR VALVE FUNCTION BY APPLYING VACUUM WITH THE HAND PUMP - Disconnect the pressure hoses at the DPFEGR sensor. - Connect the vacuum pump to the downstream connection at the sensor (intake manifold side of the sensor or the smaller diameter pickup tube). - Key in ON position. - Access the PCM and monitor the 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 volt with the key ON and no vacuum applied. - The DPFEGR PID voltage must increase to greater than 4 volts with the vacuum applied. - The DPFEGR PID must drop 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 INSTALL a new DPFEGR sensor. Note: After installing a new DPFEGR sensor, it is important to turn the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new DPFEGR sensor. Failure to do this may result in a false DTC P0402. No CONNECT all the hoses. GO to HE55.

HE53-HE54

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE55	CHECK THE EGR VALVE FUNCTION BY APPLYING VACUUM WITH THE HAND PUMP	
• Disconnect the vacuum hose at the EGR valve and plug the hose. • Connect the vacuum pump to the EGR valve. • Key on engine running. • Access the PCM and monitor the DPFEGR and RPM PIDs. • Apply 27 - 30 kPa (8 - 9 in Hg) vacuum to the DPFEGR sensor and hold for 10 seconds. If the engine wants to stall, increase the engine speed to approximately 1,000 RPM and hold steady. • Look for the following: — The EGR valve starts opening at about 5.4 kPa (1.6 in Hg) vacuum, indicated by an increasing DPFEGR PID voltage. — The DPFE PID voltage increases until the valve is fully open. The DPFEGR PID voltage must read at least 2.5 volts with full vacuum applied. — The DPFEGR PID voltage remains steady with steady vacuum. If voltage drops within a few seconds, the EGR valve or vacuum source may be leaking. — The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when the vacuum is released. • Does the DPFEGR PID voltage indicate the EGR valve is operating as described in the test step?		Yes GO to HE56. No REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding or other damage. If OK, REMOVE and INSPECT the EGR valve and tube for signs of contamination, unusual wear, carbon deposits, binding or other damage. REPAIR as necessary.

HE55

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take				
HE56	INSPECT THE EGR VACUUM SIGNAL SUPPLY FOR AN INTERMITTENT FAILURE • Key in OFF position. • Remove the vacuum hose from the exhaust gas recirculation valve and connect to a vacuum gauge. • Key on engine running. • Connect a 5 amp fused jumper wire between the following: <table border="1"><tr><td>Point A EVR Solenoid Connector, Harness Side</td><td>Point B Vehicle Battery</td></tr><tr><td>EVR - Pin 2</td><td>Negative terminal</td></tr></table> • Solenoid will be full ON. • Vacuum gauge should read above 13.5 kPa (4 in Hg). • Observe the vacuum gauge. • Look for a fault while performing the following checks: — Lightly tap on the EVR solenoid. — Carry out a thorough wiggle test on the EVR harness. — Inspect the EGR vacuum signal supply for an intermittent failure. — Inspect the EVR solenoid and vacuum hoses for plugging. — A fault is indicated by a sudden drop in the vacuum reading. • Is a fault indicated?	Point A EVR Solenoid Connector, Harness Side	Point B Vehicle Battery	EVR - Pin 2	Negative terminal	Yes ISOLATE the fault and REPAIR as necessary. No Unable to duplicate or identify the fault at this time. Note: In cold climates, the EGR valve may temporarily freeze shut and thaw when the engine warms. GO to Z1.
Point A EVR Solenoid Connector, Harness Side	Point B Vehicle Battery					
EVR - Pin 2	Negative terminal					
HE57	EGR DIAGNOSIS BY SYMPTOM: CHECK FOR EGR FLOW WITH THE EGR VACUUM HOSE DISCONNECTED AND PLUGGED Note: Carry out the 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 vacuum hose connected to the EGR valve. • Key in ON position. • Access the PCM and monitor the DPFEGR PID. • Note the voltage. • Key on engine running. • With the engine at idle, observe the DPFEGR PID voltage. • Compare to engine OFF voltage. • An increase in voltage at idle indicates the DPFEGR sensor is sensing EGR flow. • Is the DPFEGR PID voltage greater at idle by 0.15 volt than with the engine off?	Yes REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding or other damage. REPAIR as necessary. No INSPECT the EVR solenoid and vacuum hoses for plugging INSPECT the EVR solenoid vent for blockage GO to HE58.				

HE56-HE57

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take				
HE58	DETERMINE THE EGR VALVE VACUUM SUPPLY Is a fault present in the EGR valve vacuum supply?	Yes REPAIR as necessary. No INSTALL a new EVR solenoid.				
HE59	DTCS P0403 AND P1409: CHECK THE EVR SOLENOID COIL RESISTANCE - Key in OFF position. - EVR Solenoid connector disconnected. - Measure the resistance between:<table><tr><td>(+) EVR Solenoid Con- nector, Component Side</td><td>(-) EVR Solenoid Con- nector, Component Side</td></tr><tr><td>VPWR - Pin 1</td><td>EVR - Pin 2</td></tr></table> - Is the resistance between 26 ohms - 40 ohms?	(+) EVR Solenoid Con- nector, Component Side	(-) EVR Solenoid Con- nector, Component Side	VPWR - Pin 1	EVR - Pin 2	Yes GO to HE60. No INSTALL a new EVR solenoid. Clear the PCM DTCs. REPEAT the self-test.
(+) EVR Solenoid Con- nector, Component Side	(-) EVR Solenoid Con- nector, Component Side					
VPWR - Pin 1	EVR - Pin 2					
HE60	CHECK THE VPWR VOLTAGE TO EVR SOLENOID - Key in ON position. - Measure the voltage between:<table><tr><td>(+) EVR Solenoid Con- nector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VPWR - Pin 1</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 10.5 V?	(+) EVR Solenoid Con- nector, Harness Side	(-) Vehicle Battery	VPWR - Pin 1	Negative terminal	Yes GO to HE61. No REPAIR the open circuit.
(+) EVR Solenoid Con- nector, Harness Side	(-) Vehicle Battery					
VPWR - Pin 1	Negative terminal					
HE61	CHECK THE EVR CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) EVR Solenoid Con- nector, Harness Side</td></tr><tr><td>EVR</td><td>EVR - Pin 2</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) EVR Solenoid Con- nector, Harness Side	EVR	EVR - Pin 2	Yes GO to HE62. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) EVR Solenoid Con- nector, Harness Side					
EVR	EVR - Pin 2					
HE62	CHECK THE EVR CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>EVR</td><td>Negative terminal</td></tr></table> - Is the voltage less than 1 V?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	EVR	Negative terminal	Yes GO to HE63. No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
EVR	Negative terminal					

HE58-HE62

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take			
HE63	CHECK THE EVR CIRCUIT FOR A SHORT TO GND IN THE HARNESS	Yes INSTALL a new PCM. REFER to Diagnostic Methods,Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.			
- Key in OFF position. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>EVR</td><td>PWRGND</td></tr></table> - Is the resistance greater than 10K ohms?			(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	EVR
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side				
EVR	PWRGND				
HE64	CHECK FOR THE PRESENCE OF KOER DTCS P0403 OR P1409	Yes GO to HE59. No GO to HE65.			
- PCM connector connected. - Check for KOER DTCS: - Are DTCS P0403 or P1409 present?					
HE65	CARRY OUT A THOROUGH WIGGLE TEST ON THE EVR HARNESS	Yes ISOLATE the fault and REPAIR as necessary. No GO to Z1.			
- Key in OFF position. - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>EVR</td><td>PWRGND</td></tr></table> - Lightly tap on the EVR solenoid. Wiggle the EVR solenoid connector. Carry out a thorough wiggle test on the EGRVR harness. A fault is indicated by a voltage drop during the wiggle test. - Is the voltage greater than 10.5 V?			(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	EVR
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side				
EVR	PWRGND				

HE63-HE65

Test HF: Catalyst Efficiency Monitor and Exhaust System

PINPOINT TEST HF: CATALYST EFFICIENCY MONITOR AND EXHAUST SYSTEMS

Catalyst Efficiency Monitor and Exhaust Systems

HF

This pinpoint test is intended to diagnose the following:

- Catalytic converter.
- Exhaust system.

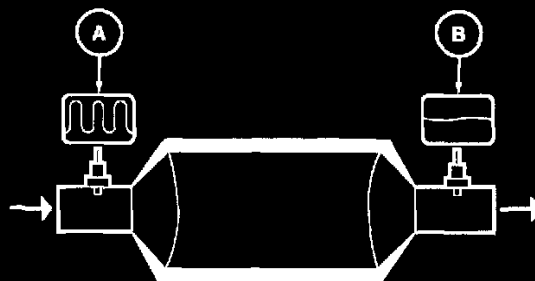
Catalyst Efficiency Monitor Overview

The catalyst efficiency monitor uses pre and post-catalyst heated oxygen sensors (HO2S) to infer the hydrocarbon (HC) efficiency based on the oxygen storage capacity of the catalyst. Under normal, closed-loop fuel conditions, high efficiency catalysts have significant oxygen storage. This makes the switching frequency of the post-catalyst HO2S (B) very slow and reduces the amplitude of those switches as compared to the switching frequency and amplitude of the pre-catalyst HO2S (A). As catalyst efficiency deteriorates due to thermal and/or chemical deterioration, its ability to store oxygen declines. The post-catalyst HO2S (B) signal begins to switch more rapidly with increasing amplitude, approaching the switching frequency and amplitude of the pre-catalyst HO2S (A).

- Note: HO2S (A) and (B) locations may vary depending on exhaust system configuration. For additional information on Catalyst Efficiency Monitor and Exhaust Systems, refer to Description and Operation.

High Catalyst Efficiency

Catalyst Efficiency



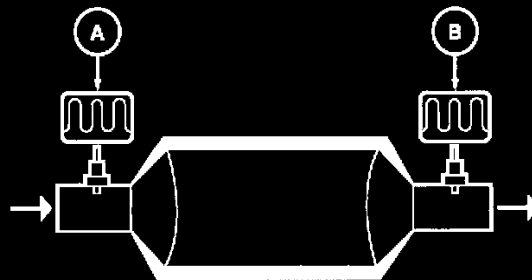
A0066241

Note, Overview And Schematic

Catalyst Efficiency Monitor and Exhaust Systems

HF

Low Catalyst Efficiency



A0066242

Test Step		Results / Action to Take
HF1	DTCS P0420 OR P0430: CHECK FOR MISFIRE DETECTION MONITOR DTCS	
Note: Be sure the customer has not: — Refueled the vehicle with leaded gasoline. — Noticed a high vehicle oil consumption. (An engine that consumes oil at a high rate deposits high levels of phosphorus on the catalyst and reduces the catalyst efficiency). Note: 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. • Check for continuous memory DTCS: • Are DTCS P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0309, P0310, P0315, P0316 or P1309 present?		Yes GO to Diagnostic Trouble Code (DTC) Charts and Descriptions for pinpoint test direction and REPAIR the misfire DTCS. No GO to HF2.
HF2	CHECK FOR HO2S DTCS	
Note: Incorrect HO2S signal input can cause an abnormal temperature in the catalyst. • Refer to Description and Operation, Heated Oxygen Sensor (HO2S) Monitor for possible HO2S DTCS. • Are there any HO2S DTCS?		Yes GO to Diagnostic Trouble Code (DTC) Charts and Descriptions for pinpoint test direction and REPAIR the HO2S DTCS. No GO to HF3.

Schematic And HF1-HF2

Catalyst Efficiency Monitor and Exhaust Systems

HF

Test Step		Results / Action to Take
HF3	CHECK FOR CHT OR ECT SENSOR DTCs	Yes GO to Diagnostic Trouble Code (DTC) Charts and Descriptions for pinpoint test direction and REPAIR the CHT or ECT DTCs. No GO to HF4.
	Note: Temperature sensor DTCs can indicate the thermostat is not operating correctly or the engine coolant level is not filled to specification, producing above normal operation temperatures. - Check for self-test DTCs: Are DTCs P0116, P0117, P0118, P0119, P0125, P0128, P0217, P1116, P1117, P1285, P1288, P1289, P1290, P1299 or P128A present?	
HF4	CHECK FOR ANY OTHER DTCs	Yes GO to Diagnostic Trouble Code (DTC) Charts and Descriptions for pinpoint test direction and REPAIR the other DTCs first. No GO to HF5.
	Are there any other DTCs recorded in HF1 (not including the initial P0420 or P0430)?	
HF5	CHECK THE ELECTRONIC ENGINE CONTROL (EC) WIRING HARNESS \PCM	Yes REPAIR as necessary. CARRY OUT the catalyst monitor drive cycle to verify the repairs. No GO to HF6.
	Note: Check the HO2S sensor electrical connectors to make sure the correct HO2S sensor is connected to the correct electrical connector. The electrical connectors are color coded to make sure the correct connection is made. If the electrical connection of the rear HO2S are interchanged/crossed, the catalyst efficiency monitor test will fail. - Visually inspect the vehicle's HO2S harness connectors for any indication of crossed wiring. - Visually inspect the harness for exposed wiring, corrosion and correct routing. - Visually inspect the PCM connectors for damaged, or pushed out pins, corrosion and loose wires. Are there any concerns with the wiring or the PCM connection?	

HF3-HF5

Catalyst Efficiency Monitor and Exhaust Systems

HF

Test Step		Results / Action to Take
HF6	CHECK THE FUEL PRESSURE	
 WARNING: The fuel system remains pressurized when the engine is not running. To prevent injury or fire, use caution when working on the fuel system.  WARNING: Before repairing or replacing any components in the fuel system, reduce the possibility of injury or fire by following the warning, caution, and handling directions in pinpoint test HC. Note: Fuel pressure above specification can produce an abnormally rich air/fuel mixture. This rich air/fuel mixture can cause higher than normal catalyst operating temperatures. - Return fuel systems (RFS): - Inspect the vacuum hose going to the fuel pressure regulator for proper installation and cracks. Repair as necessary. - Verify the vacuum source to the fuel pressure regulator. - Mechanical returnless fuel systems (MRFS): - If applicable, inspect the vacuum hose going to the fuel rail pulse damper for proper installation and cracks. Repair as necessary. - Connect a Rotunda fuel pressure gauge or equivalent. Note: On electronic returnless fuel system (ERFS), the fuel pressure can be monitored by the diagnostic tool using the fuel rail pressure (FRP) sensor PID. - Start the engine. Record the fuel pressure. - GO to Pinpoint Test HC. Compare the recorded fuel pressure reading to the Fuel System Specification Chart found at the beginning of Pinpoint Test HC. - Key in OFF position. Is the fuel pressure within specifications?		Yes Fuel pressure is OK. If applicable, REMOVE the fuel pressure gauge. GO to HF7. No Fuel pressure is out of specification. GO to HC2.
HF7	CHECK FOR LEAKS 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 exhaust system for leaks, cracks, loose connections, punctures, or non-factory modifications. Is a concern present?		Yes REPAIR as necessary. CARRY OUT the catalyst monitor drive cycle to verify the repairs. No GO to HF12.

HF6-HF7

Catalyst Efficiency Monitor and Exhaust Systems

HF

Test Step		Results / Action to Take
HF8	CHECK FOR RESTRICTIONS IN THE EXHAUST SYSTEM	Yes REPAIR as necessary. No GO to HF9.
	Note: A slight pressure in the exhaust system is normal, but excessive exhaust back pressure seriously affects engine operation. - Inspect the following for damage or restrictions: - Front and rear exhaust pipes. - Catalytic converter. - Muffler and tailpipe assembly. Is a concern present?	
HF9	CHECK FOR EXCESSIVE EXHAUST BACK PRESSURE	Yes GO to HF10. No GO to HF11.
	- The internal condition of exhaust system's ability to flow can be checked with an exhaust back pressure tool. Is an exhaust back pressure tester available?	
HF10	CHECK FOR EXCESSIVE EXHAUST BACK PRESSURE WITH EXHAUST BACK PRESSURE TOOL	Yes REPAIR as necessary. For further diagnosis of symptom (Lack of Power, Loss of Power, or No Start), REFER to Symptom Charts. No No indication of restrictions or leaks have been detected in the exhaust system. For further diagnosis of symptom (Lack of Power, Loss of Power, or No Start), REFER to Symptom Charts.
	- Install an exhaust back pressure tester and follow the tool manufacturer installation and testing instructions. Note: 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. Does the exhaust back pressure test indicate a restriction?	
HF11	CHECK MANIFOLD VACUUM FOR AN INDICATION OF EXCESSIVE EXHAUST SYSTEM RESTRICTION	Yes REPAIR as necessary. For further diagnosis of symptom (Lack of Power, Loss of Power, or No Start), REFER to Symptom Charts. No No indication of restrictions or leaks have been detected in the exhaust system. For further diagnosis of symptom (Lack of Power, Loss of Power, or No Start), REFER to Symptom Charts.
	- Attach a vacuum gauge to the intake manifold vacuum source. Note: When the engine is first started and is idled, the reading may be normal 51-74 kPa (15-22 in. Hg), but as the engine RPM is increased, the back pressure caused by a clogged exhaust system causes the needle to slowly drop to 0 kPa (0 in. Hg). The needle then may slowly rise. Excessive exhaust restriction causes the needle to drop to a low point even if the engine is only idling. - Observe the vacuum gauge while increasing the engine RPM. Does the vacuum gauge indicate an exhaust restriction concern?	

HF8-HF11

Catalyst Efficiency Monitor and Exhaust Systems**HF**

Test Step		Results / Action to Take
HF12	COMPLETE CATALYST MONITOR DRIVE CYCLE	
• Complete Catalyst Monitor Drive Cycle. Refer to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle. • Retrieve the continuous memory DTCs. • Are DTCs P0420 or P0430 present?		Yes INSTALL a new catalyst between the monitored HO2S sensors, only for bank referenced, (P0420 Bank1), (P0430 Bank2). Do not install a new unmonitored catalyst unless it is repaired as an assembly. No Test is complete and no faults were found.

HF12

Test HG: Positive Crankcase Ventilation (PCV) System
PINPOINT TEST HG: POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

Positive Crankcase Ventilation (PCV) System

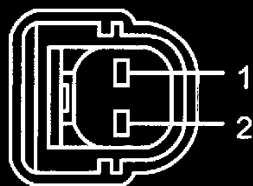
HG

This pinpoint test is intended to diagnose the following:

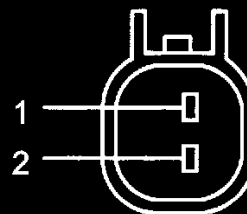
- Positive crankcase ventilation (PCV) valve (6A666) and related vacuum lines.
- Electrically heated PCV valve (6A666) and heater circuit. Both PCM and non-PCM controlled.
- Electrically heated PCV tube (9F624) and heater circuit. Both PCM and non-PCM controlled.
- Powertrain control module (PCM) (12A650).
- PCV Thermal Extension Harness (12A580).

Note: Electrically heated PCV system only, refer to Description and Operation Positive Crankcase Ventilation (PCV) system for additional information.

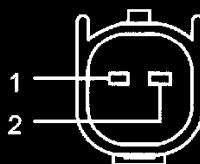
Positive Crankcase Ventilation (PCV) Connector

A

A0077518

B

N0009373

C

A0077556

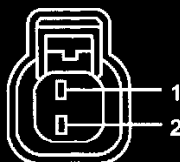
Note And Connector

Positive Crankcase Ventilation (PCV) System

HG

Vehicle	Connector	Circuit	Pin
E-Series 6.8L (PCM controlled PCV Heater), E-Series 4.6L (PCM controlled PCV Heater), F-150 4.2L (PCM controlled PCV Heater), Sable 3.0L (PCM controlled PCV Heater), Taurus 3.0L (PCM controlled PCV Heater)	A	PCVHC IGN START/RUN	2 1
Expedition 5.4L (Non-PCM controlled heated PCV tube), F-150 5.4L (Non-PCM controlled heated PCV tube), Navigator 5.4L (Non-PCM controlled heated PCV tube)	B	GND IGN START/RUN	1 2
F-Super Duty 5.4L (PCM controlled heated PCV tube)	C	PCVHC IGN START/RUN	2 1
All other vehicles	A	GND IGN START/RUN	2 1

Positive Crankcase Ventilation Thermal Extension-Harness Side (PCVTE-Harness Side)



A0077564

Circuit	Pin
GND (Ground)	2
IGN START/RUN	1

Connectors

Positive Crankcase Ventilation (PCV) System

HG

Powertrain Control Module (PCM) Connector

Table only for vehicles equipped with PCM controlled PCV heater

Vehicle	Connector	Circuit	Pin
F-150	190 Pin	PCVHC	E3
Sable, Taurus	104 Pin	PCVHC	11
All other vehicles	170 Pin	PCVHC	E2

Test Step		Results / Action to Take
HG1	VISUAL INSPECTION OF PCV VALVE	
Note: If PCV valve or tube is electrically heated, verify electrical connection. On some applications the vehicle may be equipped with a thermal harness that only provides electrical continuity when the temperature is less than 40°F (5°C) +/- 7°F (+/- 4°C). Typically this harness is located close to the PCV valve or tube. Note: If the PCV valve is water heated, verify the coolant hose and clip connections. • CHECK the PCV valve, hoses and connections for leaks or restrictions. • Verify the PCV valve maintenance schedule has been followed. • Verify the proper PCV valve part number. • Verify the PCV valve is clean. • Verify the fresh air tube and related hoses are clean and routed correctly. • Is a concern present?		Yes REPAIR as necessary. VERIFY the symptom no longer exists. No For electrically heated PCV tube, GO to HG3. For all others, GO to HG2.
HG2	STUCK PCV VALVE CHECK	
• Disconnect the PCV valve from the valve cover. • Shake the PCV valve. • Does the PCV valve rattle when shaken?		Yes REINSTALL the PCV valve. For PCV systems with electrical heating, GO to HG3. For PCV systems without electrical heating, GO to HG11. No PCV valve is sticking. INSTALL a new PCV valve. VERIFY the symptom no longer exists.

Connector And HG1-HG2

Positive Crankcase Ventilation (PCV) System

HG

Test Step		Results / Action to Take				
HG3	CHECK FOR PCM CONTROLLED PCV HEATER - If thermal extension harness is present then PCV is non-PCM controlled. Refer to Description and Operation. - CHECK if PCV heater is PCM controlled. - Is PCV heater PCM controlled?	Yes GO to HG4. No GO to HG7.				
HG4	CHECK HARNESS VOLTAGE TO PCM CONTROLLED PCV HEATER - PCV connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCV Connector, Harness Side</td><td>(-)</td></tr><tr><td>IGN START/RUN</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) PCV Connector, Harness Side	(-)	IGN START/RUN	Ground	Yes GO to HG5. No REPAIR the open circuit.
(+) PCV Connector, Harness Side	(-)					
IGN START/RUN	Ground					
HG5	CHECK HARNESS CIRCUIT TO PCM CONTROLLED PCV HEATER - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCV Connector, Harness Side</td></tr><tr><td>PCVHC</td><td>PCVHC</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) PCV Connector, Harness Side	PCVHC	PCVHC	Yes GO to HG6. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) PCV Connector, Harness Side					
PCVHC	PCVHC					
HG6	CHECK THE RESISTANCE OF PCM CONTROLLED PCV VALVE OR TUBE HEATER - Measure the resistance between:<table><tr><td>(+) PCV Connector, Component Side</td><td>(-) PCV Connector, Component Side</td></tr><tr><td>IGN START/RUN</td><td>GND</td></tr></table> - Is the resistance between 10 ohms - 35 ohms?	(+) PCV Connector, Component Side	(-) PCV Connector, Component Side	IGN START/RUN	GND	Yes Key in OFF position. GO to HG13. No INSTALL a new PCV valve or tube.
(+) PCV Connector, Component Side	(-) PCV Connector, Component Side					
IGN START/RUN	GND					
HG7	CHECK POWER AND GROUND AT HARNESS ELECTRICALLY HEATED PCV VALVE OR TUBE NON-COMPUTER CONTROLLED - PCV connector disconnected. - PCVTE-Harness Side connector disconnected. - Measure the voltage between:<table><tr><td>(+) PCVTE-Harness Side, Harness Side</td><td>(-) PCVTE-Harness Side, Harness Side</td></tr><tr><td>IGN START/RUN - Pin 1</td><td>GND - Pin 2</td></tr></table> - Is the voltage greater than 10.5 V?	(+) PCVTE-Harness Side, Harness Side	(-) PCVTE-Harness Side, Harness Side	IGN START/RUN - Pin 1	GND - Pin 2	Yes Key in OFF position. For vehicles with thermal extension harness, GO to HG9. For all others, GO to HG10. No Key in OFF position. GO to HG8.
(+) PCVTE-Harness Side, Harness Side	(-) PCVTE-Harness Side, Harness Side					
IGN START/RUN - Pin 1	GND - Pin 2					

HG3-HG7

Positive Crankcase Ventilation (PCV) System

HG

Test Step		Results / Action to Take				
HG8	CHECK POWER CIRCUIT - PCV connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCV Connector, Harness Side</td><td>(-)</td></tr><tr><td>IGN START/RUN</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) PCV Connector, Harness Side	(-)	IGN START/RUN	Ground	Yes Key in OFF position. REPAIR open GND circuit. No Key in OFF position. REPAIR open PWR circuit
(+) PCV Connector, Harness Side	(-)					
IGN START/RUN	Ground					
HG9	VALVE RESISTANCE CHECK WITHOUT EXTENSION HARNESS - Disconnect thermal extension harness from PCV valve. - Measure the resistance between:<table><tr><td>(+) PCV Connector, Component Side</td><td>(-) PCV Connector, Component Side</td></tr><tr><td>IGN START/RUN</td><td>PCVHC</td></tr></table> - Is the resistance between 10 ohms - 35 ohms?	(+) PCV Connector, Component Side	(-) PCV Connector, Component Side	IGN START/RUN	PCVHC	Yes INSTALL a new thermal extension harness PCV. No INSTALL a new PCV.
(+) PCV Connector, Component Side	(-) PCV Connector, Component Side					
IGN START/RUN	PCVHC					
HG10	CHECK THE RESISTANCE OF ELECTRICALLY HEATED PCV VALVE OR TUBE - Measure the resistance between:<table><tr><td>(+) PCV Connector, Component Side</td><td>(-) PCV Connector, Component Side</td></tr><tr><td>IGN START/RUN</td><td>GND</td></tr></table> - Is the resistance between 10 ohms - 35 ohms?	(+) PCV Connector, Component Side	(-) PCV Connector, Component Side	IGN START/RUN	GND	Yes Key in OFF position. GO to HG11. No INSTALL a new PCV valve or tube.
(+) PCV Connector, Component Side	(-) PCV Connector, Component Side					
IGN START/RUN	GND					
HG11	PCV SYSTEM CHECK - Start the engine and warm it until engine temperature is stable. - Disconnect the closure (fresh air) hose from the remote air cleaner or air outlet tube (the tube connecting the mass air flow sensor and the throttle body). - Place a stiff piece of paper over the hose end. Wait 1 minute. - Does vacuum hold the paper in place?	Yes The PCV system is OK. Concern is elsewhere. RETURN to Symptom Charts for further direction. No System is leaking/plugged or Evaporative Emission system is leaking. GO to HG12.				

HG8-HG11

**Positive Crankcase Ventilation (PCV)
System****HG**

Test Step		Results / Action to Take
HG12	EVAPORATIVE EMISSION SYSTEM CHECK	
	Note: If the evaporative emission hose is not connected to the PCV hose, follow the No Action to Take. • Disconnect the evaporative emission hose at the connection to the PCV hose (if equipped). Cap the connector. • Again place a stiff piece of paper over the closure (fresh air) hose end. Wait 1 minute. • Does vacuum hold the paper in place?	Yes The PCV system is OK. REFER to Evaporative Emissions System. No CHECK for vacuum leaks/obstruction in the PCV system (such as oil cap, PCV valve, hoses, cut grommets, valve cover bolt torque/gasket leak). REFER to the VECI label for PCV system components and routing. REPAIR as necessary.
HG13	CHECK IF CONCERN OR DTC STILL PRESENT	
	• Is the concern or DTC is still present?	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No Unable to duplicate or identify the fault at this time. Concern is elsewhere. RETURN to Symptom Charts for further direction.

HG12-HG13

Test HH: Exhaust Gas Recirculation System Module (ESM)
PINPOINT TEST HH: EXHAUST GAS RECIRCULATION SYSTEM MODULE (ESM)

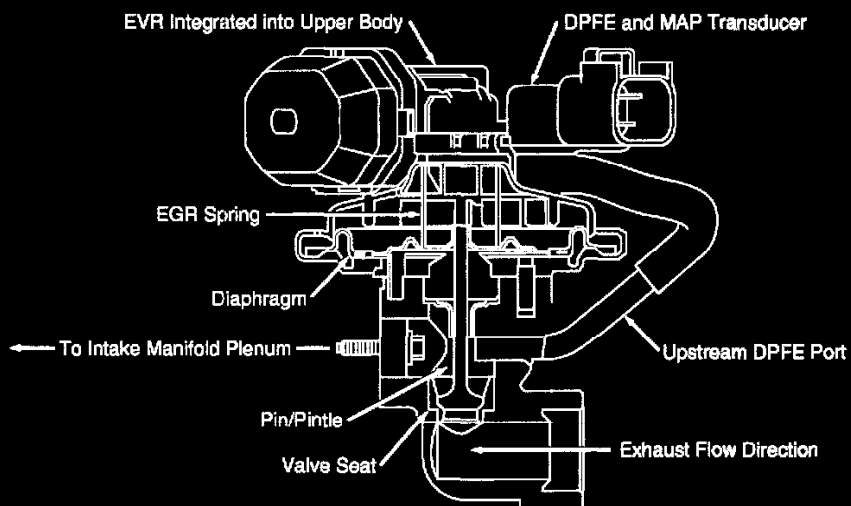
Exhaust Gas Recirculation System Module (ESM)

HH

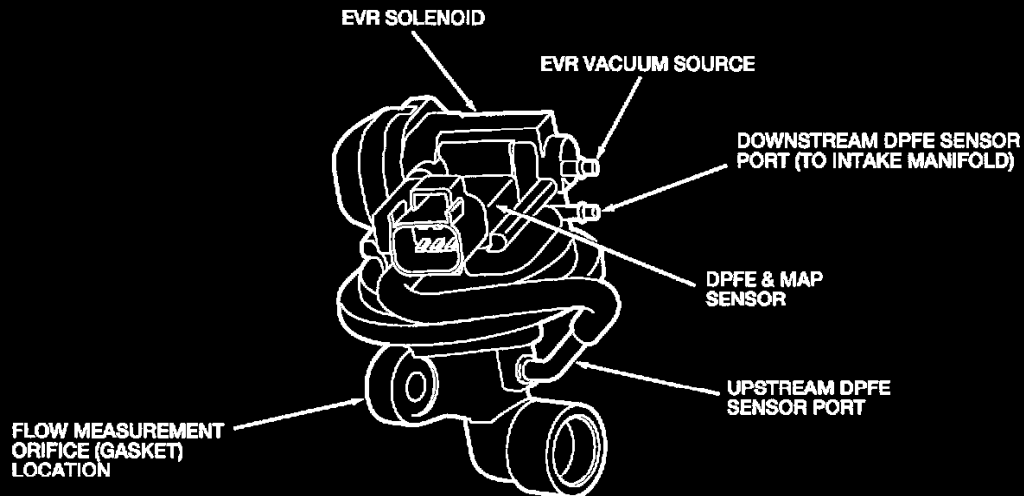
This pinpoint test is intended to diagnose the following:

- Exhaust gas recirculation system module (ESM) (9Y456).
- Orifice tube assembly (9D477).
- Differential pressure feedback EGR (DPFE) sensor pressure hoses.
- Vacuum lines.
- Harness circuits: VREF, DPFE, SIGRTN, EVR, VPWR.
- Powertrain control module (PCM) (12A650).

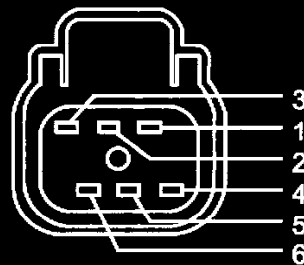
ESM EGR Assembly

**A0079230**

Note And Schematic

**Exhaust Gas Recirculation System
Module (ESM)****HH**

A0093492

EGR System Module (ESM) Connector

A0077577

Circuit	Pin
EVR (Electronic Vacuum Regulator)	1
VPWR (Power Supply)	4

(Continued)

Schematic And Connector

Exhaust Gas Recirculation System Module (ESM)

HH

Circuit	Pin
SIGRTN (Signal return)	6
DPFEGR (Differential Pressure Feedback EGR)	5
VREF (Reference Voltage)	2

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	PWRGND EVR VREF SIGRTN DPFEGR	B24 B16 E20 E17 E41
Crown Victoria, Explorer, Five Hundred, Freestyle, Grand Marquis, Montego, Mountaineer, Town Car	150 (50-50-50) Pin	PWRGND EVR VREF SIGRTN DPFEGR	B47 E6 E40 E41 E44
E-Series, F-Super Duty	170 Pin	PWRGND EVR VREF SIGRTN DPFEGR	B47 E63 E57 E58 E21
Escape, Mariner	150 (50-50-50) Pin	PWRGND EVR VREF SIGRTN DPFEGR	B47 E27 E40 E41 E44
Excursion	104 Pin	PWRGND EVR VREF SIGRTN DPFEGR	3 47 90 91 65
F-150	190 Pin	PWRGND EVR VREF SIGRTN DPFEGR	B67 E63 E57 E58 E21

(Continued)

Exhaust Gas Recirculation System Module (ESM)

HH

Vehicle	Connector	Circuit	Pin
LS, Thunderbird	150 (60-32-58) Pin	PWRGND EVR VREF SIGRTN DPFEGR	B24 E16 E14 E17 E41
Mustang	170 Pin	PWRGND EVR VREF SIGRTN DPFEGR	B47 E63 E24 E33 E21
All other vehicles	104 Pin	PWRGND EVR VREF SIGRTN DPFEGR	103 47 90 91 65

Test Step		Results / Action to Take							
HH1	DTCS P0405 AND P1400: DETERMINE THE PRESENT DPFEGR PID VOLTAGE	Yes GO to HH2. No GO to HH10.							
	- Key in ON position. - Access the PCM and monitor the DPFEGR PID. - Is the voltage less than 0.2 V?								
HH2	INDUCE OPPOSITE DPFEGR SENSOR SIGNAL	Yes INSTALL a new ESM. No GO to HH3.							
	- Key in OFF position. - ESM connector disconnected. - Key in ON position. - Access the PCM and monitor the DPFEGR PID. - Is the voltage between 4 V - 6 V?								
HH3	CHECK THE DPFEGR CIRCUIT FOR A SHORT TO SIGRTN OR GND IN THE HARNESS	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit in question.							
	- Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table border="1"><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>DPFEGR</td><td>SIGRTN</td></tr></table> - Measure the resistance between:<table border="1"><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>DPFEGR</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?		(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	DPFEGR	SIGRTN	(+) PCM Connector, Harness Side	(-) Vehicle Battery	DPFEGR
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side								
DPFEGR	SIGRTN								
(+) PCM Connector, Harness Side	(-) Vehicle Battery								
DPFEGR	Negative terminal								

Chart, HH1-HH3

Exhaust Gas Recirculation System Module (ESM)

HH

Test Step		Results / Action to Take						
HH4	DTCs P0406 AND P1401: DETERMINE THE PRESENT DPFEGR PID VOLTAGE • Key in ON position. • Access the PCM and monitor the DPFEGR PID. • Is the voltage greater than 4 V?	Yes GO to HH5. No GO to HH10.						
HH5	CHECK THE VREF VOLTAGE TO ESM • Key in OFF position. • ESM connector disconnected. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) ESM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VREF - Pin 2</td><td>Negative terminal</td></tr></table> • Is the voltage between 4 V - 5.5 V?	(+) ESM Connector, Harness Side	(-) Vehicle Battery	VREF - Pin 2	Negative terminal	Yes GO to HH6. No REPAIR the open circuit.		
(+) ESM Connector, Harness Side	(-) Vehicle Battery							
VREF - Pin 2	Negative terminal							
HH6	CHECK THE DPFEGR CIRCUIT FOR A SHORT TO POWER • Key in OFF position. • PCM connector disconnected. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) ESM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>DPFEGR - Pin 5</td><td>Negative terminal</td></tr></table> • Is the voltage less than 1 V?	(+) ESM Connector, Harness Side	(-) Vehicle Battery	DPFEGR - Pin 5	Negative terminal	Yes GO to HH7. No REPAIR the short circuit.		
(+) ESM Connector, Harness Side	(-) Vehicle Battery							
DPFEGR - Pin 5	Negative terminal							
HH7	CHECK THE DPFEGR CIRCUIT FOR A SHORT TO VREF • Key in OFF position. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VREF</td><td>DPFEGR</td></tr></table> • Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	VREF	DPFEGR	Yes GO to HH8. No REPAIR the short circuit.		
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
VREF	DPFEGR							
HH8	CHECK THE DPFEGR AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) ESM Connector, Harness Side</td></tr><tr><td>DPFEGR</td><td>DPFEGR - Pin 5</td></tr><tr><td>SIGRTN</td><td>SIGRTN - Pin 6</td></tr></table> • Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) ESM Connector, Harness Side	DPFEGR	DPFEGR - Pin 5	SIGRTN	SIGRTN - Pin 6	Yes GO to HH9. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) ESM Connector, Harness Side							
DPFEGR	DPFEGR - Pin 5							
SIGRTN	SIGRTN - Pin 6							

HH4-HH8

Exhaust Gas Recirculation System Module (ESM)

HH

Test Step		Results / Action to Take				
HH9	INDUCE THE OPPOSITE DPFEGR SENSOR VOLTAGE - PCM connector connected. - Connect a 5 amp fused jumper wire between the following:<table><tr><th>Point A ESM Connector, Harness Side</th><th>Point B ESM Connector, Harness Side</th></tr><tr><td>DPFEGR - Pin 5</td><td>SIGRTN - Pin 6</td></tr></table> - Key in ON position. - Access the PCM and monitor the DPFEGR PID. - Is the voltage less than 0.1 V?	Point A ESM Connector, Harness Side	Point B ESM Connector, Harness Side	DPFEGR - Pin 5	SIGRTN - Pin 6	Yes INSTALL a new ESM. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
Point A ESM Connector, Harness Side	Point B ESM Connector, Harness Side					
DPFEGR - Pin 5	SIGRTN - Pin 6					
HH10	CARRY OUT A THOROUGH WIGGLE TEST ON THE ESM HARNESS - Access the PCM and monitor the 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 voltage reading, or is a concern found?	Yes REPAIR as necessary. No Unable to duplicate or identify the fault at this time. GO to Z1.				
HH11	DTC P0402: CHECK THE VREF VOLTAGE TO THE ESM Note: Diagnose and repair all circuit fault DTCs before diagnosing range/performance or flow concerns. For circuit fault DTC diagnosis, refer to the Diagnostic Trouble Code (DTC) Charts. - Key in OFF position. - ESM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><th>(+) ESM Connector, Harness Side</th><th>(-) Vehicle Battery</th></tr><tr><td>VREF - Pin 2</td><td>Negative terminal</td></tr></table> - Is the voltage between 4.5 V - 5.5 V?	(+) ESM Connector, Harness Side	(-) Vehicle Battery	VREF - Pin 2	Negative terminal	Yes GO to HH12. No GO to C1.
(+) ESM Connector, Harness Side	(-) Vehicle Battery					
VREF - Pin 2	Negative terminal					

HH9-HH11

Exhaust Gas Recirculation System Module (ESM)

HH

Test Step		Results / Action to Take
HH12	SIMULATE THE DPFE SENSOR SIGNAL WITH A VACUUM PUMP	Yes INSTALL a new ESM. No GO to HH13.
• Disconnect the downstream DPFE sensor port hose at the ESM. • Verify hose and port is clear and free of obstructions. • Connect a vacuum pump to the downstream DPFE sensor port. • Key in ON position. • Access the PCM and monitor the DPFEGR PID. • 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 volt with the key ON and no vacuum applied. — The DPFEGR PID voltage must increase to greater than 4 volts with the vacuum applied. — The DPFEGR PID must drop 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?		
HH13	INSPECT THE EVR SOLENOID VENT FOR BLOCKAGE	Yes REPAIR the vent, or if not repairable, INSTALL a new ESM assembly. No GO to HH14.
Note: A plugged electronic vacuum regulator (EVR) solenoid vent does not allow EGR vacuum to vent to the atmosphere. • EVR vacuum hose disconnected. • 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 the EVR source port. • Apply 34 to 51 kPa (10 to 15 in Hg) vacuum. • Is the EVR solenoid vent or filter plugged or restricted?		
HH14	CHECK THE EGR VALVE FOR CARBON BUILD-UP	Yes REPAIR as necessary. No Unable to duplicate or identify the fault at this time.
• Remove the ESM. • Visually inspect the EGR valve and valve seat for proper seating, carbon build-up and debris. • Is a concern present?		
HH15	DTC P0401: CARRY OUT THE KOER SELF-TEST	Yes GO to HH16. No GO to HH17.
Note: Diagnose and repair all circuit fault DTCs before diagnosing range/performance or flow concerns. • Carry out the KOER self-test. • Is DTC P1408 present?		

HH12-HH15

Exhaust Gas Recirculation System Module (ESM)

HH

Test Step		Results / Action to Take				
HH16	DTC P1408: CHECK THE VREF VOLTAGE TO THE ESM • Key in OFF position. • ESM connector disconnected. • Key in ON position. • Measure the voltage between:<table border="1"><tr><td>(+) ESM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VREF - Pin 2</td><td>Negative terminal</td></tr></table> • Is the voltage between 4.5 V - 5.5 V?	(+) ESM Connector, Harness Side	(-) Vehicle Battery	VREF - Pin 2	Negative terminal	Yes GO to HH17. No GO to C1.
(+) ESM Connector, Harness Side	(-) Vehicle Battery					
VREF - Pin 2	Negative terminal					
HH17	CHECK THE EVR SOLENOID VACUUM • ESM connector connected. • Disconnect the EVR vacuum source hose. • Connect a vacuum gauge to the EVR vacuum source hose. • Key on engine running. • Monitor the vacuum gauge. • Is the manifold vacuum greater than 34 kPa (10 in-Hg)?	Yes GO to HH18. No REPAIR as necessary.				
HH18	SIMULATE THE DPFE SENSOR SIGNAL WITH A VACUUM PUMP • Key in OFF position. • Disconnect the downstream DPFE sensor port hose at the ESM. • Verify hose and port is clear and free of obstructions. • Connect a vacuum pump to the downstream DPFE sensor port. • Key in ON position. • Access the PCM and monitor the DPFEGR PID. • 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 volt with the key ON and no vacuum applied. — The DPFEGR PID voltage must increase to greater than 4 volts with the vacuum applied. — The DPFEGR PID must drop 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 INSTALL a new ESM. No CONNECT all the hoses. GO to HH19.				

Exhaust Gas Recirculation System Module (ESM)

HH

Test Step		Results / Action to Take				
HH19	CHECK THE EVR SOLENOID OPERATION • Key on engine running. • Engine at normal operating temperature. • Allow the engine idle to stabilize. • Access the PCM and monitor the 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 Unable to duplicate or identify the fault at this time. CHECK for the presence of carbon build-up in the EGR passage. No GO to HH20.				
HH20	CHECK FOR THE PRESENCE OF CARBON BUILD-UP IN THE EGR PASSAGE Note: In certain vehicle applications, carbon build-up 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 in OFF position. • Remove the ESM. For additional information, refer to Computers and Control Systems. • Disconnect the air inlet tube from the throttle body. For additional information, refer to Fuel Delivery and Air Induction. • 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 CLEAN the EGR port as necessary and reinstall the ESM. No INSTALL a new ESM.				
HH21	DTCS P0403 AND P1409: CHECK THE EVR SOLENOID OPERATION • Key on engine running. • Engine at normal operating temperature. • Allow the engine idle to stabilize. • Access the PCM and monitor the 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 Unable to duplicate or identify the fault at this time. GO to Z1. No GO to HH22.				
HH22	CHECK THE VPWR VOLTAGE TO THE EVR SOLENOID • Key in OFF position. • ESM connector disconnected. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) ESM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VPWR - Pin 4</td><td>Negative terminal</td></tr></table> • Is the voltage greater than 10.5 V?	(+) ESM Connector, Harness Side	(-) Vehicle Battery	VPWR - Pin 4	Negative terminal	Yes GO to HH23. No REPAIR the open circuit.
(+) ESM Connector, Harness Side	(-) Vehicle Battery					
VPWR - Pin 4	Negative terminal					

HH19-HH22

Exhaust Gas Recirculation System Module (ESM)

HH

Test Step		Results / Action to Take				
HH23	CHECK THE EVR SOLENOID COIL RESISTANCE - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) ESM Connector, Component Side</td><td>(-) ESM Connector, Component Side</td></tr><tr><td>VPWR - Pin 4</td><td>EGRVR</td></tr></table> - Is the resistance between 26 ohms - 40 ohms?	(+) ESM Connector, Component Side	(-) ESM Connector, Component Side	VPWR - Pin 4	EGRVR	Yes GO to HH24. No INSTALL a new ESM.
(+) ESM Connector, Component Side	(-) ESM Connector, Component Side					
VPWR - Pin 4	EGRVR					
HH24	CHECK THE EVR CIRCUIT FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) ESM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>EVR - Pin 1</td><td>EVR</td></tr></table> - Is the resistance less than 5 ohms?	(+) ESM Connector, Harness Side	(-) PCM Connector, Harness Side	EVR - Pin 1	EVR	Yes GO to HH25. No REPAIR the open circuit.
(+) ESM Connector, Harness Side	(-) PCM Connector, Harness Side					
EVR - Pin 1	EVR					
HH25	CHECK THE EVR CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>EVR</td><td>Negative terminal</td></tr></table> - Is the voltage less than 1 V?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	EVR	Negative terminal	Yes GO to HH26. No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
EVR	Negative terminal					
HH26	CHECK THE EVR CIRCUIT FOR A SHORT TO GND IN THE HARNESS - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>EVR</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-)	EVR	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-)					
EVR	Ground					

HH23-HH26

**Exhaust Gas Recirculation System
Module (ESM)****HH**

Test Step		Results / Action to Take
HH27	EGR DIAGNOSIS BY SYMPTOM: CHECK FOR EGR FLOW WITH THE EVR VACUUM HOSE DISCONNECTED AND PLUGGED	
Note: Carry out the 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 in ON position. • Access the PCM and monitor the DPFEGR PID. • Record the PID voltage. • Key on engine running. • With the engine at idle, observe the DPFEGR PID voltage. • Compare to engine OFF voltage. • An increase in DPFEGR PID voltage at idle indicates EGR flow. • Is the idle DPFEGR PID voltage greater than 0.15 volt when compared to the KOEO DPFEGR PID voltage?		Yes REMOVE and INSPECT the 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. No INSPECT the EVR solenoid vent for blockage. To continue symptom diagnosis, REFER to Symptom Charts, Step 3: No DTC(s) Present Symptom Charts.

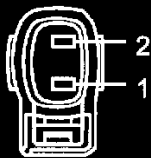
HH27

Test HK: Variable Cam Timing (VCT)
PINPOINT TEST HK: VARIABLE CAM TIMING (VCT)

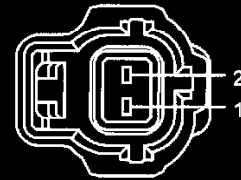
Variable Cam Timing (VCT)**HK**

This pinpoint test is intended to diagnose the following:

- VCT solenoid (6L713) or (6B297).
- Spider assembly (6C260) right bank, or (6C261) left bank.
- Harness circuits: VPWR and VCT.
- Powertrain control module (PCM) (12A650).

Variable Cam Timing Bank 1 (VCT1) Actuator Connector**A**

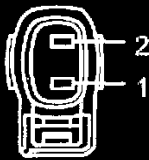
A0077517

B

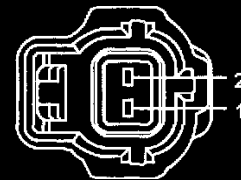
A0077516

Vehicle	Connector	Circuit	Pin
LS, Thunderbird	A	VPWR VCT1	1 2
All other vehicles	B	VPWR VCT1	1 2

Note And Connector

Variable Cam Timing (VCT)**HK****Variable Cam Timing Bank 2 (VCT2) Actuator Connector****A****B**

A0077517



A0077516

Vehicle	Connector	Circuit	Pin
LS, Thunderbird	A	VPWR VCT2	1 2
All other vehicles	B	VPWR VCT2	1 2

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
F-Super Duty	170 Pin	VPWR VCT2 VCT1	B35, B36, T39 E68 E67
LS, Thunderbird	150 (60-32-58) Pin	VPWR VCT2 VCT1	B32, B33 E13 E1
Mustang	170 Pin	VPWR VCT2 VCT1	B35, B36 E68 E67
All other vehicles	190 Pin	VPWR VCT2 VCT1	B51, B52, B53 E68 E67

Variable Cam Timing (VCT)

HK

Test Step		Results / Action to Take				
HK1	DTCS P0010, P0020, P1380 OR P1385: CHECK FOR VCT DTCS					
• Clear the DTCS. • The engine should be at operating temperature before running the self-test. • Carry out the KOER self-test. • Are DTCS P0010, P0020, P1380 or P1385 present?		Yes For KOER DTCS P0010 or P1380, GO to HK3 . For KOER DTCS P0020 or P1385, GO to HK9 . No GO to HK2 .				
HK2	CARRY OUT A THOROUGH WIGGLE TEST ON THE VCT HARNESS					
• Carry out a thorough wiggle test on the VCT harness. • Carry out the KOER self-test. • Are DTCS P0010, P1380, P0020 or P1385 present?		Yes For KOER DTCS P0010 or P1380, GO to HK3 . For KOER DTCS P0020 or P1385, GO to HK9 . No GO to Z1 .				
HK3	CHECK THE VCT1 SOLENOID RESISTANCE					
• Key in OFF position. • VCT1 Actuator connector disconnected. • Measure the resistance between: <table><tr><td>(+) VCT1 Actuator Connector, Component Side</td><td>(-) VCT1 Actuator Connector, Component Side</td></tr><tr><td>VCT1</td><td>VPWR</td></tr></table> • Is the resistance between 5 ohms - 14 ohms?		(+) VCT1 Actuator Connector, Component Side	(-) VCT1 Actuator Connector, Component Side	VCT1	VPWR	Yes GO to HK4 . No INSTALL a new VCT1 actuator.
(+) VCT1 Actuator Connector, Component Side	(-) VCT1 Actuator Connector, Component Side					
VCT1	VPWR					
HK4	CHECK THE VCT1 SOLENOID FOR INTERNAL SHORTS					
• Measure the resistance between: <table><tr><td>(+) VCT1 Actuator Connector, Component Side</td><td>(-)</td></tr><tr><td>VCT1</td><td>Ground</td></tr></table> • Is the resistance greater than 10K ohms?		(+) VCT1 Actuator Connector, Component Side	(-)	VCT1	Ground	Yes GO to HK5 . No INSTALL a new VCT1 actuator.
(+) VCT1 Actuator Connector, Component Side	(-)					
VCT1	Ground					
HK5	CHECK THE VPWR CIRCUIT FOR AN OPEN IN THE HARNESS					
• Key in ON position. • Measure the voltage between: <table><tr><td>(+) VCT1 Actuator Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> • Is the voltage greater than 10.5 V?		(+) VCT1 Actuator Connector, Harness Side	(-)	VPWR	Ground	Yes GO to HK6 . No REPAIR the open circuit.
(+) VCT1 Actuator Connector, Harness Side	(-)					
VPWR	Ground					

HK1-HK5

Variable Cam Timing (VCT)

HK

Test Step		Results / Action to Take				
HK6	CHECK THE VCT1 CIRCUIT FOR A SHORT TO PWR IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) VCT1 Actuator Con- nector, Harness Side</td><td>(-)</td></tr><tr><td>VCT1</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) VCT1 Actuator Con- nector, Harness Side	(-)	VCT1	Ground	Yes GO to HK7. No REPAIR the short circuit to PWR.
(+) VCT1 Actuator Con- nector, Harness Side	(-)					
VCT1	Ground					
HK7	CHECK THE VCT1 CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) VCT1 Actuator Con- nector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VCT1</td><td>VCT1</td></tr></table> - Is the resistance less than 5 ohms?	(+) VCT1 Actuator Con- nector, Harness Side	(-) PCM Connector, Harness Side	VCT1	VCT1	Yes GO to HK8. No REPAIR the open circuit.
(+) VCT1 Actuator Con- nector, Harness Side	(-) PCM Connector, Harness Side					
VCT1	VCT1					
HK8	CHECK THE VCT1 CIRCUIT FOR A SHORT TO GND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) VCT1 Actuator Con- nector, Harness Side</td><td>(-)</td></tr><tr><td>VCT1</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) VCT1 Actuator Con- nector, Harness Side	(-)	VCT1	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit to GND.
(+) VCT1 Actuator Con- nector, Harness Side	(-)					
VCT1	Ground					
HK9	DTCS P0020 OR P1385: CHECK THE VCT2 SOLENOID RESISTANCE - Key in OFF position. - VCT2 Actuator connector disconnected. - Measure the resistance between:<table><tr><td>(+) VCT2 Actuator Con- nector, Component Side</td><td>(-) VCT2 Actuator Con- nector, Component Side</td></tr><tr><td>VCT2</td><td>VPWR</td></tr></table> - Is the resistance between 5 ohms - 14 ohms?	(+) VCT2 Actuator Con- nector, Component Side	(-) VCT2 Actuator Con- nector, Component Side	VCT2	VPWR	Yes GO to HK10. No INSTALL a new VCT2 actuator.
(+) VCT2 Actuator Con- nector, Component Side	(-) VCT2 Actuator Con- nector, Component Side					
VCT2	VPWR					
HK10	CHECK THE VCT2 SOLENOID FOR INTERNAL SHORTS - Measure the resistance between:<table><tr><td>(+) VCT2 Actuator Con- nector, Component Side</td><td>(-)</td></tr><tr><td>VCT2</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) VCT2 Actuator Con- nector, Component Side	(-)	VCT2	Ground	Yes GO to HK11. No INSTALL a new VCT2 actuator.
(+) VCT2 Actuator Con- nector, Component Side	(-)					
VCT2	Ground					

HK6-HK10

Variable Cam Timing (VCT)

HK

Test Step		Results / Action to Take				
HK11	CHECK THE VPWR CIRCUIT FOR AN OPEN IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) VCT2 Actuator Con- nector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) VCT2 Actuator Con- nector, Harness Side	(-)	VPWR	Ground	Yes GO to HK12. No REPAIR the open circuit.
(+) VCT2 Actuator Con- nector, Harness Side	(-)					
VPWR	Ground					
HK12	CHECK THE VCT2 CIRCUIT FOR A SHORT TO PWR IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) VCT2 Actuator Con- nector, Harness Side</td><td>(-)</td></tr><tr><td>VCT2</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) VCT2 Actuator Con- nector, Harness Side	(-)	VCT2	Ground	Yes GO to HK13. No REPAIR the short circuit to PWR.
(+) VCT2 Actuator Con- nector, Harness Side	(-)					
VCT2	Ground					
HK13	CHECK THE VCT2 CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) VCT2 Actuator Con- nector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VCT2</td><td>VCT2</td></tr></table> - Is the resistance less than 5 ohms?	(+) VCT2 Actuator Con- nector, Harness Side	(-) PCM Connector, Harness Side	VCT2	VCT2	Yes GO to HK14. No REPAIR the open circuit.
(+) VCT2 Actuator Con- nector, Harness Side	(-) PCM Connector, Harness Side					
VCT2	VCT2					
HK14	CHECK THE VCT2 CIRCUIT FOR A SHORT TO GND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) VCT2 Actuator Con- nector, Harness Side</td><td>(-)</td></tr><tr><td>VCT2</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) VCT2 Actuator Con- nector, Harness Side	(-)	VCT2	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit to GND.
(+) VCT2 Actuator Con- nector, Harness Side	(-)					
VCT2	Ground					

Variable Cam Timing (VCT)**HK**

Test Step		Results / Action to Take
HK15	KOER DTCS P0011, P1381, P0012, P1383, P0021, P1386, P0022 AND P1388:	
	Note: Only diagnose VCT actuator and circuit indicated by the DTC. Oil contamination in VCT systems can cause positioning errors. VCT systems require an oil filter specific to the application. • 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 the spider bracket for contamination prior to installing a new solenoid. • Check vehicle oil filter identification for proper type. • Engine at normal operating temperature. • Clear the DTCs. • KOER Self Test. • Check for KOER DTCS: • Are DTCS P0011, P1381, P0012, P1383, P0021, P1386, P0022 or P1388 present?	Yes Key in OFF position. INSTALL a new VCT actuator. No Unable to duplicate or identify the fault at this time. GO to Z1.

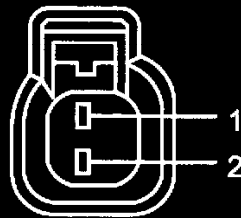
HK15

Test HL: Dual-Injection Fuel Delivery System**PINPOINT TEST HL: DUAL-INJECTION FUEL DELIVERY SYSTEM**

Dual-Injection Fuel Delivery System**HL**

This pinpoint test is intended to diagnose the following:

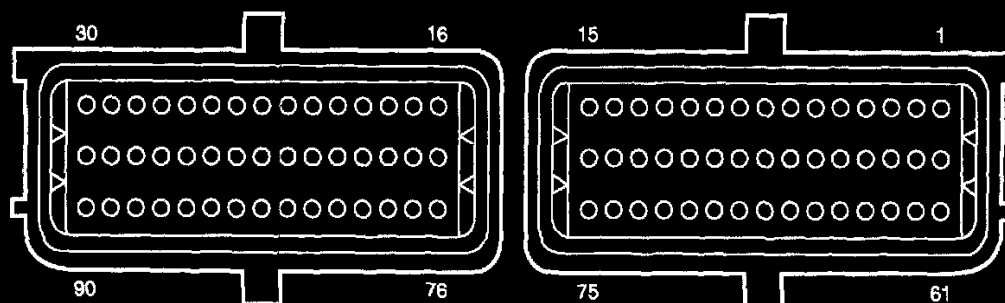
- Fuel injector.
- Harness circuits: INJ1-INJ8, INJ1F-INJ8F, INJ1R-INJ8R, and FSSW.
- Fuel injector control module (FICM).
- Powertrain control module (PCM) (12A650).

Injector (INJ) Connector

A0077525

Circuit	Pin
VPWR (Power Supply)	2
INJ (Injector)	1

Note And Connector

Dual-Injection Fuel Delivery System**HL****Fuel Injector Control Module (FICM) Connector**

A0080046

Circuit	Pin
INJ1 (Injector 1)	61
INJ1F (Injector 1 Front)	76
INJ1R (Injector 1 Rear)	46
INJ2 (Injector 2)	62
INJ2F (Injector 2 Front)	77
INJ2R (Injector 2 Rear)	47
INJ3 (Injector 3)	63
INJ3F (Injector 3 Front)	78
INJ3R (Injector 3 Rear)	48
INJ4 (Injector 4)	64
INJ4F (Injector 4 Front)	79
INJ4R (Injector 4 Rear)	49
INJ5 (Injector 5)	65
INJ5F (Injector 5 Front)	80
INJ5R (Injector 5 Rear)	50
INJ6 (Injector 6)	66
INJ6F (Injector 6 Front)	81
INJ6R (Injector 6 Rear)	51
INJ7 (Injector 7)	67
INJ7F (Injector 7 Front)	82
INJ7R (Injector 7 Rear)	52
INJ8 (Injector 8)	68
INJ8F (Injector 8 Front)	83
INJ8R (Injector 8 Rear)	53

(Continued)

Connector

Dual-Injection Fuel Delivery System**HL**

Circuit	Pin
FSSW (Fuel Select Switch)	42
CHGND (Chassis Ground)	1, 10, 11, 12, 17, 19, 2, 21, 23, 3, 4, 5, 6, 7, 8, 9
VPWR (Power Supply)	45, 60

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Connector	Circuit	Pin
104 Pin	INJ8	98
	INJ7	72
	INJ6	99
	INJ5	73
	INJ4	100
	INJ3	74
	INJ2	101
	INJ1	75
	FSSW	42

Test Step		Results / Action to Take
HL1	CONTINUOUS MEMORY DTCS P0201, P0202, P0203, P0204, P0205, P0206, P0207 OR P0208: CHECK FOR DTCS	
	- Clear the PCM DTCs. - Retrieve the PCM continuous memory DTCs. - Are DTCs P0201, P0202, P0203, P0204, P0205, P0206, P0207 or P0208 present?	Yes GO to HL3. No GO to HL2.
HL2	CHECK FOR INJECTOR FAULT PIDS	
	- Access the appropriate INJxF PIDs using a diagnostic tool. - Does the INJxF PID indicate a fault (or YES)?	Yes GO to HL3. No GO to Z1.

Dual-Injection Fuel Delivery System

HL

Test Step		Results / Action to Take				
HL3	KOEO AND KOER DTCS P0201, P0202, P0203, P0204, P0205, P0206, P0207 OR P0208: CHECK THE INJ CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - FICM connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) FICM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>Suspect INJ</td><td>Suspect INJ</td></tr></table> - Is the resistance less than 5 ohms?	(+) FICM Connector, Harness Side	(-) PCM Connector, Harness Side	Suspect INJ	Suspect INJ	Yes GO to HL4. No REPAIR the open circuit.
(+) FICM Connector, Harness Side	(-) PCM Connector, Harness Side					
Suspect INJ	Suspect INJ					
HL4	CHECK THE INJ CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>Suspect INJ</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-)	Suspect INJ	Ground	Yes GO to HL5. No REPAIR the short circuit to GND.
(+) PCM Connector, Harness Side	(-)					
Suspect INJ	Ground					
HL5	CHECK THE INJ CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>Suspect INJ</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) PCM Connector, Harness Side	(-)	Suspect INJ	Ground	Yes GO to HL6. No REPAIR the short circuit to PWR.
(+) PCM Connector, Harness Side	(-)					
Suspect INJ	Ground					
HL6	CHECK THE FUEL INJECTOR DRIVER SIGNAL FROM THE PCM - Key in OFF position. - PCM connector connected. - Connect a non-powered test lamp between:<table><tr><td>(+) FICM Connector, Harness Side</td><td>(-) FICM Connector, Harness Side</td></tr><tr><td>VPWR - Pin 45, 60</td><td>Suspect INJ</td></tr></table> - Observe the test lamp while cranking the engine. - Is the test lamp blinking?	(+) FICM Connector, Harness Side	(-) FICM Connector, Harness Side	VPWR - Pin 45, 60	Suspect INJ	Yes GO to HL7. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
(+) FICM Connector, Harness Side	(-) FICM Connector, Harness Side					
VPWR - Pin 45, 60	Suspect INJ					

HL3-HL6

Dual-Injection Fuel Delivery System

HL

Test Step		Results / Action to Take				
HL7	CHECK THE FICM AND PCM FOR DAMAGE • Key in OFF position. • Carry out a thorough visual inspection of the connector, pins and wires attaching to the pins. • FICM connector connected. • Key in ON position. • Clear the PCM DTCs. • Retrieve the PCM continuous memory DTCs. • Access the appropriate INJxF PIDs using a diagnostic tool. • Are DTCs P0201, P0202, P0203, P0204, P0205, P0206, P0207 or P0208 or an associated Injector fault flag PID present?	Yes INSTALL a new FICM. No DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions.				
HL8	CHECK THE PRIMARY OR SECONDARY FUEL INJECTOR FOR SELF-TEST DTCs: Note: The primary (forward) fuel injectors are located slightly in front of the secondary (rearward) fuel injectors. • Clear the PCM DTCs. • Obtain information from the customer information worksheet or any other available data from the customer. • Attempt to recreate the concern. • Check for self-test DTCs. • Are any primary or secondary fuel injector DTCs present?	Yes For DTCs P0262, P0265, P0268, P0271, P0274, P0277, P0280, P0283, P1271, P1272, P1273, P1274, P1275, P1276, P1277 or P1278, GO to HL9. For DTCs P0261, P0264, P0267, P0270, P0273, P0276, P0279, P0282, P1261, P1262, P1263, P1264, P1265, P1266, P1267 or P1268, GO to HL10. No GO to Z1.				
HL9	CHECK THE FUEL INJECTOR CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS Note: Disconnect the suspect fuel injector harness connector. Only the suspect injector needs to be diagnosed. • Key in OFF position. • INJ connector disconnected. • FICM connector disconnected. • Key in ON position. • Measure the voltage between: <table border="1"><tr><td>(+) INJ Connector, Har- ness Side</td><td>(-)</td></tr><tr><td>INJ - Pin 1</td><td>Ground</td></tr></table> • Is the voltage less than 1 V?	(+) INJ Connector, Har- ness Side	(-)	INJ - Pin 1	Ground	Yes GO to HL13. No REPAIR the short circuit to PWR.
(+) INJ Connector, Har- ness Side	(-)					
INJ - Pin 1	Ground					

HL7-HL9

Dual-Injection Fuel Delivery System

HL

Test Step		Results / Action to Take				
HL10	CHECK THE VPWR CIRCUIT FOR AN OPEN IN THE HARNESS Note: Disconnect the suspect fuel injector harness connector. Only the suspect injector needs to be diagnosed. • Key In OFF position. • INJ connector disconnected. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) INJ Connector, Har- ness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 2</td><td>Ground</td></tr></table> • Is the voltage greater than 10.5 V?	(+) INJ Connector, Har- ness Side	(-)	VPWR - Pin 2	Ground	Yes GO to HL11. No REPAIR the open circuit.
(+) INJ Connector, Har- ness Side	(-)					
VPWR - Pin 2	Ground					
HL11	CHECK THE INJ CIRCUIT FOR AN OPEN IN THE HARNESS • Key in OFF position. • FICM connector disconnected. • Measure the resistance between:<table><tr><td>(+) INJ Connector, Har- ness Side</td><td>(-) FICM Connector, Harness Side</td></tr><tr><td>INJ - Pin 1</td><td>Suspect INJ</td></tr></table> • Is the resistance less than 5 ohms?	(+) INJ Connector, Har- ness Side	(-) FICM Connector, Harness Side	INJ - Pin 1	Suspect INJ	Yes GO to HL12. No REPAIR the open circuit.
(+) INJ Connector, Har- ness Side	(-) FICM Connector, Harness Side					
INJ - Pin 1	Suspect INJ					
HL12	CHECK THE INJ CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS • Measure the resistance between:<table><tr><td>(+) INJ Connector, Har- ness Side</td><td>(-)</td></tr><tr><td>INJ - Pin 1</td><td>Ground</td></tr></table> • Is the resistance greater than 10K ohms?	(+) INJ Connector, Har- ness Side	(-)	INJ - Pin 1	Ground	Yes GO to HL13. No REPAIR the short circuit to GND.
(+) INJ Connector, Har- ness Side	(-)					
INJ - Pin 1	Ground					
HL13	CHECK THE FUEL INJECTOR RESISTANCE • Key in OFF position. • Measure the resistance between:<table><tr><td>(+) INJ Connector, Component Side</td><td>(-) INJ Connector, Component Side</td></tr><tr><td>INJ - Pin 1</td><td>VPWR - Pin 2</td></tr></table> • Is the resistance between 11 ohms - 18 ohms?	(+) INJ Connector, Component Side	(-) INJ Connector, Component Side	INJ - Pin 1	VPWR - Pin 2	Yes GO to HL14. No INSTALL a new fuel injector.
(+) INJ Connector, Component Side	(-) INJ Connector, Component Side					
INJ - Pin 1	VPWR - Pin 2					

HL10-HL13

Dual-Injection Fuel Delivery System

HL

Test Step		Results / Action to Take			
HL14	CHECK THE FICM FOR DAMAGE	Yes INSTALL a new FICM. No DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions.			
• Key in OFF position. • Carry out a thorough visual inspection of the connector, pins and wires attaching to the pins. • FICM connector connected. • INJ connector connected. • Key in ON position. • Clear the DTCs. • Attempt to recreate the concern. • Check for self-test DTCs. • Are any primary or secondary fuel injector DTCs present?					
HL15	DTC P0611: VERIFY THE DTC	Yes GO to HL16. No GO to Z1.			
• Clear the PCM DTCs. • Carry out the PCM KOEO and KOER self-test. • Is DTC P0611 present?					
HL16	CHECK THE VPWR CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to HL17. No REPAIR the open circuit.			
• Key in OFF position. • FICM connector disconnected. • Key in ON position. • Measure the voltage between: <table><tr><td>(+) FICM Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 45, 60</td><td>Ground</td></tr></table> • Is the voltage greater than 10.5 V?			(+) FICM Connector, Harness Side	(-)	VPWR - Pin 45, 60
(+) FICM Connector, Harness Side	(-)				
VPWR - Pin 45, 60	Ground				
HL17	CHECK THE CHGND CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to HL18. No REPAIR the open circuit.			
• Key in OFF position. • Measure the resistance between: <table><tr><td>(+) FICM Connector, Harness Side</td><td>(-)</td></tr><tr><td>CHGND - Pin 1, 10, 11, 12, 17, 19, 2, 21, 23, 3, 4, 5, 6, 7, 8, 9</td><td>Ground</td></tr></table> • Is the resistance less than 5 ohms?			(+) FICM Connector, Harness Side	(-)	CHGND - Pin 1, 10, 11, 12, 17, 19, 2, 21, 23, 3, 4, 5, 6, 7, 8, 9
(+) FICM Connector, Harness Side	(-)				
CHGND - Pin 1, 10, 11, 12, 17, 19, 2, 21, 23, 3, 4, 5, 6, 7, 8, 9	Ground				

HL14-HL17

Dual-Injection Fuel Delivery System

HL

Test Step		Results / Action to Take				
HL18	CHECK THE FICM FOR DAMAGE - Carry out a thorough visual inspection of the connector, pins and wires attaching to the pins. - FICM connector connected. - Key in ON position. - Clear the PCM DTCs. - Retrieve the PCM continuous memory DTCs. Is DTC P0611 present?	Yes REFER to Information Bus (Module Communications Network) to continue no communication with the FICM diagnosis. No DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions.				
HL19	DTC P1156: CHECK FOR DTCS - Clear the PCM DTCs. - Carry out the PCM KOEO and KOER self-test. Is DTC P1156 present?	Yes GO to HL20. No GO to Z1.				
HL20	CHECK THE FSSW CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - FICM connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) FICM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FSSW - Pin 42</td><td>FSSW - Pin 42</td></tr></table> Is the resistance less than 5 ohms?	(+) FICM Connector, Harness Side	(-) PCM Connector, Harness Side	FSSW - Pin 42	FSSW - Pin 42	Yes GO to HL21. No REPAIR the open circuit.
(+) FICM Connector, Harness Side	(-) PCM Connector, Harness Side					
FSSW - Pin 42	FSSW - Pin 42					
HL21	CHECK THE FSSW CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FSSW - Pin 42</td><td>Ground</td></tr></table> Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-)	FSSW - Pin 42	Ground	Yes GO to HL22. No REPAIR the short circuit to GND.
(+) PCM Connector, Harness Side	(-)					
FSSW - Pin 42	Ground					
HL22	CHECK THE FSSW CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FSSW - Pin 42</td><td>Ground</td></tr></table> Is the voltage less than 1 V?	(+) PCM Connector, Harness Side	(-)	FSSW - Pin 42	Ground	Yes GO to HL23. No REPAIR the short circuit to PWR.
(+) PCM Connector, Harness Side	(-)					
FSSW - Pin 42	Ground					

HL18-HL22

Dual-Injection Fuel Delivery System**HL**

Test Step		Results / Action to Take
HL23	CHECK THE FICM AND PCM FOR DAMAGE	
• Key in OFF position. • Carry out a thorough visual inspection of the connector, pins and wires attaching to the pins. • PCM connector connected. • FICM connector connected. • Key in ON position. • Clear the PCM DTCs. • Retrieve the PCM continuous memory DTCs. • Is DTC P1156 present?		Yes INSTALL a new FICM. No DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions .

Yes

INSTALL a new FICM.

No

DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions .

HL23

Test HM: Secondary Air Injection (AIR) System**PINPOINT TEST HM: SECONDARY AIR INJECTION (AIR) SYSTEM**

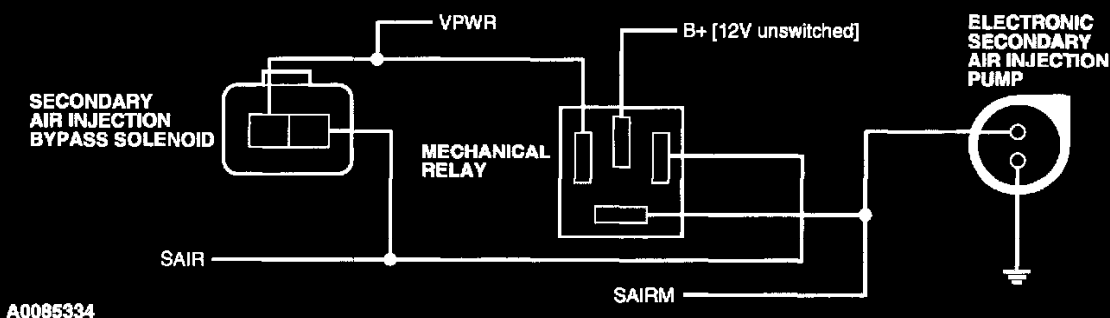
Secondary Air Injection (AIR) System

HM

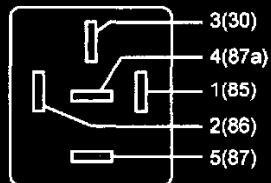
This pinpoint test is intended to diagnose the following:

- Secondary Air Injection System Relay (14B192).
- Electric Air Injection Pump (9A486).
- Secondary Air Injection Bypass Solenoid (9H465).
- Harness circuits: B+, VPWR, SAIR, SAIRM, Ground.
- Powertrain control module (PCM) (12A650).
- Secondary Air Injection Diverter Valve (9F491).
- Vacuum supply.
- Air Water Shield/Silencer (9C463).
- Hoses.
- Partial restricted exhaust.

Typical AIR wiring diagram.



Note And Schematic

Secondary Air Injection (AIR) System**HIM****Secondary Air Injection (AIR) Relay Connector**

A0077582

Circuit	Pin
AIR_PWR (AIR Pump Power)	87
B+ (Battery Positive Voltage)	30
VPWR (Power Supply)	86
SAIR (Secondary Air)	85

Secondary Air Injection (AIR) Solenoid Connector

A0077533

Circuit	Pin
VPWR (Power Supply)	2
SAIR (Secondary Air)	1

Connectors

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

A0077529

Circuit	Pin
AIR_PWR (AIR Pump Power)	2
AIR_GND (AIR Pump Ground)	1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Connector	Circuit	Pin
150 (50-50-50) Pin	SAIRM VREF SIGRTN CASE GND PWRGND VPWR SAIR	B19 E40 B41 B10 B47 B35 B17

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take				
HM1	KOEO AND KOER DTC P0412: ISOLATE THE COMMAND SIGNAL CIRCUIT TO 1 COMPONENT AND RERUN THE SELF-TEST	Yes GO to HM2. No Key in OFF position. INSTALL a new AIR solenoid.				
Note: Only start at this step if you followed the Symptom Charts PCM Quick Test direction and a KOEO or KOER DTC is present. • Key in OFF position. • Diagnostic tool connector connected. • AIR Solenoid connector disconnected. • Key in ON position. • Clear the DTCs. • Carry out the KOEO self-test. • Is DTC P0412 present?						
HM2	CHECK THE RESISTANCE OF AIR SOLENOID • Measure the resistance between:<table><tr><td>(+) AIR Solenoid Connector, Component Side</td><td>(-) AIR Solenoid Connector, Component Side</td></tr><tr><td>SAIR - Pin 1</td><td>VPWR - Pin 2</td></tr></table> • Is the resistance between 50 ohms - 95 ohms?	(+) AIR Solenoid Connector, Component Side	(-) AIR Solenoid Connector, Component Side	SAIR - Pin 1	VPWR - Pin 2	Yes GO to HM3. No Key in OFF position. INSTALL a new AIR solenoid.
(+) AIR Solenoid Connector, Component Side	(-) AIR Solenoid Connector, Component Side					
SAIR - Pin 1	VPWR - Pin 2					
HM3	CHECK THE VPWR VOLTAGE TO THE AIR SOLENOID • Measure the voltage between:<table><tr><td>(+) AIR Solenoid Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 2</td><td>Ground</td></tr></table> • Is the voltage greater than 10.5 V?	(+) AIR Solenoid Connector, Harness Side	(-)	VPWR - Pin 2	Ground	
(+) AIR Solenoid Connector, Harness Side	(-)					
VPWR - Pin 2	Ground					
HM4	ISOLATE THE COMMAND SIGNAL CIRCUIT TO 1 COMPONENT AND RERUN THE SELF-TEST • Key in OFF position. • AIR Solenoid connector connected. • AIR Relay connector disconnected. • Key in ON position. • Clear the DTCs. • Carry out the KOEO self-test. • Is DTC P0412 present?	Yes GO to HM5. No Key in OFF position. INSTALL a new AIR relay.				
HM5	CHECK THE RESISTANCE OF AIR RELAY • Measure the resistance between:<table><tr><td>(+) AIR Relay Connector, Component Side</td><td>(-) AIR Relay Connector, Component Side</td></tr><tr><td>SAIR - Pin 85</td><td>VPWR - Pin 86</td></tr></table> • Is the resistance between 40 ohms - 80 ohms?		(+) AIR Relay Connector, Component Side	(-) AIR Relay Connector, Component Side	SAIR - Pin 85	VPWR - Pin 86
(+) AIR Relay Connector, Component Side	(-) AIR Relay Connector, Component Side					
SAIR - Pin 85	VPWR - Pin 86					

HM1-HM5

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take																
HM6	CHECK THE VPWR VOLTAGE TO THE AIR RELAY - Measure the voltage between:<table><tr><td>(+) AIR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 86</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) AIR Relay Connector, Harness Side	(-)	VPWR - Pin 86	Ground	Yes GO to HM7. No Key in OFF position. REPAIR the open circuit.												
(+) AIR Relay Connector, Harness Side	(-)																	
VPWR - Pin 86	Ground																	
HM7	CHECK THE SAIR CIRCUIT(S) FOR AN OPEN IN THE HARNESS - Key in OFF position. - AIR Solenoid connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) AIR Solenoid Connector, Harness Side</td></tr><tr><td>SAIR - Pin B17</td><td>SAIR - Pin 1</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) AIR Relay Connector, Harness Side</td></tr><tr><td>SAIR - Pin B17</td><td>SAIR - Pin 85</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) AIR Solenoid Connector, Harness Side	SAIR - Pin B17	SAIR - Pin 1	(+) PCM Connector, Harness Side	(-) AIR Relay Connector, Harness Side	SAIR - Pin B17	SAIR - Pin 85	Yes GO to HM8. No REPAIR the open circuit.								
(+) PCM Connector, Harness Side	(-) AIR Solenoid Connector, Harness Side																	
SAIR - Pin B17	SAIR - Pin 1																	
(+) PCM Connector, Harness Side	(-) AIR Relay Connector, Harness Side																	
SAIR - Pin B17	SAIR - Pin 85																	
HM8	CHECK THE SAIR FOR SHORTS TO POWER(S) AND GROUND(S) IN THE HARNESS - DIRECT AND INDIRECT - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>SAIR - Pin B17</td><td>VPWR - Pin B35</td></tr><tr><td>SAIR - Pin B17</td><td>PWRGND - Pin B47</td></tr><tr><td>SAIR - Pin B17</td><td>CASE GND - Pin B10</td></tr><tr><td>SAIR - Pin B17</td><td>SIGRTN - Pin B41</td></tr><tr><td>SAIR - Pin B17</td><td>VREF - Pin E40</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>SAIR - Pin B17</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	SAIR - Pin B17	VPWR - Pin B35	SAIR - Pin B17	PWRGND - Pin B47	SAIR - Pin B17	CASE GND - Pin B10	SAIR - Pin B17	SIGRTN - Pin B41	SAIR - Pin B17	VREF - Pin E40	(+) PCM Connector, Harness Side	(-)	SAIR - Pin B17	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side																	
SAIR - Pin B17	VPWR - Pin B35																	
SAIR - Pin B17	PWRGND - Pin B47																	
SAIR - Pin B17	CASE GND - Pin B10																	
SAIR - Pin B17	SIGRTN - Pin B41																	
SAIR - Pin B17	VREF - Pin E40																	
(+) PCM Connector, Harness Side	(-)																	
SAIR - Pin B17	Ground																	

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take			
HM9	CONTINUOUS MEMORY DTC P0412: WIGGLE TEST ON THE AIR HARNESS SAIR CIRCUIT LOOKING FOR AN OPEN CIRCUIT OR SHORT TO GROUND - PCM OUTPUT OFF	Yes Key in OFF position. REPAIR as necessary. No GO to HM10.			
	Note: Only start at this step if you followed the Symptom Charts PCM Quick Test direction and no KOEO or KOER DTC is present. Note: Open circuit and short-to-ground conditions are detected when the PCM output driver is OFF. The AIRF PID instantly shows a SAIR PCM output circuit open or short to ground fault - PCM output OFF. • Key in ON position. • Diagnostic tool connector connected. • Access the PCM and monitor the AIR, AIRM and AIRF PIDs. • Observe the PCM output driver fault PID AIRF. Wiggle the SAIR harness and connectors, and lightly tap the components while observing the AIRF PID. • Is a concern present?				
HM10	WIGGLE TEST ON THE AIR HARNESS SAIR CIRCUIT LOOKING FOR A SHORT TO POWER OR LOW RESISTANCE LOAD TO POWER - PCM OUTPUT ON	Yes Key in OFF position. REPAIR as necessary. No Key in OFF position. GO to HM11.			
	 CAUTION: Running the AIR pump with OTM longer than 2 minutes may overheat and damage the AIR pump. Refer to Diagnostic Methods, Output Test Mode (OTM). Note: The SAIR PCM output driver detects a short-to-power condition, when the driver is on. The AIRF PID instantly shows a SAIR PCM output circuit short to power or low resistance short to power fault - PCM output ON. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the outputs ON. • Observe the PCM output driver fault PID AIRF. While commanding outputs on with OTM, wiggle the SAIR line harness and connectors, and lightly tap components while observing the AIRF PID. • Command the outputs OFF. • Exit output test mode. • Is a concern present?				
HM11	CHECK THE RESISTANCE OF AIR SOLENOID	Yes GO to HM12. No INSTALL a new AIR solenoid.			
	• AIR Solenoid connector disconnected. • Measure the resistance between: <table><tr><td>(+) AIR Solenoid Connector, Component Side</td><td>(-) AIR Solenoid Connector, Component Side</td></tr><tr><td>SAIR - Pin 1</td><td>VPWR - Pin 2</td></tr></table> • Is the resistance between 50 ohms - 95 ohms?		(+) AIR Solenoid Connector, Component Side	(-) AIR Solenoid Connector, Component Side	SAIR - Pin 1
(+) AIR Solenoid Connector, Component Side	(-) AIR Solenoid Connector, Component Side				
SAIR - Pin 1	VPWR - Pin 2				

HM9-HM11

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take								
HM12	CHECK THE VPWR VOLTAGE TO THE AIR SOLENOID - Key in ON position. - Measure the voltage between:<table><tr><td>(+) AIR Solenoid Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 2</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) AIR Solenoid Connector, Harness Side	(-)	VPWR - Pin 2	Ground	Yes Key in OFF position. GO to HM13 . No Key in OFF position. REPAIR the open circuit.				
(+) AIR Solenoid Connector, Harness Side	(-)									
VPWR - Pin 2	Ground									
HM13	CHECK THE RESISTANCE OF AIR RELAY - AIR Relay connector disconnected. - Measure the resistance between:<table><tr><td>(+) AIR Relay Connector, Component Side</td><td>(-) AIR Relay Connector, Component Side</td></tr><tr><td>SAIR - Pin 85</td><td>VPWR - Pin 86</td></tr></table> - Is the resistance between 40 ohms - 80 ohms?	(+) AIR Relay Connector, Component Side	(-) AIR Relay Connector, Component Side	SAIR - Pin 85	VPWR - Pin 86	Yes GO to HM14 . No INSTALL a new AIR relay.				
(+) AIR Relay Connector, Component Side	(-) AIR Relay Connector, Component Side									
SAIR - Pin 85	VPWR - Pin 86									
HM14	CHECK THE VPWR VOLTAGE TO THE AIR RELAY - Key in ON position. - Measure the voltage between:<table><tr><td>(+) AIR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 86</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) AIR Relay Connector, Harness Side	(-)	VPWR - Pin 86	Ground	Yes GO to HM15 . No Key in OFF position. REPAIR the open circuit.				
(+) AIR Relay Connector, Harness Side	(-)									
VPWR - Pin 86	Ground									
HM15	CHECK THE SAIR CIRCUIT(S) FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) AIR Solenoid Connector, Harness Side</td></tr><tr><td>SAIR - Pin B17</td><td>SAIR - Pin 1</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) AIR Relay Connector, Harness Side</td></tr><tr><td>SAIR - Pin B17</td><td>SAIR - Pin 85</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) AIR Solenoid Connector, Harness Side	SAIR - Pin B17	SAIR - Pin 1	(+) PCM Connector, Harness Side	(-) AIR Relay Connector, Harness Side	SAIR - Pin B17	SAIR - Pin 85	Yes GO to HM16 . No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) AIR Solenoid Connector, Harness Side									
SAIR - Pin B17	SAIR - Pin 1									
(+) PCM Connector, Harness Side	(-) AIR Relay Connector, Harness Side									
SAIR - Pin B17	SAIR - Pin 85									

HM12-HM15

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take																
HM16	CHECK THE SAIR FOR SHORTS TO POWER(S) AND GROUND(S) IN THE HARNESS - DIRECT AND INDIRECT - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>SAIR - Pin B17</td><td>VPWR - Pin B35</td></tr><tr><td>SAIR - Pin B17</td><td>PWRGND - Pin B47</td></tr><tr><td>SAIR - Pin B17</td><td>CASE GND - Pin B10</td></tr><tr><td>SAIR - Pin B17</td><td>SIGRTN - Pin B41</td></tr><tr><td>SAIR - Pin B17</td><td>VREF - Pin E40</td></tr></table> - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-)</th></tr><tr><td>SAIR - Pin B17</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	SAIR - Pin B17	VPWR - Pin B35	SAIR - Pin B17	PWRGND - Pin B47	SAIR - Pin B17	CASE GND - Pin B10	SAIR - Pin B17	SIGRTN - Pin B41	SAIR - Pin B17	VREF - Pin E40	(+) PCM Connector, Harness Side	(-)	SAIR - Pin B17	Ground	Yes Unable to duplicate or identify the fault at this time. GO to Z1. No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side																	
SAIR - Pin B17	VPWR - Pin B35																	
SAIR - Pin B17	PWRGND - Pin B47																	
SAIR - Pin B17	CASE GND - Pin B10																	
SAIR - Pin B17	SIGRTN - Pin B41																	
SAIR - Pin B17	VREF - Pin E40																	
(+) PCM Connector, Harness Side	(-)																	
SAIR - Pin B17	Ground																	
HM17	DTC P0411: VISUALLY INSPECT THE AIR SYSTEM COMPONENTS AND HOSES - Visually inspect the AIR system components and hoses for damage, obstruction, binding, including exhaust damage, cracking, a blocked water shield on the AIR pump inlet hose, water, or ice. - Are the AIR system components and hoses OK?	Yes GO to HM18. No Key in OFF position. REPAIR as necessary. CLEAR the DTCs and REPEAT the self-test.																
HM18	CHECK THE AIR PUMP/MOTOR OPERATION  CAUTION: Running the AIR pump with OTM longer than 2 minutes may overheat and damage the AIR pump. Refer to Diagnostic Methods, Output Test Mode (OTM). - Key in ON position. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Listen for the AIR pump operation while toggling to OTM states from ON to OFF. - Command the outputs ON. - Command the outputs OFF. - Exit output test mode. - Does AIR pump operation correspond with the OTM ON and OFF commands?	Yes GO to HM19. No GO to HM33.																

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take
HM19	MEASURE THE VACUUM AT THE AIR DIVERTER VALVE	
	- Connect a vacuum gauge to the control vacuum hose at the AIR diverter valve(s). - Apply 54 kPa (16 in-Hg) of vacuum at the manifold side of the AIR bypass solenoid vacuum supply hose(s). - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Observe the vacuum gauge reading at the AIR diverter valve(s). - Command the outputs OFF. Is applied vacuum present at the AIR diverter valve(s)?	Yes GO to HM22. No Exit output test mode. GO to HM20.
HM20	MEASURE THE VACUUM AT THE AIR SOLENOID VALVE	
	- Connect a vacuum gauge to the control vacuum outlet at the AIR solenoid valve(s). - Apply 54 kPa (16 in-Hg) of vacuum at the manifold side of the AIR bypass solenoid vacuum supply hose(s). - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Observe the vacuum gauge reading at the AIR solenoid valve. - Command the outputs OFF. - Exit output test mode. Is applied vacuum present at the AIR diverter valve(s)?	Yes Key in OFF position. REPAIR as necessary the restricted vacuum duct, tubing or hoses between the AIR solenoid and the AIR diverter valve No GO to HM21.
HM21	MEASURE MANIFOLD VACUUM AT THE AIR SOLENOID VALVE	
	- Connect a vacuum gauge to the manifold vacuum hose at the AIR solenoid valve(s). - Key on engine running. Is the manifold vacuum greater than 47 kPa (14 in-Hg)?	Yes Key in OFF position. GO to HM30. No Key in OFF position. REPAIR the cause of the restriction
HM22	MEASURE THE VACUUM AT THE AIR DIVERTER VALVE - VACUUM RELEASE	
	- Command the outputs OFF. - Exit output test mode. - Observe the vacuum gauge reading at the AIR solenoid valve. Was vacuum released - 0 kPa (0 in-Hg)?	Yes GO to HM23. No Key in OFF position. INSTALL a new AIR solenoid.

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take
HM23	CHECK THE AIR FLOW AT THE AIR DIVERTER VALVE(S) OUTLET	
	• Disconnect the air hose from the AIR diverter valve(s) outlet side. • Apply 53 kPa (16 in-Hg) of vacuum at the AIR diverter valve(s). • Key in ON position. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the outputs ON. • Observe air flow at the AIR diverter valve(s) outlet. • Command the outputs OFF. • Exit output test mode. • Is air flow present at the AIR diverter valve(s) outlet?	Yes GO to HM24. No Key in OFF position. GO to HM25.
HM24	CHECK THE AIR FLOW AT THE AIR DIVERTER VALVE(S) OUTLET. - CONTINUED	
	• Disconnect the control vacuum hose from the AIR diverter valve(s). • Key in ON position. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the outputs ON. • Observe air flow at the AIR diverter valve(s) outlet. • Command the outputs OFF. • Exit output test mode. • Is air flow present at the AIR diverter valve(s) outlet?	Yes Key in OFF position. INSTALL a new appropriate AIR diverter valve(s). No Key in OFF position. GO to HM28.
HM25	CHECK THE AIR FLOW AT THE AIR DIVERTER VALVE(S) INLET	
	• Disconnect the air hose from the AIR diverter valve(s) inlet side. • Key in ON position. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the outputs ON. • Observe air flow at the AIR diverter(s) inlet hose. • Command the outputs OFF. • Exit output test mode. • Is air flow present at the AIR diverter valve(s) inlet hose?	Yes Key in OFF position. INSTALL a new appropriate AIR diverter valve(s). No Key in OFF position. GO to HM26.
HM26	CHECK THE AIR FLOW AT THE AIR PUMP	
	• Disconnect the air hose from the AIR pump outlet side. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the outputs ON. • Observe air flow at the AIR pump outlet. • Command the outputs OFF. • Exit output test mode. • Is the air flow present at the AIR pump outlet?	Yes REPAIR as necessary the restricted air flow duct, tubing or hoses between the AIR pump and the AIR diverter valve. No Key in OFF position. GO to HM27.

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take			
HM27	CHECK THE AIR FLOW AT THE AIR PUMP - CONTINUED	Yes REPAIR as necessary the restricted air flow duct, tubing or hoses between the AIR pump inlet and the pump AIR water shield/silencer and/or silencer. No Key in OFF position. INSTALL a new AIR motor.			
	- Disconnect the air hose from the AIR pump inlet side. - INSPECT the air hose and water shield from the AIR pump inlet side for restrictions or damage. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Observe air flow at the AIR pump outlet. - Command the outputs OFF. - Exit output test mode. - Is the air flow present at the AIR pump outlet?				
HM28	CHECK THE AIR DISTRIBUTION MANIFOLD INTEGRITY AT THE EXHAUST MANIFOLD	Yes GO to HM29. No REPAIR as necessary.			
	- Check the AIR distribution manifold at the exhaust manifold for restrictions, blockage, or damage. - Is the AIR distribution manifold at the exhaust manifold restriction free?				
HM29	CHECK FOR RESTRICTIONS IN THE EXHAUST SYSTEM	Yes GO to Z1. No REPAIR as necessary.			
	- CHECK for restrictions in the exhaust system. - Is the exhaust system restriction free?				
HM30	CHECK THE RESISTANCE OF AIR SOLENOID	Yes GO to HM31. No INSTALL a new AIR solenoid.			
	- AIR Solenoid connector disconnected. - Measure the resistance between:<table><tr><td>(+) AIR Solenoid Connector, Component Side</td><td>(-) AIR Solenoid Connector, Component Side</td></tr><tr><td>SAIR - Pin 1</td><td>VPWR - Pin 2</td></tr></table> - Is the resistance between 50 ohms - 95 ohms?		(+) AIR Solenoid Connector, Component Side	(-) AIR Solenoid Connector, Component Side	SAIR - Pin 1
(+) AIR Solenoid Connector, Component Side	(-) AIR Solenoid Connector, Component Side				
SAIR - Pin 1	VPWR - Pin 2				
HM31	CHECK THE ELECTRICAL CONNECTOR INTEGRITY	Yes GO to HM32. No REPAIR as necessary.			
	- Inspect the AIR Solenoid harness connector and component connector. - Check the electrical connector for damage, corrosion, and water ingress. - Is the connector in good working order?				
HM32	CHECK THE VPWR VOLTAGE TO THE AIR SOLENOID	Yes INSTALL a new AIR solenoid. No REPAIR the open circuit.			
	- Key in ON position. - Measure the voltage between:<table><tr><td>(+) AIR Solenoid Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 2</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?		(+) AIR Solenoid Connector, Harness Side	(-)	VPWR - Pin 2
(+) AIR Solenoid Connector, Harness Side	(-)				
VPWR - Pin 2	Ground				

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take				
HM33	CHECK THE AIR PUMP/MOTOR ELECTRICAL CONNECTOR INTEGRITY					
• Check the AIR pump/motor electrical connector for damage, corrosion, and water ingress. • AIR Motor connector disconnected. • Is the connector in good working order?		Yes GO to HM34 . No REPAIR as necessary.				
HM34	CHECK THE AIR PUMP/MOTOR GROUND CIRCUIT FOR AN OPEN IN THE HARNESS					
• AIR Motor connector disconnected. • Measure the resistance between: <table><tr><td>(+) AIR Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>AIR_GND - Pin 1</td><td>Ground</td></tr></table> • Is the resistance less than 5 ohms?		(+) AIR Motor Connector, Harness Side	(-)	AIR_GND - Pin 1	Ground	Yes GO to HM35 . No REPAIR the open circuit.
(+) AIR Motor Connector, Harness Side	(-)					
AIR_GND - Pin 1	Ground					
HM35	CHECK THE B+ VOLTAGE FROM THE AIR RELAY AT THE AIR PUMP/MOTOR					
• Key in ON position. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the outputs ON. • Measure the voltage between: <table><tr><td>(+) AIR Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>AIR_PWR - Pin 2</td><td>Ground</td></tr></table> • Command the outputs OFF. • Exit output test mode. • Is the voltage above 10.5 volts?		(+) AIR Motor Connector, Harness Side	(-)	AIR_PWR - Pin 2	Ground	Yes Key in OFF position. INSTALL a new AIR motor. No Key in OFF position. GO to HM36 .
(+) AIR Motor Connector, Harness Side	(-)					
AIR_PWR - Pin 2	Ground					
HM36	CHECK THE AIR PUMP/MOTOR FOR WATER OR ICE CONTAMINATION					
Note: Water ingested in the AIR pump reduces the life of the pump. • Disconnect the air hose from the AIR pump inlet side. • Disconnect the air hose from the AIR pump outlet side. • AIR Motor connector disconnected. Note: The AIR pump temperature must be above 0°C (32°F) degrees. • Tilt the AIR pump assembly to a range of positions to see if any water is present. • Is water or evidence of ice present in AIR pump?		Yes INSTALL a new AIR motor. Carefully inspect the AIR pump hoses for proper routing and installation of the inlet water shield/silencer. REPAIR as necessary. No INSTALL a new AIR motor.				

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

Test Step		Results / Action to Take
HM37	DTC P2257: CHECK THE AIR PID OPERATION WITH OTM  CAUTION: Running the AIR pump with OTM longer than 2 minutes may overheat and damage the AIR pump. Refer to Diagnostic Methods, Output Test Mode (OTM). • Key in ON position. • Access the PCM and monitor the AIR PID. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Observe the AIR PID while toggling the OTM state from ON to OFF. Note: When the OTM outputs are commanded on, the PCM output signal AIR PID should turn on. • Command the outputs ON. • Command the outputs OFF. • Exit output test mode. • Does the AIR PID correspond with the OTM ON and OFF commands?	

Yes
GO to **HM38**.

No
GO to **HM47**.

Yes
Unable to duplicate or identify the fault at this time.
GO to **HM39**.

No
GO to **HM40**.

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take						
HM39	CARRY OUT A THOROUGH WIGGLE TEST ON THE AIR HARNESS - SAIRM LINE - Access the PCM and monitor the AIR and AIRM PIDs. Note: When the OTM outputs are commanded on, the PCM output signal AIR PID should turn on followed by the PCM input signal AIRM PID. The AIRM PID indicates voltage at the AIR pump/motor. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - While commanding the outputs on with the OTM, wiggle the SAIRM line harness and connectors, and lightly tap the components while observing the AIRM PID. Note: Changing AIRM PID states indicate a fault location in the secondary side of the AIR relay circuit. The AIRM PID indicates voltage at the AIR pump/motor. - Command the outputs OFF. - Exit output test mode. Is a concern present?	Yes Key in OFF position. REPAIR as necessary. No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1.						
HM40	CHECK THE B+ AND VPWR VOLTAGE TO THE AIR RELAY - Key in OFF position. - AIR Relay connector disconnected. - Key in ON position. - Measure the voltage between:<table border="1"><tr><td>(+) AIR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>B+ - Pin 30</td><td>Ground</td></tr><tr><td>VPWR - Pin 86</td><td>Ground</td></tr></table> Are the voltages greater than 10.5 V?	(+) AIR Relay Connector, Harness Side	(-)	B+ - Pin 30	Ground	VPWR - Pin 86	Ground	Yes GO to HM43. No Key in OFF position. REPAIR the open circuit. GO to HM41.
(+) AIR Relay Connector, Harness Side	(-)							
B+ - Pin 30	Ground							
VPWR - Pin 86	Ground							
HM41	CHECK FOR AN ISOLATED B+ AIR FUSE FAULT IN THE LAST STEP Note: An isolated B+ AIR fuse fault could be the result of frozen water in the AIR pump. Was a B+ AIR fuse fault the only fault in the last step?	Yes Key in OFF position. GO to HM42. No Key in OFF position. The repair is complete.						

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take			
HM42	CHECK THE AIR PUMP/MOTOR FOR WATER OR ICE CONTAMINATION	Yes INSTALL a new AIR motor. Carefully inspect the AIR pump hoses for proper routing and installation of the inlet water shield/silencer. No The repair is complete.			
Note: Water ingested in the AIR pump reduces the life of the pump. • Disconnect the air hose from the AIR pump inlet side. • Disconnect the air hose from the AIR pump outlet side. • AIR Motor connector disconnected. Note: The AIR pump temperature must be above 0°C (32°F) degrees. • Tilt the AIR pump assembly to a range of positions to see if any water is present. • Is water or evidence of ice present in AIR pump?					
HM43	CHECK THE POWER CIRCUIT FROM THE AIR RELAY TO THE AIR PUMP/MOTOR FOR AN OPEN CIRCUIT	Yes GO to HM44. No REPAIR the open circuit.			
• Key in OFF position. • AIR Motor connector disconnected. • Measure the resistance between:<table><tr><td>(+) AIR Relay Connector, Harness Side</td><td>(-) AIR Motor Connector, Harness Side</td></tr><tr><td>AIR_PWR - Pin 87</td><td>AIR_PWR - Pin 2</td></tr></table> • Is the resistance less than 5 ohms?			(+) AIR Relay Connector, Harness Side	(-) AIR Motor Connector, Harness Side	AIR_PWR - Pin 87
(+) AIR Relay Connector, Harness Side	(-) AIR Motor Connector, Harness Side				
AIR_PWR - Pin 87	AIR_PWR - Pin 2				
HM44	CHECK THE AIRM PID OPERATION WITH A JUMPER	Yes Key In OFF position. INSTALL a new AIR relay. No GO to HM45.			
 CAUTION: Running the AIR Pump with a jumper wire longer than 2 minutes may overheat and damage the AIR pump. • Key in ON position. • Access the PCM and monitor the AIRM and AIR PIDs. Note: The AIRM PID indicates voltage at the AIR pump/motor. • Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A AIR Relay Connector, Harness Side</td><td>Point B AIR Relay Connector, Harness Side</td></tr><tr><td>B+ - Pin 30</td><td>AIR_PWR - Pin 87</td></tr></table> • Remove the jumper wire(s) • Did the AIRM PID turn on with the jumper applied?			Point A AIR Relay Connector, Harness Side	Point B AIR Relay Connector, Harness Side	B+ - Pin 30
Point A AIR Relay Connector, Harness Side	Point B AIR Relay Connector, Harness Side				
B+ - Pin 30	AIR_PWR - Pin 87				

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take								
HM45	CHECK THE SAIRM CIRCUIT AND THE AIR PUMP/MOTOR POWER CIRCUIT FOR SHORT(S) - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>SAIRM - Pin B19</td><td>Ground</td></tr></table> - Measure the resistance between:<table><tr><td>(+) AIR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>AIR_PWR - Pin 87</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-)	SAIRM - Pin B19	Ground	(+) AIR Relay Connector, Harness Side	(-)	AIR_PWR - Pin 87	Ground	Yes GO to HM46. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-)									
SAIRM - Pin B19	Ground									
(+) AIR Relay Connector, Harness Side	(-)									
AIR_PWR - Pin 87	Ground									
HM46	CHECK THE SAIRM CIRCUIT AND THE AIR PUMP/MOTOR POWER CIRCUIT FOR AN OPEN(S) IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) AIR Relay Connector, Harness Side</td></tr><tr><td>SAIRM - Pin B19</td><td>AIR_PWR - Pin 87</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) AIR Motor Connector, Harness Side</td></tr><tr><td>SAIRM - Pin B19</td><td>AIR_PWR - Pin 2</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) AIR Relay Connector, Harness Side	SAIRM - Pin B19	AIR_PWR - Pin 87	(+) PCM Connector, Harness Side	(-) AIR Motor Connector, Harness Side	SAIRM - Pin B19	AIR_PWR - Pin 2	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) AIR Relay Connector, Harness Side									
SAIRM - Pin B19	AIR_PWR - Pin 87									
(+) PCM Connector, Harness Side	(-) AIR Motor Connector, Harness Side									
SAIRM - Pin B19	AIR_PWR - Pin 2									
HM47	CHECK THE SAIR CIRCUIT(S) FOR AN OPEN IN THE HARNESS - Key in OFF position. - AIR Relay connector disconnected. - AIR Solenoid connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) AIR Solenoid Connector, Harness Side</td></tr><tr><td>SAIR - Pin B17</td><td>SAIR - Pin 1</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) AIR Relay Connector, Harness Side</td></tr><tr><td>SAIR - Pin B17</td><td>SAIR - Pin 85</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) AIR Solenoid Connector, Harness Side	SAIR - Pin B17	SAIR - Pin 1	(+) PCM Connector, Harness Side	(-) AIR Relay Connector, Harness Side	SAIR - Pin B17	SAIR - Pin 85	Yes GO to HM48. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) AIR Solenoid Connector, Harness Side									
SAIR - Pin B17	SAIR - Pin 1									
(+) PCM Connector, Harness Side	(-) AIR Relay Connector, Harness Side									
SAIR - Pin B17	SAIR - Pin 85									

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

Test Step		Results / Action to Take																
HM48	CHECK THE SAIR FOR SHORTS TO POWER(S) AND GROUND(S) IN THE HARNESS - DIRECT AND INDIRECT - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>SAIR - Pin B17</td><td>VPWR - Pin B35</td></tr><tr><td>SAIR - Pin B17</td><td>PWRGND - Pin B47</td></tr><tr><td>SAIR - Pin B17</td><td>SIGRTN - Pin B41</td></tr><tr><td>SAIR - Pin B17</td><td>VREF - Pin E40</td></tr><tr><td>SAIR - Pin B17</td><td>CASE GND - Pin B10</td></tr></table> - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-)</th></tr><tr><td>SAIR - Pin B17</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	SAIR - Pin B17	VPWR - Pin B35	SAIR - Pin B17	PWRGND - Pin B47	SAIR - Pin B17	SIGRTN - Pin B41	SAIR - Pin B17	VREF - Pin E40	SAIR - Pin B17	CASE GND - Pin B10	(+) PCM Connector, Harness Side	(-)	SAIR - Pin B17	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side																	
SAIR - Pin B17	VPWR - Pin B35																	
SAIR - Pin B17	PWRGND - Pin B47																	
SAIR - Pin B17	SIGRTN - Pin B41																	
SAIR - Pin B17	VREF - Pin E40																	
SAIR - Pin B17	CASE GND - Pin B10																	
(+) PCM Connector, Harness Side	(-)																	
SAIR - Pin B17	Ground																	
HM49	DTC P2258: CHECK THE AIR PID OPERATION WITH OTM  CAUTION: Running the AIR pump with OTM longer than 2 minutes may overheat and damage the AIR pump. Refer to Diagnostic Methods, Output Test Mode (OTM). - Key in ON position. - Access the PCM and monitor the AIR PID. - Observe the AIR PID(s) while toggling the OTM states from ON to OFF. Note: When the OTM outputs are commanded on, the PCM output signal AIR PID should turn on. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Command the outputs OFF. - Exit output test mode. - Does the AIR PID correspond with the OTM ON and OFF commands?	Yes GO to HM50. No GO to HM61.																

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take
HM50	CHECK THE AIRM PID OPERATION WITH THE OTM	
	- Diagnostic tool connector connected. - Key in ON position. - Access the PCM and monitor the AIR and AIRM PIDs. - Observe the AIRM PID while toggling the OTM state from ON to OFF. Note: When the OTM outputs are commanded on, the PCM output signal AIR PID should turn on followed by the PCM input signal AIRM PID. The AIRM PID indicates voltage at the AIR pump/motor. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Command the outputs OFF. - Exit output test mode. Does the AIRM PID correspond with the OTM ON and OFF commands?	Yes GO to HM51. No GO to HM52.
HM51	CARRY OUT A THOROUGH WIGGLE TEST ON THE AIR HARNESS	
	- Access the PCM and monitor the AIR and AIRM PIDs. Note: When the OTM outputs are commanded on, the PCM output signal AIR PID should turn on followed by the PCM input signal AIRM PID. The AIRM PID indicates voltage at the AIR pump/motor. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - While commanding the outputs on with the OTM, wiggle the harness and connectors, and lightly tap the components while observing the AIRM PID. Note: Changing AIRM PID states indicate a fault location in the secondary side of the AIR relay circuit. The AIRM PID indicates voltage at the AIR pump/motor. - Command the outputs OFF. - Exit output test mode. Is a concern present?	Yes Key in OFF position. REPAIR as necessary. No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1.
HM52	REMOVE THE AIR RELAY AND OBSERVE THE AIR MONITOR PID	
	- Key in OFF position. - AIR Relay connector disconnected. - Key in ON position. Note: AIRM PID corresponds to PCM input SAIRM line voltage indicating voltage to the AIR pump / motor and should be in the OFF state. - Access the PCM and monitor the AIR and AIRM PIDs. Is the AIRM PID in the OFF state?	Yes GO to HM53. No GO to HM56.

HM50-HM52

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take												
HM53	CONFIRM THE SAIR SIGNAL WITH A TEST LAMP - Key in ON position. - Connect a non-powered test lamp between:<table><tr><td>(+) AIR Relay Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>SAIR - Pin 85</td><td>Positive terminal</td></tr></table> - Is the test lamp off?	(+) AIR Relay Connector, Harness Side	(-) Vehicle Battery	SAIR - Pin 85	Positive terminal	Yes Key in OFF position. INSTALL a new AIR relay. No GO to HM54.								
(+) AIR Relay Connector, Harness Side	(-) Vehicle Battery													
SAIR - Pin 85	Positive terminal													
HM54	CHECK THE SAIR CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - AIR Solenoid connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) AIR Solenoid Connector, Harness Side</td></tr><tr><td>SAIR - Pin B17</td><td>SAIR - Pin 1</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) AIR Relay Connector, Harness Side</td></tr><tr><td>SAIR - Pin B17</td><td>SAIR - Pin 85</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) AIR Solenoid Connector, Harness Side	SAIR - Pin B17	SAIR - Pin 1	(+) PCM Connector, Harness Side	(-) AIR Relay Connector, Harness Side	SAIR - Pin B17	SAIR - Pin 85	Yes GO to HM55. No REPAIR the open circuit.				
(+) PCM Connector, Harness Side	(-) AIR Solenoid Connector, Harness Side													
SAIR - Pin B17	SAIR - Pin 1													
(+) PCM Connector, Harness Side	(-) AIR Relay Connector, Harness Side													
SAIR - Pin B17	SAIR - Pin 85													
HM55	CHECK THE SAIR LINE FOR SHORTS TO GROUND(S) IN THE HARNESS - DIRECT AND INDIRECT - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>SAIR - Pin B17</td><td>PWRGND - Pin B47</td></tr><tr><td>SAIR - Pin B17</td><td>VREF - Pin E40</td></tr><tr><td>SAIR - Pin B17</td><td>CASE GND - Pin B10</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>SAIR - Pin B17</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	SAIR - Pin B17	PWRGND - Pin B47	SAIR - Pin B17	VREF - Pin E40	SAIR - Pin B17	CASE GND - Pin B10	(+) PCM Connector, Harness Side	(-)	SAIR - Pin B17	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side													
SAIR - Pin B17	PWRGND - Pin B47													
SAIR - Pin B17	VREF - Pin E40													
SAIR - Pin B17	CASE GND - Pin B10													
(+) PCM Connector, Harness Side	(-)													
SAIR - Pin B17	Ground													

HM53-HM55

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take				
HM56	CHECK FOR VOLTAGE AT THE AIR RELAY TO THE AIR PUMP/MOTOR POWER CIRCUIT	Yes Key in OFF position. GO to HM60. No Key in OFF position. GO to HM57.				
• Key in ON position. • Measure the voltage between: <table><tr><td>(+) AIR Relay Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>AIR_PWR - Pin 87</td><td>Negative terminal</td></tr></table> • Is the voltage less than 0.1 V?			(+) AIR Relay Connector, Harness Side	(-) Vehicle Battery	AIR_PWR - Pin 87	Negative terminal
(+) AIR Relay Connector, Harness Side	(-) Vehicle Battery					
AIR_PWR - Pin 87	Negative terminal					
HM57	CHECK THE AIR PUMP/MOTOR ELECTRICAL CONNECTOR INTEGRITY					
• Check the AIR pump/motor electrical connector for damage, corrosion, and water ingress. • AIR Motor connector disconnected. • Is the connector in good working order?		Yes GO to HM58. No REPAIR as necessary.				
HM58	CHECK THE AIR PUMP/MOTOR GROUND CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to HM59. No REPAIR the open circuit.				
• Measure the resistance between: <table><tr><td>(+) AIR Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>AIR_GND - Pin 1</td><td>Ground</td></tr></table> • Is the resistance less than 5 ohms?			(+) AIR Motor Connector, Harness Side	(-)	AIR_GND - Pin 1	Ground
(+) AIR Motor Connector, Harness Side	(-)					
AIR_GND - Pin 1	Ground					
HM59	CHECK THE AIR PUMP/MOTOR FOR AN OPEN					
• Measure the resistance between: <table><tr><td>(+) AIR Motor Connector, Component Side</td><td>(-) AIR Motor Connector, Component Side</td></tr><tr><td>AIR_GND - Pin 1</td><td>AIR_PWR - Pin 2</td></tr></table> • Is the resistance less than 10 ohms?		(+) AIR Motor Connector, Component Side	(-) AIR Motor Connector, Component Side	AIR_GND - Pin 1	AIR_PWR - Pin 2	Yes GO to HM60. No INSTALL a new AIR motor.
(+) AIR Motor Connector, Component Side	(-) AIR Motor Connector, Component Side					
AIR_GND - Pin 1	AIR_PWR - Pin 2					

HM56-HM59

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take																
HM60	CHECK THE SAIR LINE FOR SHORTS TO GROUND(S) IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>SAIR - Pin B17</td><td>PWRGND - Pin B47</td></tr><tr><td>SAIR - Pin B17</td><td>VREF - Pin E40</td></tr><tr><td>SAIR - Pin B17</td><td>CASE GND - Pin B10</td></tr></table> - Measure the resistance between:<table><tr><th>(+) AIR Solenoid Connector, Harness Side</th><th>(-)</th></tr><tr><td>SAIR - Pin 1</td><td>Ground</td></tr></table> - Measure the resistance between:<table><tr><th>(+) AIR Relay Connector, Harness Side</th><th>(-)</th></tr><tr><td>SAIR - Pin 85</td><td>Ground</td></tr></table> Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	SAIR - Pin B17	PWRGND - Pin B47	SAIR - Pin B17	VREF - Pin E40	SAIR - Pin B17	CASE GND - Pin B10	(+) AIR Solenoid Connector, Harness Side	(-)	SAIR - Pin 1	Ground	(+) AIR Relay Connector, Harness Side	(-)	SAIR - Pin 85	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side																	
SAIR - Pin B17	PWRGND - Pin B47																	
SAIR - Pin B17	VREF - Pin E40																	
SAIR - Pin B17	CASE GND - Pin B10																	
(+) AIR Solenoid Connector, Harness Side	(-)																	
SAIR - Pin 1	Ground																	
(+) AIR Relay Connector, Harness Side	(-)																	
SAIR - Pin 85	Ground																	
HM61	CHECK THE SAIR CIRCUIT(S) FOR AN OPEN IN THE HARNESS - Key in OFF position. - AIR Relay connector disconnected. - AIR Solenoid connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) AIR Solenoid Connector, Harness Side</th></tr><tr><td>SAIR - Pin B17</td><td>SAIR - Pin 1</td></tr></table> - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) AIR Relay Connector, Harness Side</th></tr><tr><td>SAIR - Pin B17</td><td>SAIR - Pin 85</td></tr></table> Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) AIR Solenoid Connector, Harness Side	SAIR - Pin B17	SAIR - Pin 1	(+) PCM Connector, Harness Side	(-) AIR Relay Connector, Harness Side	SAIR - Pin B17	SAIR - Pin 85	Yes GO to HM62. No REPAIR the open circuit.								
(+) PCM Connector, Harness Side	(-) AIR Solenoid Connector, Harness Side																	
SAIR - Pin B17	SAIR - Pin 1																	
(+) PCM Connector, Harness Side	(-) AIR Relay Connector, Harness Side																	
SAIR - Pin B17	SAIR - Pin 85																	

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

Test Step		Results / Action to Take												
HM62	CHECK THE SAIR FOR SHORTS TO POWER(S) AND GROUND(S) IN THE HARNESS - DIRECT AND INDIRECT													
Measure the resistance between: <table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>SAIR - Pin B17</td><td>VPWR - Pin B35</td></tr><tr><td>SAIR - Pin B17</td><td>PWRGND - Pin B47</td></tr><tr><td>SAIR - Pin B17</td><td>SIGRTN - Pin B41</td></tr><tr><td>SAIR - Pin B17</td><td>VREF - Pin E40</td></tr><tr><td>SAIR - Pin B17</td><td>CASE GND - Pin B10</td></tr></table>		(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	SAIR - Pin B17	VPWR - Pin B35	SAIR - Pin B17	PWRGND - Pin B47	SAIR - Pin B17	SIGRTN - Pin B41	SAIR - Pin B17	VREF - Pin E40	SAIR - Pin B17	CASE GND - Pin B10	
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side													
SAIR - Pin B17	VPWR - Pin B35													
SAIR - Pin B17	PWRGND - Pin B47													
SAIR - Pin B17	SIGRTN - Pin B41													
SAIR - Pin B17	VREF - Pin E40													
SAIR - Pin B17	CASE GND - Pin B10													
Measure the resistance between: <table><tr><th>(+) PCM Connector, Harness Side</th><th>(-)</th></tr><tr><td>SAIR - Pin B17</td><td>Ground</td></tr></table>		(+) PCM Connector, Harness Side	(-)	SAIR - Pin B17	Ground									
(+) PCM Connector, Harness Side	(-)													
SAIR - Pin B17	Ground													
Is the resistance greater than 10K ohms?		Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.												

HM62

Test HU: Intake Air System

PINPOINT TEST HU: INTAKE AIR SYSTEMS

Intake Air Systems

HU

This pinpoint test is intended to diagnose the following:

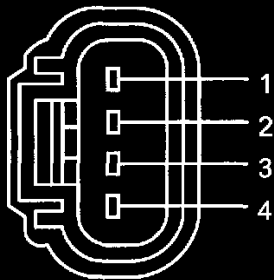
- Accelerator cable linkage to throttle body (9C799).
- Air cleaner assembly (including air cleaner element).
- Air inlet tube.
- Clean air tube hose and resonator (9R504) and (9F593).
- Intake Manifold Runner Control (IMRC) housing assembly (9U531), (9U524) and (9J447).
- IMRC actuator assembly (9J559).
- IMRC also includes Charge Motion Control Valve (CMCV) (9G730).
- Intake Manifold Tuning Valve (IMTV) also includes the Long Short Runner Control (LSRC) (9L490).
- IMTV electric actuator assembly (9L490).
- Speed control cable (9A825).
- Throttle body assembly (9E926).
- Harness circuits: IMRC, MONITOR, SIGNAL, SIGRTN, PWRGND, and VPWR.
- Harness circuits: IMTV, MONITOR, SIGNAL, and VPWR.
- Powertrain control module (PCM) (12A650).

Intake Air System

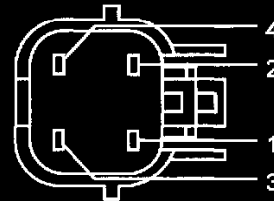
IMRCM voltage values

VEHICLE	IMRC OFF	IMRC ON
BASE	2.5	0
Focus, 2.0L	0	5
Focus, 2.3L	0	5
F-150, 5.4L	5	0

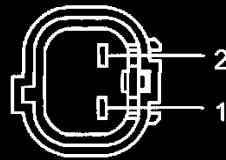
Note And Schematic

Intake Air Systems**HU****Intake Manifold Runner Control (IMRC) Actuator Connector****A**

A0077580

B

A0077557

C

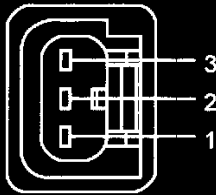
A0077562

Vehicle	Connector	Circuit	Pin
Expedition 5.4L, F-150 5.4L, F-Super Duty 5.4L, Navigator 5.4L	A	IMRCM IMRC PWRGND VPWR	4 3 2 1
F-150 4.2L, Freestar/Monterey	B	IMRCM IMRC PWRGND VPWR	4 1 2 3
Focus 2.3L, Focus 2.0L	C	IMRC VPWR	1 2
Mustang 4.6L	A	IMRC PWRGND VPWR	3 2 1

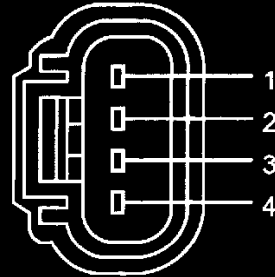
Connector

Intake Air Systems**HU****Intake Manifold Runner Control Monitor (IMRCM)
Sensor Connector**

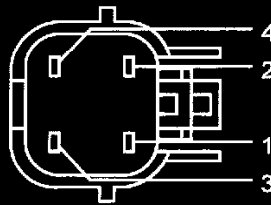
For most vehicles the IMRCM is integrated into the IMRC connector.

A

A0077572

B

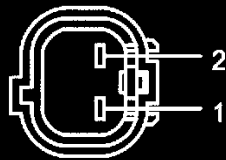
A0077580

C

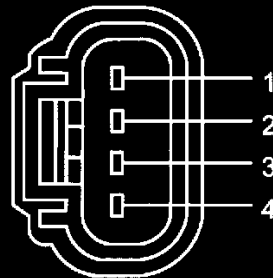
A0077557

Vehicle	Connector	Circuit	Pin
Focus 2.3L, Focus 2.0L	A	PWRGND VPWR IMRCM	2 3 1
Expedition 5.4L, F-150 5.4L, F-Super Duty 5.4L, Navigator 5.4L	B	PWRGND VPWR IMRCM	2 1 4
F-150 4.2L, Freestar/Monterey	C	PWRGND VPWR IMRCM	2 3 4

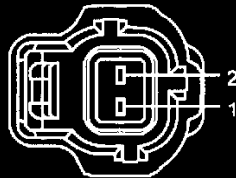
Connector

Intake Air Systems**HU****Intake Manifold Tuning Valve (IMTV) Actuator Connector****A**

A0077562

B

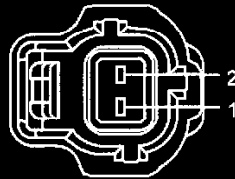
A0077580

C

A0077550

Vehicle	Connector	Circuit	Pin
Focus 2.3L, Escape 2.3L, Mariner 2.3L	A	IMTV VPWR	1 2
Aviator	B	PWRGND IMTVM IMTV VPWR	2 4 3 1
F-Super Duty 6.8L	B	PWRGND IMTV VPWR	2 3 1
LS 3.0L, Sable 3.0L 2V, Taurus 3.0L 2V	C	IMTV VPWR	2 1

Connector

Intake Air Systems**HU****Intake Manifold Tuning Valve (Bank 2) (IMTV2)
Actuator Connector**

A0077550

Circuit	Pin
IMTV2 (Intake Manifold Tuning Valve (Bank 2))	2
VPWR (Power Supply)	1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	SIGRTN IMTVM IMTV PWRGND	E17 E58 E3 B24
Expedition, F-150, Navigator	190 Pin	SIGRTN IMRCM PWRGND IMRC	E58 E43 B67 E50
F-Super Duty 5.4L	170 Pin	SIGRTN IMRCM PWRGND IMRC	E58 E43 B47 E50
F-Super Duty 6.8L	170 Pin	SIGRTN IMTV PWRGND	E58 E64 B47

(Continued)

Connector

Intake Air Systems

HU

Vehicle	Connector	Circuit	Pin
Focus 2.3L	150 (50-50-50) Pin	SIGRTN IMTV IMRCM PWRGND IMRC	E41 E26 E42 B47 E43
Focus 2.0L	150 (50-50-50) Pin	SIGRTN IMRCM PWRGND IMRC	E41 E42 B47 E43
Freestar/Monterey	104 Pin	SIGRTN IMRCM PWRGND IMRC	91 8 103 42
LS	150 (60-32-58) Pin	SIGRTN IMTV2 IMTV PWRGND	E17 E37 E29 B24
Mustang	170 Pin	SIGRTN IMRCM PWRGND IMRC	E33 not used B47 E50
Sable, Taurus	104 Pin	SIGRTN IMTV PWRGND	91 29 103
All other vehicles	150 (50-50-50) Pin	SIGRTN IMTV PWRGND	E41 E6 B47

Test Step		Results / Action to Take
HU1	PART THROTTLE SYMPTOM	Yes GO to HU6. No GO to HU2.
	Are any part throttle concerns present?	
HU2	CHECK THE BASE IDLE SPEED	Yes GO to HU4. No Key in OFF position. GO to HU3.
	Note: The vehicle must be at operating temperature and at idle for a minimum of 1 minute. - Key on engine running. - Determine if the idle speed is incorrect. Refer to the Typical Reference Value Charts in Reference Values, if necessary. - Access the PCM and monitor the RPM PID. - If equipped, read the vehicle tachometer. Is vehicle idle speed correct?	

Chart, HU1-HU2

Intake Air Systems

HU

Test Step		Results / Action to Take
HU3	CHECK THE BASE IDLE SPEED	Yes GO to HU8 . No GO to HU9 .
	- Check that the throttle arm contacts the return stop. - Is the idle speed high?	
HU4	CHECK FOR BINDING OR STICKING OF THE THROTTLE SYSTEM	Yes GO to HU5 . No GO to HU6 .
	- Gently cycle the throttle from fully closed to fully open and back to fully closed. Check for sticking or binding during rotation. - Is a stick or bind condition present?	
HU5	ISOLATE THE BINDING AND/OR STICKING CONCERN	Yes REPAIR the cable(s) causing the concern. No INSTALL a new throttle body assembly.
	 CAUTION: Do not attempt to clean the throttle bore and plate area. Cleaning will damage the throttle body assembly. Note: The sticking or binding condition can either be within the cables or throttle body assembly. - Disconnect the accelerator cable and speed control cable from the throttle body linkage. - Rotate the throttle body linkage. - Does the throttle body rotate freely without a sticking, binding or grabbing condition?	
HU6	CHECK THE FUNCTIONALITY OF THROTTLE POSITION SENSOR	Yes Key in OFF position. GO to HU7 . No Key in OFF position. INSTALL a new TP sensor.
	- Key in ON position. - Access the PCM and monitor the TP V PID. - Gently cycle the throttle from fully closed to fully open and back to fully closed. - Did the TP PID display a smooth reading?	
HU7	CHECK THE INTAKE AIR SYSTEM FOR LEAKS, OBSTRUCTIONS AND DAMAGE	Yes INSTALL a new air cleaner element. REMOVE the restriction. No REINSTALL the air cleaner element. GO to HU8 .
	Note: The Focus air cleaner element is integral to the air cleaner assembly. Inspect the air restriction gauge (if equipped) for a restriction indication. - Remove the air cleaner element. Check the air cleaner for blockage. - Check for restrictions between the air inlet and the throttle body. - Are any restriction concerns present?	

Intake Air Systems

HU

Test Step		Results / Action to Take
HU8	CHECK THE POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM	
	Note: A high idle may indicate an incorrect PCV valve size or a vacuum leak. - Check that no cracks or leaks are present. - Remove the PCV valve. - Verify a clean PCV valve. - Verify the proper PCV valve part number. Are any PCV System concerns present?	Yes INSTALL a new PCV valve. REPAIR as necessary. No For high idle, GO to HU12. For all others, CONNECT the PCV valve. GO to HU9.
HU9	CHECK THE IAC VALVE RESPONSE	
	- Key on engine running. - The vehicle must be at operating temperature and at idle for a minimum of 1 minute. - IAC connector disconnected. Did the RPM drop or the engine stall?	Yes GO to HU11. No GO to HU10.
HU10	CHECK THE IAC VALVE RESPONSE	
	Is the idle speed high?	Yes GO to HU12. No Key in OFF position. INSTALL a new IAC valve.
HU11	INSPECT THE THROTTLE BODY PLATE HOLE FOR PLUGGING	
	Note: Only some applications have a throttle plate hole. If not equipped GO to Symptom Charts. - Key in OFF position. - Remove the resonator from the throttle body assembly. - Inspect the throttle plate hole for any restrictions. Are any restriction concerns present?	Yes REPAIR as necessary. No Concern is elsewhere. RETURN to Symptom Charts for further direction.
HU12	CHECK FOR VACUUM LEAKS	
	- Listen for vacuum leaks. - Inspect the 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. - IAC valve assembly or gasket. - EGR valve gasket leak to intake manifold. - intake manifold assembly or gasket. - EGR valve diaphragm or control solenoid. - vacuum supply connectors and hose. Are any leaks present?	Yes Key in OFF position. REPAIR as necessary. No Key in OFF position. GO to HU13.

Intake Air Systems

HU

Test Step		Results / Action to Take
HU13	CHECK THE THROTTLE BODY FOR EXCESSIVE WEAR	Yes INSTALL a new throttle body assembly. No Concern is elsewhere. RETURN to Symptom Charts for further direction.
	- Remove the throttle body assembly. Refer to Fuel Delivery and Air Induction for removal and inspection. - Check the following: - excessive wear or grooving in the throttle bore. - misaligned or worn throttle plate. - excessive gap between the throttle bore and plate. Are any concerns present?	
HU14	DTCS P1512, P1513, P1516, P1517, P1518, P1519, P1520, P1537, P1538, P2004, P2005, P2006, P2007, P2008, P2014, P2015, P2019 OR P2020: VISUAL INSPECTION	Yes GO to HU15 . No GO to HU16 .
	Note: If unable to fully carry out the following inspections, answer NO to the question in this step. - Visually inspect the linkage for possible causes of binding or obstructions. Check the lever/linkage for movement. There may be some tension in one direction but there should be full travel. Note: The IMRC return spring is strong on vacuum systems. Make sure they operate properly and the plates open and close fully. On vacuum operated systems the engine must run for 20 seconds to restore vacuum then return to KOEO for testing. Some IMRC electrical systems are driven in both directions by the solenoid and do not use a return spring. They can not be opened manually. - Manually open and close the IMRC plates at the intake manifold while checking for sticking or binding. Is a mechanical concern present?	
HU15	CHECK THE IMRC FOR MECHANICAL OPERATION	Yes REFER to Fuel Delivery and Air Induction to REPAIR as necessary or INSTALL a new IMRC. No GO to HU16 .
	- Disconnect the IMRC linkage or remove the actuator assembly from the manifold. Note: IMRC return spring is strong - approximately 0.34 to 0.45 Nm (3 to 4 in-lb). Some electric motor applications do not use a return spring and should move freely when open and closed. - Rotate the IMRC plate lever to fully open and to fully closed, contacting both limits. - Check for sticking or binding during rotation. Is a mechanical concern present?	

HU

Test Step	Results / Action to Take

Intake Air Systems

HU

Test Step		Results / Action to Take				
HU18	CHECK THE VPWR CIRCUIT FOR AN OPEN IN THE HARNESS - IMRC Actuator connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) IMRC Actuator Con- nector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) IMRC Actuator Con- nector, Harness Side	(-)	VPWR	Ground	Yes GO to HU19. No REPAIR the open circuit and retest the vehicle.
(+) IMRC Actuator Con- nector, Harness Side	(-)					
VPWR	Ground					
HU19	CHECK THE GROUND CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the voltage between:<table><tr><td>(+) IMRC Actuator Con- nector, Harness Side</td><td>(-) IMRC Actuator Con- nector, Harness Side</td></tr><tr><td>VPWR</td><td>PWRGND</td></tr></table> - Is the voltage greater than 10.5 V?	(+) IMRC Actuator Con- nector, Harness Side	(-) IMRC Actuator Con- nector, Harness Side	VPWR	PWRGND	
(+) IMRC Actuator Con- nector, Harness Side	(-) IMRC Actuator Con- nector, Harness Side					
VPWR	PWRGND					
HU20	VERIFY THE DRIVER CIRCUIT FUNCTION - Connect a non-powered test lamp between:<table><tr><td>(+) IMRC Actuator Con- nector, Harness Side</td><td>(-) IMRC Actuator Con- nector, Harness Side</td></tr><tr><td>VPWR</td><td>IMRC</td></tr></table> - Does the test lamp illuminate?	(+) IMRC Actuator Con- nector, Harness Side	(-) IMRC Actuator Con- nector, Harness Side	VPWR	IMRC	Yes Key in OFF position. For Focus 2.3L, GO to HU25. For all others, GO to HU26. No GO to HU21.
(+) IMRC Actuator Con- nector, Harness Side	(-) IMRC Actuator Con- nector, Harness Side					
VPWR	IMRC					
HU21	VERIFY THE DRIVER CIRCUIT FUNCTION - Access the PCM and control the IMRC PID. - Connect a non-powered test lamp between:<table><tr><td>(+) IMRC Actuator Con- nector, Harness Side</td><td>(-) IMRC Actuator Con- nector, Harness Side</td></tr><tr><td>VPWR</td><td>IMRC</td></tr></table> - Command the outputs ON. Note: If the vehicle is equipped with a vacuum-type IMRC return to Key ON Engine RUN to conduct the IMRC check. Momentarily increase the engine speed above 3,000 RPM and observe the PIDs. - Does the test lamp illuminate?	(+) IMRC Actuator Con- nector, Harness Side	(-) IMRC Actuator Con- nector, Harness Side	VPWR	IMRC	
(+) IMRC Actuator Con- nector, Harness Side	(-) IMRC Actuator Con- nector, Harness Side					
VPWR	IMRC					
		Yes For Focus 2.3L, GO to HU25. For all others, GO to HU24. No Key in OFF position. GO to HU22.				

Intake Air Systems

HU

Test Step		Results / Action to Take						
HU22	CHECK THE IMRC CIRCUIT FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) IMRC Actuator Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>IMRC</td><td>IMRC</td></tr></table> - Is the resistance less than 5 ohms?	(+) IMRC Actuator Connector, Harness Side	(-) PCM Connector, Harness Side	IMRC	IMRC	Yes GO to HU23. No REPAIR the open circuit and retest the vehicle.		
(+) IMRC Actuator Connector, Harness Side	(-) PCM Connector, Harness Side							
IMRC	IMRC							
HU23	CHECK THE IMRC CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) IMRC Actuator Connector, Harness Side</td><td>(-)</td></tr><tr><td>IMRC</td><td>Ground</td></tr></table> - Is the voltage less than 10.5 V?	(+) IMRC Actuator Connector, Harness Side	(-)	IMRC	Ground	Yes Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No Key in OFF position. REPAIR the short circuit to PWR and retest the vehicle.		
(+) IMRC Actuator Connector, Harness Side	(-)							
IMRC	Ground							
HU24	CHECK FOR SHORTS BETWEEN CIRCUITS IN THE IMRC HARNESS - Key in OFF position. - PCM connector connected. - Measure the resistance between:<table><tr><td>(+) IMRC Actuator Connector, Harness Side</td><td>(-) IMRC Actuator Connector, Harness Side</td></tr><tr><td>IMRC</td><td>IMRCM</td></tr><tr><td>IMRC</td><td>PWRGND</td></tr></table> - Are the resistances greater than 10K ohms?	(+) IMRC Actuator Connector, Harness Side	(-) IMRC Actuator Connector, Harness Side	IMRC	IMRCM	IMRC	PWRGND	Yes INSTALL a new IMRC actuator and retest vehicle. No GO to HU26.
(+) IMRC Actuator Connector, Harness Side	(-) IMRC Actuator Connector, Harness Side							
IMRC	IMRCM							
IMRC	PWRGND							
HU25	CHECK FOR SHORT BETWEEN THE IMRC AND PWRGND CIRCUITS IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>IMRC</td><td>PWRGND</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	IMRC	PWRGND	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit and retest the vehicle. GO to HU40.		
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
IMRC	PWRGND							

Intake Air Systems

HU

Test Step		Results / Action to Take						
HU26	CHECK FOR SHORTS BETWEEN CIRCUITS IN THE IMRC HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) IMRC Actuator Con- nector, Harness Side</td><td>(-) IMRC Actuator Con- nector, Harness Side</td></tr><tr><td>IMRC</td><td>IMRCM</td></tr><tr><td>IMRC</td><td>PWRGND</td></tr></table> - Are the resistances greater than 10K ohms?	(+) IMRC Actuator Con- nector, Harness Side	(-) IMRC Actuator Con- nector, Harness Side	IMRC	IMRCM	IMRC	PWRGND	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit and retest the vehicle. GO to HU40.
(+) IMRC Actuator Con- nector, Harness Side	(-) IMRC Actuator Con- nector, Harness Side							
IMRC	IMRCM							
IMRC	PWRGND							
HU27	CHECK THE IMRCM PID - Key in ON position. - Access the PCM and monitor the IMRCM PID. - Is the IMRCM PID displaying either VREF or approximately 2.5 volts?	Yes For Focus 2.3L, GO to HU34. For all others, GO to HU28. No For Focus 2.3L, GO to HU28. For all others, GO to HU32.						
HU28	CHECK THE IMRCM CIRCUIT FOR A SHORT TO VPWR - Key on engine running. Note: The vehicle must be at operating temperature and at idle for a minimum of 1 minute. - Key in ON position. - Access the PCM and control the IMRC PID. - Command the outputs ON. Note: If the vehicle is equipped with a vacuum-type IMRC return to Key ON Engine RUN to conduct the IMRC check. Momentarily increase the engine speed above 3,000 RPM and observe the PIDs. - Access the PCM and monitor the IMRCM PID. - Is the voltage less than 1 V?	Yes For Focus 2.3L, GO to HU32. For all others, GO to HU29. No For Focus 2.3L, GO to HU29. For all others, GO to HU34.						
HU29	CHECK THE IMRCM CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS - Key in ON position. - IMRCM Sensor connector disconnected. - Measure the voltage between:<table><tr><td>(+) IMRCM Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>IMRCM</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) IMRCM Sensor Connector, Harness Side	(-)	IMRCM	Ground	Yes GO to HU30. No GO to HU31.		
(+) IMRCM Sensor Connector, Harness Side	(-)							
IMRCM	Ground							

Intake Air Systems

HU

Test Step		Results / Action to Take				
HU30	CHECK THE IMRCM CIRCUIT FOR A SHORT TO POWER IN THE CONTROL MODULE					
- PCM connector disconnected. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) IMRCM Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>IMRCM</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?		(+) IMRCM Sensor Connector, Harness Side	(-)	IMRCM	Ground	Yes Key in OFF position. REPAIR the short circuit to PWR and retest the vehicle. No Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
(+) IMRCM Sensor Connector, Harness Side	(-)					
IMRCM	Ground					
HU31	CHECK THE IMRCM CIRCUIT FOR A SHORT TO VPWR					
- Key in OFF position. - Measure the resistance between: <table><tr><td>(+) IMRCM Sensor Connector, Component Side</td><td>(-) IMRCM Sensor Connector, Component Side</td></tr><tr><td>IMRCM</td><td>VPWR</td></tr></table> - Is the resistance greater than 10K ohms?		(+) IMRCM Sensor Connector, Component Side	(-) IMRCM Sensor Connector, Component Side	IMRCM	VPWR	Yes CHECK for an intermittent concern. GO to Z1. No INSTALL a new IMRCM sensor and retest vehicle. GO to HU40.
(+) IMRCM Sensor Connector, Component Side	(-) IMRCM Sensor Connector, Component Side					
IMRCM	VPWR					
HU32	CHECK THE IMRCM CIRCUIT FOR A SHORT TO GROUND					
- Key in ON position. - Access the PCM and monitor the IMRCM PID. - IMRCM Sensor connector disconnected. - Did voltage change from less than 1 volt to VREF when disconnecting the IMRCM harness connector?		Yes Key in OFF position. INSTALL a new IMRCM sensor and retest vehicle. GO to HU40. No GO to HU33.				
HU33	CHECK THE IMRCM CIRCUIT(S) FOR A SHORT TO GROUND IN THE HARNESS					
- PCM connector disconnected. - Measure the resistance between: <table><tr><td>(+) IMRCM Sensor Connector, Harness Side</td><td>(-) IMRCM Sensor Connector, Harness Side</td></tr><tr><td>IMRCM</td><td>PWRGND</td></tr></table> - Is the resistance greater than 10K ohms?		(+) IMRCM Sensor Connector, Harness Side	(-) IMRCM Sensor Connector, Harness Side	IMRCM	PWRGND	Yes Key in OFF position. INSTALL a new PCM and retest vehicle. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). GO to HU40. No Key in OFF position. REPAIR the short circuit to GND and retest the vehicle. GO to HU40.
(+) IMRCM Sensor Connector, Harness Side	(-) IMRCM Sensor Connector, Harness Side					
IMRCM	PWRGND					

Intake Air Systems

HU

Test Step		Results / Action to Take				
HU34	CHECK THE MONITOR CIRCUIT RESPONSE - IMRCM Sensor connector disconnected. - Access the PCM and monitor the IMRCM PID. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A IMRCM Sensor Connector, Harness Side</td><td>Point B</td></tr><tr><td>IMRCM</td><td>Ground</td></tr></table> - Did the IMRCM PID voltage change from VREF to less than 1 volt when connecting the jumper?	Point A IMRCM Sensor Connector, Harness Side	Point B	IMRCM	Ground	Yes Key in OFF position. GO to HU35 . No Key in OFF position. GO to HU38 .
Point A IMRCM Sensor Connector, Harness Side	Point B					
IMRCM	Ground					
HU35	CHECK THE PWRGND CIRCUIT FOR CONTINUITY TO CHASSIS GND - Remove the jumper wire(s) - PCM connector connected. - Measure the resistance between:<table><tr><td>(+) IMRCM Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>PWRGND</td><td>Negative terminal</td></tr></table> - Is the resistance less than 5 ohms?	(+) IMRCM Sensor Connector, Harness Side	(-) Vehicle Battery	PWRGND	Negative terminal	Yes GO to HU36 . No GO to HU37 .
(+) IMRCM Sensor Connector, Harness Side	(-) Vehicle Battery					
PWRGND	Negative terminal					
HU36	CHECK THE MONITOR CIRCUIT FOR AN INTERMITTENT OPEN - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) IMRCM Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>IMRCM</td><td>IMRCM</td></tr></table> - Wiggle, shake, and bend small sections of the wiring harness while working from the component to the module. - Is the resistance fluctuating while checking the harness?	(+) IMRCM Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	IMRCM	IMRCM	Yes REPAIR the open circuit and retest the vehicle. GO to HU40 . No INSTALL a new IMRCM sensor and retest vehicle. GO to HU40 .
(+) IMRCM Sensor Connector, Harness Side	(-) PCM Connector, Harness Side					
IMRCM	IMRCM					
HU37	CHECK HARNESS PWRGND CIRCUIT FOR CONTINUITY - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) IMRCM Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>PWRGND</td><td>PWRGND</td></tr></table> - Is the resistance less than 5 ohms?	(+) IMRCM Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	PWRGND	PWRGND	Yes CHECK the circuit for an intermittent concern. GO to Z1 . No REPAIR the open circuit and retest the vehicle. GO to HU40 .
(+) IMRCM Sensor Connector, Harness Side	(-) PCM Connector, Harness Side					
PWRGND	PWRGND					

Intake Air Systems

HU

Test Step		Results / Action to Take			
HU38	CHECK THE IMRCM CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to HU39. No REPAIR the open circuit and retest the vehicle. GO to HU40.			
- Remove the jumper wire(s) - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) IMRCM Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>IMRCM</td><td>IMRCM</td></tr></table> - Is the resistance less than 5 ohms?			(+) IMRCM Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	IMRCM
(+) IMRCM Sensor Connector, Harness Side	(-) PCM Connector, Harness Side				
IMRCM	IMRCM				
HU39	CHECK THE MONITOR CIRCUIT FOR AN INTERMITTENT OPEN	Yes REPAIR the open circuit and retest the vehicle. GO to HU40. No INSTALL a new PCM and retest vehicle. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory. GO to HU40.			
- Measure the resistance between:<table><tr><td>(+) IMRCM Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>IMRCM</td><td>IMRCM</td></tr></table> - Wiggle, shake, and bend small sections of the wiring harness while working from the component to the module. - Is the resistance fluctuating while checking the harness?			(+) IMRCM Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	IMRCM
(+) IMRCM Sensor Connector, Harness Side	(-) PCM Connector, Harness Side				
IMRCM	IMRCM				
HU40	VERIFY THE REPAIR	Yes Key in OFF position. DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No The test completed successfully.			
- Key in ON position. - Clear the PCM DTCs. - Access the PCM and monitor the IMRCM, IMRCF and IMRC PIDs. - Key on engine running. - Drive the vehicle, obeying all traffic and safety laws. - Safely carry out three acceleration runs from a stop or roll to between 3000 and 4,000 RPM. - Watch for any PID change. - Carry out the PCM Quick Test. - Are any DTCs received?					
HU41	DTCS P0660, P1549, P2070 OR P2071: VISUAL INSPECTION OF INTAKE MANIFOLD TUNING VALVE	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to HU42.			
- Inspect the component for signs of damage. - Check the harness and connection. - Is a concern present?					

Intake Air Systems

HU

Test Step		Results / Action to Take				
HU42	CHECK THE VPWR CIRCUIT FOR AN OPEN IN THE HARNESS - IMTV Actuator connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) IMTV Actuator Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VPWR</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 10.5 V?	(+) IMTV Actuator Connector, Harness Side	(-) Vehicle Battery	VPWR	Negative terminal	Yes GO to HU43. No REPAIR the open circuit and retest the vehicle.
(+) IMTV Actuator Connector, Harness Side	(-) Vehicle Battery					
VPWR	Negative terminal					
HU43	CHECK THE IMTV CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) IMTV Actuator Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>IMTV</td><td>IMTV</td></tr></table> - Is the resistance less than 5 ohms?	(+) IMTV Actuator Connector, Harness Side	(-) PCM Connector, Harness Side	IMTV	IMTV	Yes GO to HU44. No REPAIR the open circuit and retest the vehicle.
(+) IMTV Actuator Connector, Harness Side	(-) PCM Connector, Harness Side					
IMTV	IMTV					
HU44	CHECK THE IMTV CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>IMTV</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-)	IMTV	Ground	Yes GO to HU45. No REPAIR the short circuit to GND and retest the vehicle.
(+) PCM Connector, Harness Side	(-)					
IMTV	Ground					
HU45	CHECK THE IMTV CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>IMTV</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) PCM Connector, Harness Side	(-)	IMTV	Ground	Yes GO to HU46. No REPAIR the short circuit to PWR and retest the vehicle.
(+) PCM Connector, Harness Side	(-)					
IMTV	Ground					
HU46	DTCS P2070 AND P2071: CHECK FOR IMTVM DTCS Are any of the above listed DTCs present?	Yes GO to HU47. No GO to HU53.				

HU42-HU46

Intake Air Systems

HU

Test Step		Results / Action to Take						
HU47	CHECK THE IMTVM CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) IMTV Actuator Con- nector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>IMTVM</td><td>IMTVM</td></tr></table> - Is the resistance less than 5 ohms?	(+) IMTV Actuator Con- nector, Harness Side	(-) PCM Connector, Harness Side	IMTVM	IMTVM	Yes GO to HU48 . No REPAIR the open circuit and retest the vehicle.		
(+) IMTV Actuator Con- nector, Harness Side	(-) PCM Connector, Harness Side							
IMTVM	IMTVM							
HU48	CHECK THE PWRGND CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) IMTV Actuator Con- nector, Harness Side</td><td>(-)</td></tr><tr><td>PWRGND</td><td>Ground</td></tr></table> - Is the resistance less than 5 ohms?	(+) IMTV Actuator Con- nector, Harness Side	(-)	PWRGND	Ground	Yes GO to HU49 . No REPAIR the open circuit and retest the vehicle.		
(+) IMTV Actuator Con- nector, Harness Side	(-)							
PWRGND	Ground							
HU49	CHECK FOR SHORTS BETWEEN CIRCUITS IN THE IMTV HARNESS - Measure the resistance between:<table><tr><td>(+) IMTV Actuator Con- nector, Harness Side</td><td>(-) IMTV Actuator Con- nector, Harness Side</td></tr><tr><td>IMTVM</td><td>IMTV</td></tr><tr><td>IMTVM</td><td>PWRGND</td></tr></table> - Are the resistances greater than 10K ohms?	(+) IMTV Actuator Con- nector, Harness Side	(-) IMTV Actuator Con- nector, Harness Side	IMTVM	IMTV	IMTVM	PWRGND	Yes GO to HU50 . No REPAIR the short circuit and retest the vehicle.
(+) IMTV Actuator Con- nector, Harness Side	(-) IMTV Actuator Con- nector, Harness Side							
IMTVM	IMTV							
IMTVM	PWRGND							
HU50	CHECK THE IMTVM CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS - Measure the voltage between:<table><tr><td>(+) IMTV Actuator Con- nector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>IMTVM</td><td>Negative terminal</td></tr></table> - Is the voltage less than 1 V?	(+) IMTV Actuator Con- nector, Harness Side	(-) Vehicle Battery	IMTVM	Negative terminal	Yes GO to HU51 . No REPAIR the short circuit to PWR and retest the vehicle.		
(+) IMTV Actuator Con- nector, Harness Side	(-) Vehicle Battery							
IMTVM	Negative terminal							
HU51	CHECK THE IMTVM CIRCUIT FOR A SHORT TO POWER IN THE CONTROL MODULE - PCM connector connected. - Measure the voltage between:<table><tr><td>(+) IMTV Actuator Con- nector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>IMTVM</td><td>Negative terminal</td></tr></table> - Is the voltage less than 10.5 V?	(+) IMTV Actuator Con- nector, Harness Side	(-) Vehicle Battery	IMTVM	Negative terminal	Yes GO to HU52 . No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).		
(+) IMTV Actuator Con- nector, Harness Side	(-) Vehicle Battery							
IMTVM	Negative terminal							

Intake Air Systems

HU

Test Step		Results / Action to Take						
HU52	CHECK FOR SHORTS IN THE PCM - Measure the resistance between:<table><tr><td>(+) IMTV Actuator Con- nector, Harness Side</td><td>(-) IMTV Actuator Con- nector, Harness Side</td></tr><tr><td>IMTVM</td><td>IMTV</td></tr><tr><td>IMTVM</td><td>PWRGND</td></tr></table> - Are the resistances greater than 10K ohms?	(+) IMTV Actuator Con- nector, Harness Side	(-) IMTV Actuator Con- nector, Harness Side	IMTVM	IMTV	IMTVM	PWRGND	Yes GO to HU53 . No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
(+) IMTV Actuator Con- nector, Harness Side	(-) IMTV Actuator Con- nector, Harness Side							
IMTVM	IMTV							
IMTVM	PWRGND							
HU53	CHECK THE IMTV FOR AN INTERMITTENT CONCERN - IMTV Actuator connector disconnected. - PCM connector connected. - Key in ON position. - Connect a non-powered test lamp between:<table><tr><td>(+) IMTV Actuator Con- nector, Harness Side</td><td>(-) IMTV Actuator Con- nector, Harness Side</td></tr><tr><td>VPWR</td><td>IMTV</td></tr></table> - Does the test lamp illuminate?	(+) IMTV Actuator Con- nector, Harness Side	(-) IMTV Actuator Con- nector, Harness Side	VPWR	IMTV	Yes INSTALL a new PCM and retest vehicle. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory. No GO to HU54 .		
(+) IMTV Actuator Con- nector, Harness Side	(-) IMTV Actuator Con- nector, Harness Side							
VPWR	IMTV							
HU54	CHECK THE IMTV FOR AN INTERMITTENT CONCERN - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Connect a non-powered test lamp between:<table><tr><td>(+) IMTV Actuator Con- nector, Harness Side</td><td>(-) IMTV Actuator Con- nector, Harness Side</td></tr><tr><td>VPWR</td><td>IMTV</td></tr></table> - Command the outputs ON. - Does the test lamp illuminate?	(+) IMTV Actuator Con- nector, Harness Side	(-) IMTV Actuator Con- nector, Harness Side	VPWR	IMTV	Yes GO to HU55 . No Key in OFF position. INSTALL a new PCM and retest vehicle. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).		
(+) IMTV Actuator Con- nector, Harness Side	(-) IMTV Actuator Con- nector, Harness Side							
VPWR	IMTV							
HU55	CHECK THE IMTV FOR DAMAGE - Key in OFF position. - Remove the IMTV. Refer to Computers and Control Systems. - Visually inspect the shutter for damage. - Manually rotate the shutter. - Is a concern present?	Yes INSTALL a new IMTV actuator and retest vehicle. No GO to HU56 .						
HU56	CHECK THE IMTV FOR AN INTERMITTENT CONCERN - IMTV Actuator connector connected. - Key in ON position. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Did the IMTV shutter rotate?	Yes Key in OFF position. Intermittent concern. GO to Z1 . No Key in OFF position. INSTALL a new IMTV actuator and retest vehicle.						

Intake Air Systems

HU

Test Step		Results / Action to Take			
HU57	DTCS P0663 OR P1532: VISUAL INSPECTION OF INTAKE MANIFOLD TUNING VALVE (BANK 2)	Yes REPAIR as necessary. CLEAR the DTCs and REPEAT the self-test. No GO to HU58.			
	- Inspect the component for signs of damage. - Check the harness and connection. - Is a concern present?				
HU58	CHECK THE VPWR CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to HU59. No REPAIR the open circuit and retest the vehicle.			
	- IMTV2 Actuator connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) IMTV2 Actuator Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VPWR - Pin 1</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 10.5 V?		(+) IMTV2 Actuator Connector, Harness Side	(-) Vehicle Battery	VPWR - Pin 1
(+) IMTV2 Actuator Connector, Harness Side	(-) Vehicle Battery				
VPWR - Pin 1	Negative terminal				
HU59	CHECK THE IMTV2 CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to HU60. No REPAIR the open circuit and retest the vehicle.			
	- Key in OFF position. - IMTV2 Actuator connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) IMTV2 Actuator Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>IMTV2 - Pin 2</td><td>IMTV2</td></tr></table> - Is the resistance less than 5 ohms?		(+) IMTV2 Actuator Connector, Harness Side	(-) PCM Connector, Harness Side	IMTV2 - Pin 2
(+) IMTV2 Actuator Connector, Harness Side	(-) PCM Connector, Harness Side				
IMTV2 - Pin 2	IMTV2				
HU60	CHECK THE IMTV2 CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS	Yes GO to HU61. No REPAIR the short circuit to GND and retest the vehicle.			
	- Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>IMTV2</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?		(+) PCM Connector, Harness Side	(-)	IMTV2
(+) PCM Connector, Harness Side	(-)				
IMTV2	Ground				

Intake Air Systems

HU

Test Step		Results / Action to Take				
HU61	CHECK THE IMTV2 CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>IMTV2</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) PCM Connector, Harness Side	(-)	IMTV2	Ground	Yes GO to HU62. No REPAIR the short circuit to PWR and retest the vehicle.
(+) PCM Connector, Harness Side	(-)					
IMTV2	Ground					
HU62	CHECK THE IMTV2 FOR AN INTERMITTENT CONCERN - IMTV2 Actuator connector disconnected. - PCM connector connected. - Key in ON position. - Connect a non-powered test lamp between:<table><tr><td>(+) IMTV2 Actuator Connector, Harness Side</td><td>(-) IMTV2 Actuator Connector, Harness Side</td></tr><tr><td>VPWR - Pin 1</td><td>IMTV2 - Pin 2</td></tr></table> - Does the test lamp illuminate?	(+) IMTV2 Actuator Connector, Harness Side	(-) IMTV2 Actuator Connector, Harness Side	VPWR - Pin 1	IMTV2 - Pin 2	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No GO to HU63.
(+) IMTV2 Actuator Connector, Harness Side	(-) IMTV2 Actuator Connector, Harness Side					
VPWR - Pin 1	IMTV2 - Pin 2					
HU63	CHECK THE IMTV2 FOR AN INTERMITTENT CONCERN - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Connect a non-powered test lamp between:<table><tr><td>(+) IMTV2 Actuator Connector, Harness Side</td><td>(-) IMTV2 Actuator Connector, Harness Side</td></tr><tr><td>VPWR - Pin 1</td><td>IMTV2 - Pin 2</td></tr></table> - Command the outputs ON. - Does the test lamp illuminate?	(+) IMTV2 Actuator Connector, Harness Side	(-) IMTV2 Actuator Connector, Harness Side	VPWR - Pin 1	IMTV2 - Pin 2	Yes GO to HU64. No Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
(+) IMTV2 Actuator Connector, Harness Side	(-) IMTV2 Actuator Connector, Harness Side					
VPWR - Pin 1	IMTV2 - Pin 2					
HU64	CHECK THE IMTV2 FOR DAMAGE - Key in OFF position. - Remove the IMTV2. Refer to Engine. - Visually inspect the shutter for damage. - Manually rotate the shutter. - Is a concern present?	Yes INSTALL a new IMTV2 actuator and retest vehicle. No GO to HU65.				
HU65	CHECK THE FOR AN INTERMITTENT CONCERN - IMTV2 Actuator connector connected. - Key in ON position. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Did the IMTV2 shutter rotate?	Yes Key in OFF position. Intermittent concern. GO to Z1. No Key in OFF position. INSTALL a new IMTV2 actuator and retest vehicle.				

HU61-HU65

Test HX: Evaporative Emission (EVAP) Monitor and System
PINPOINT TEST HX: EVAPORATIVE EMISSION (EVAP) MONITOR AND SYSTEM

Evaporative Emission (EVAP) Monitor and System

HX

Note: Use this pinpoint test only when directed here.

The use of a soap solution 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 (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:

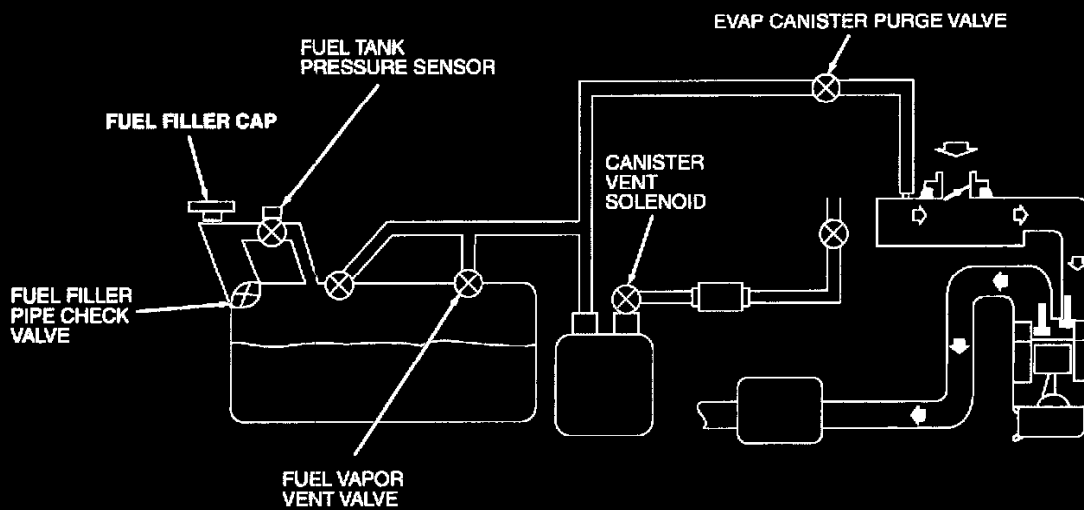
- Canister vent (CV) solenoid (9F945).
- Fuel filler cap (9030).
- Fuel tank pressure (FTP) sensor (9C052).
- EVAP canister purge (EVAPCP) valve (9C915). Also known as the vapor management valve (VMV).
- EVAP system leaks using the Rotunda Vacutec Leak Detector Smoke Machine.
- Harness circuits: B+, CV, EVAPCP, FCIL, FLI, FTP, SIGRTN, VPWR, VREF and CASE GND.
- Powertrain control module (PCM) (12A650).

Typical EVAP System

The image shown here is a generic EVAP system illustration. Refer to the Component or System for further system details.

Note And Schematic

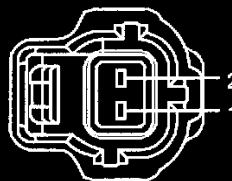
Evaporative Emission (EVAP) Monitor and System

HX

A0042253

Canister Vent Solenoid (CANV) Connector

For applications that use the engine off natural vacuum (EONV) EVAP leak check monitor, B+ provides power to the CANV solenoid instead of VPWR.



A0077547

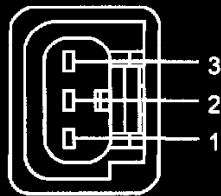
Vehicle	Connector	Circuit	Pin
F-Super Duty	A	B+ CANV	1 2
All other vehicles	A	CANV VPWR	2 1

Schematic And Connector

**Evaporative Emission (EVAP) Monitor
and System****HX****EVAP Canister Purge (EVAPCP) Valve Connector**

A0077550

Circuit	Pin
VPWR (Power Supply)	1
EVAPCP (EVAP Canister Purge)	2

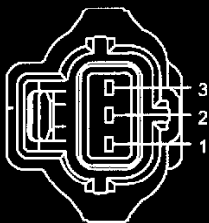
Fuel Tank Pressure (FTP) Sensor Connector**A**

A0077573

B

A0077555

Connectors

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

A0077554

Vehicle	Connector	Circuit	Pin
E-Series, E-Series inline design, Escape, Expedition, F-150, F-Super Duty inline design, Five Hundred, Focus 2.3L, Ford GT, Freestar/Monterey, Freestyle, LS 3.0L, LS 3.9L, Mariner, Montego, Mustang, Navigator, Sable, Taurus, Thunderbird, Town Car	A	FTP SIGRTN VREF	3 2 1
E-Series tank design, Explorer 4.0L, Explorer 4.6L, Explorer SportTrac, F-Super Duty tank design	B	FTP SIGRTN VREF	1 2 3
All other vehicles	C	FTP SIGRTN VREF	3 2 1

Connector

Evaporative Emission (EVAP) Monitor and System

HX

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	CANV FTP SIGRTN VREF EVAPCP	B6 B52 B17 B20 B12
Crown Victoria, Grand Marquis	150 (50-50-50) Pin	CASE GND FLI CANV FTP SIGRTN VREF EVAPCP	B10 T30 B13 B9 B41 B40 B34
E-Series, F-Super Duty	170 Pin	CASE GND CANV FTP SIGRTN VREF EVAPCP	B10 B13 B3 B41 B40 E1
Escape, Five Hundred, Freestyle, Mariner, Montego, Town Car	150 (50-50-50) Pin	CASE GND CANV FTP SIGRTN VREF EVAPCP	B10 B13 B9 B41 B40 B34
Expedition, Navigator	190 Pin	CASE GND CANV FTP SIGRTN VREF EVAPCP	B66 B61 B44 B58 B29 B65
Explorer SportTrac, Ranger	104 Pin	FCIL CASE GND FLI CANV FTP SIGRTN VREF EVAPCP	82 25 12 67 62 91 90 56
Explorer, Mountaineer	150 (50-50-50) Pin	CASE GND CANV FTP SIGRTN VREF EVAPCP	B10 B13 B9 B41 E40, T40 B34

(Continued)

Connector

Evaporative Emission (EVAP) Monitor and System

HX

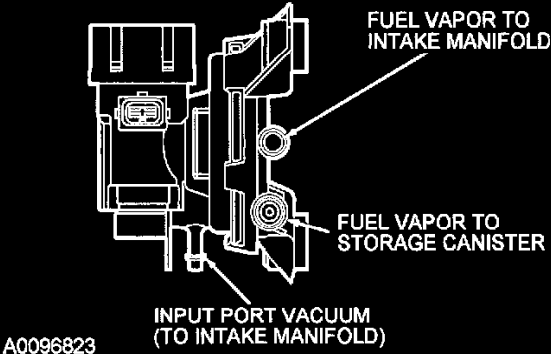
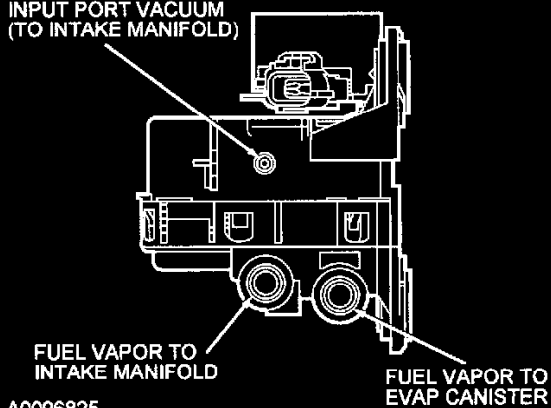
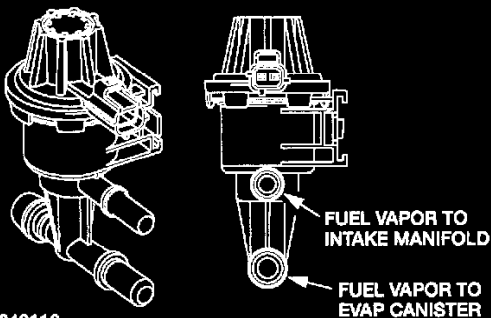
Vehicle	Connector	Circuit	Pin
F-150	190 Pin	CASE GND CANV FTP SIGRTN VREF EVAPCP	B66 B61 B44 B58 B29 E65
Focus	150 (50-50-50) Pin	CASE GND CANV FTP SIGRTN VREF EVAPCP	B10 B13 B9 B41 E40 B34
LS, Thunderbird	150 (60-32-58) Pin	CASE GND CANV FTP SIGRTN VREF EVAPCP	B43 B30 B52 B5 B55 B12
Mustang	170 Pin	CASE GND CANV FTP SIGRTN VREF EVAPCP	B10 B13 B3 B43 B40 E8
All other vehicles	104 Pin	CASE GND CANV FTP SIGRTN VREF EVAPCP	25 67 62 91 90 56

Test Step		Results / Action to Take
HX1	DTC P0443: CHECK THE PCM OUTPUT TO EVAP CANISTER PURGE VALVE	
• Key in OFF position. • EVAPCP Valve connector disconnected. • Connect a non-powered test lamp between the EVAPCP and VPWR circuits at the EVAP canister purge valve harness connector. • Key in ON position. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the outputs ON. • Command the outputs OFF. • Exit output test mode. • Does the test lamp turn on and off when the output(s) is commanded on and off?		Yes Key in OFF position. GO to HX2. No GO to HX5.

Connector Test HX1

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take
HX2	TYPE OF EVAP CANISTER PURGE VALVE • Typical EVAP Canister Purge Valve (with vacuum diaphragm).   • Typical Electronic EVAP Canister Purge Valve.  • Are you testing an electronic EVAP canister purge valve?	Yes Key in OFF position. GO to HX3. No Key in OFF position. GO to HX4.

HX2

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take				
HX3	CHECK THE EVAP CANISTER PURGE VALVE SOLENOID RESISTANCE	Yes Unable to identify the fault at this time. GO to Z1. No INSTALL a new EVAPCP valve.				
Note: The EVAP canister purge valve resistance reading must be taken with the engine cooled down. - EVAPCP Valve connector disconnected. - Measure the resistance between: <table><tr><td>(+) EVAPCP Valve Connector, Component Side</td><td>(-) EVAPCP Valve Connector, Component Side</td></tr><tr><td>EVAPCP - Pin 2</td><td>VPWR - Pin 1</td></tr></table> - Is the resistance between 2.5 ohms - 6 ohms?			(+) EVAPCP Valve Connector, Component Side	(-) EVAPCP Valve Connector, Component Side	EVAPCP - Pin 2	VPWR - Pin 1
(+) EVAPCP Valve Connector, Component Side	(-) EVAPCP Valve Connector, Component Side					
EVAPCP - Pin 2	VPWR - Pin 1					
HX4	CHECK THE EVAP CANISTER PURGE VALVE SOLENOID RESISTANCE					
Note: The EVAP canister purge valve resistance reading must be taken with the engine cooled down. - EVAPCP Valve connector disconnected. - Measure the resistance between: <table><tr><td>(+) EVAPCP Valve Connector, Component Side</td><td>(-) EVAPCP Valve Connector, Component Side</td></tr><tr><td>EVAPCP - Pin 2</td><td>VPWR - Pin 1</td></tr></table> - Is the resistance between 30 ohms - 38 ohms?		(+) EVAPCP Valve Connector, Component Side	(-) EVAPCP Valve Connector, Component Side	EVAPCP - Pin 2	VPWR - Pin 1	Yes Unable to identify the fault at this time. GO to Z1. No INSTALL a new EVAPCP valve.
(+) EVAPCP Valve Connector, Component Side	(-) EVAPCP Valve Connector, Component Side					
EVAPCP - Pin 2	VPWR - Pin 1					
HX5	CHECK THE VPWR VOLTAGE TO EVAP CANISTER PURGE VALVE					
- Key in ON position. - Measure the voltage between: <table><tr><td>(+) EVAPCP Valve Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VPWR - Pin 1</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 10.5 V?		(+) EVAPCP Valve Connector, Harness Side	(-) Vehicle Battery	VPWR - Pin 1	Negative terminal	
(+) EVAPCP Valve Connector, Harness Side	(-) Vehicle Battery					
VPWR - Pin 1	Negative terminal					
HX6	CHECK THE EVAP CANISTER PURGE VALVE CIRCUIT FOR AN OPEN IN THE HARNESS	Yes Key in OFF position. GO to HX6. No REPAIR the open circuit.				
- Key in OFF position. - PCM connector disconnected. - Measure the resistance between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) EVAPCP Valve Connector, Harness Side</td></tr><tr><td>EVAPCP</td><td>EVAPCP - Pin 2</td></tr></table> - Is the resistance less than 5 ohms?			(+) PCM Connector, Harness Side	(-) EVAPCP Valve Connector, Harness Side	EVAPCP	EVAPCP - Pin 2
(+) PCM Connector, Harness Side	(-) EVAPCP Valve Connector, Harness Side					
EVAPCP	EVAPCP - Pin 2					

HX3-HX6

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take				
HX7	CHECK THE EVAP CANISTER PURGE VALVE CIRCUIT FOR A SHORT TO PWRGND IN THE HARNESS - Diagnostic tool connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>EVAPCP</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-)	EVAPCP	Ground	Yes GO to HX8. No REPAIR the short circuit to GND.
(+) PCM Connector, Harness Side	(-)					
EVAPCP	Ground					
HX8	CHECK THE EVAP CANISTER PURGE VALVE CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) EVAPCP Valve Connector, Harness Side</td><td>(-)</td></tr><tr><td>EVAPCP - Pin 2</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) EVAPCP Valve Connector, Harness Side	(-)	EVAPCP - Pin 2	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit to PWR.
(+) EVAPCP Valve Connector, Harness Side	(-)					
EVAPCP - Pin 2	Ground					
HX9	DTC P1450: CHECK FOR VISUAL CAUSES OF EXCESSIVE FUEL TANK VACUUM Note: If the CV solenoid and the fuel tank assemblies are not accessible during this step, refer to Evaporative Emissions System and Fuel Delivery and Air Induction for removal instructions. - Check for kinks or bends in the fuel vapor hoses/tubes (EVAPCP outlet tube and EVAP canister tube). - Visually inspect the EVAP canister inlet port, CV solenoid filter, and canister vent hose assembly for contamination or debris. - Check the CV solenoid filter for blockage or contamination. - Is a fault indicated?	Yes REMOVE any contamination or debris around the fuel vapor hose/tubes and CV solenoid assembly. REMOVE kinks or bends in the EVAPCP outlet tube, EVAP canister tube, and canister vent hose assembly. CLEAR the DTCs. For repair verification, CARRY OUT the evaporative emission leak check monitor repair verification drive cycle. REFER to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle. No GO to HX10.				
HX10	CHECK THE FUEL TANK PRESSURE SENSOR VOLTAGE WITH THE FUEL FILLER CAP REMOVED - Remove the fuel filler cap. - Key in ON position. - Access the PCM and monitor the FTP V PID. - Is the voltage between 2.4 V - 2.8 V?	Yes GO to HX14. No Key in OFF position. GO to HX11.				

HX7-HX10

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take						
HX11	CHECK FOR ANY OTHER DTCS • Check for other 3-wire sensor DTCs (KOEO, KOER, or continuous memory) present with the DTC P1450. • Are any other DTCs present?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No Key in OFF position. GO to HX12.						
HX12	CHECK THE VREF VOLTAGE TO FUEL TANK PRESSURE SENSOR • FTP Sensor connector disconnected. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) FTP Sensor Connector, Harness Side</td><td>(-) FTP Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> • Is the voltage between 4 V - 6 V?	(+) FTP Sensor Connector, Harness Side	(-) FTP Sensor Connector, Harness Side	VREF	SIGRTN	Yes Key in OFF position. INSTALL a new FTP sensor. CLEAR the DTCs. For repair verification, CARRY OUT the evaporative emission leak check monitor repair verification drive cycle. REFER to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle. No Key in OFF position. GO to HX13.		
(+) FTP Sensor Connector, Harness Side	(-) FTP Sensor Connector, Harness Side							
VREF	SIGRTN							
HX13	CHECK THE VREF AND SIGRTN CIRCUIT FOR AN OPEN IN THE HARNESS • PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) FTP Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>VREF</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> • Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) FTP Sensor Connector, Harness Side	VREF	VREF	SIGRTN	SIGRTN	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) FTP Sensor Connector, Harness Side							
VREF	VREF							
SIGRTN	SIGRTN							
HX14	CHECK IF THE ENGINE WILL IDLE • Key on engine running. • Does the engine stall or cannot maintain Idle?	Yes Key in OFF position. GO to HX15. No GO to HX16.						

HX11-HX14

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take
HX15	CHECK THE EVAP SYSTEM FOR A STUCK OPEN VALVE	Yes Key in OFF position. The EVAP system is not the cause of the symptom. Concern is elsewhere. RETURN to Symptom Charts for further direction. No Key in OFF position. INSTALL a new EVAP Canister Purge Valve.
	- Disconnect the larger of 2 manifold lines at the EVAPCP and cap it at the EVAPCP. - Key on engine running. - Does the engine stall or cannot maintain idle?	
HX16	CHECK FOR BLOCKAGE IN THE FUEL TANK VENT SYSTEM	Yes CHECK for blockage in the vapor line to the EVAPCV solenoid. CHECK the CV solenoid filter for blockage or contamination. CHECK the carbon canister for blockage. If OK, INSTALL a new EVAPCV. No GO to HX17.
	- Key on engine running. - Access the PCM and monitor the EVAPPDC, EVMV, FTP V and EVAPCV PIDs. - While monitoring the FTP PID, open the EVAPCP by commanding the EVAPPDC PID to a 100% duty cycle (or EVMV PID to a 1,000 mA). Ramp the EVAP canister purge valve open in increments. Note: The EVAPCV is normally open and venting to the atmosphere. - Does the FTP sensor voltage drop below 2 volts when the EVAPCP valve is commanded fully open?	
HX17	CHECK THE EVAP SYSTEM FOR A STUCK OPEN VALVE	Yes Key in OFF position. INSTALL a new EVAP Canister Purge Valve. No GO to HX18.
	- Key on engine running. - Close the EVAPCP by commanding the EVAPPDC PID to 0% duty cycle or the EVMV PID to 0 mA. - Close the EVAPCV by commanding the EVAPCV PID to ON (100% duty cycle). - Does the FTPV PID decrease, engine RPM change, or engine stall, as an indication that the EVAPCP is stuck open?	

HX15-HX17

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

Test Step		Results / Action to Take
HX18	EVAP CANISTER PURGE VALVE TEST	Yes Key in OFF position. For DTC P1450: No Fault Found. Problem may be intermittent. All others, check the EVAP system for leaks: No Key in OFF position. Check for blockages between the fuel tank, the EVAP canister purge valve, and the engine intake manifold. Check for obstructions in the EVAP canister purge valve diaphragm and ports. If OK, INSTALL a new EVAP canister purge valve.
	• Key on engine running. • Close the EVAPCV by commanding the EVAPCV PID to ON (100% duty cycle). • While monitoring the FTP PID, open the EVAPCP by commanding the EVAPDC PID to a 100% duty cycle (or EVMV PID to a 1,000 mA). • Does the FTPV PID decrease, engine RPM change, or engine stall as an indication that the EVAPCP is opening?	
HX19	DTC P0452: CHECK FOR FUEL TANK PRESSURE SENSOR CONNECTOR CONTAMINATION	
	• Key in OFF position. • Visually check for liquid fuel contamination of the FTP sensor electrical connector. • Check for a completely submerged FTP sensor (tank-mounted type only) in the liquid fuel. This can affect the correct FTP voltage reading. • Does the FTP sensor and its connector show any signs of fuel contamination?	Yes REPAIR as necessary. ADJUST the fuel tank overfill. No GO to HX20.
HX20	CHECK FOR LOW FTP SENSOR VOLTAGE	Yes Key in OFF position. GO to HX21. No The fault that produced the DTC P0452 is intermittent. GO to Z1.
	Note: The FTP sensor voltage with no pressure/vacuum on the fuel tank is between 2.4 and 2.8 volts. • Key in ON position. • Access the PCM and monitor the FTP V PID. • Is the voltage less than 0.22 V?	

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take								
HX21	CHECK THE OPPOSITE INDUCED HIGH FTP SENSOR SIGNAL - FTP Sensor connector disconnected. Note: If a diagnostic tool communication concern exists, immediately remove the jumper and follow the NO path in the RESULT/ACTION column. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A FTP Sensor Connector, Harness Side</td><td>Point B FTP Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>FTP</td></tr></table> - Key in ON position. - Access the PCM and monitor the FTP V PID. Is the voltage between 4 V - 6 V?	Point A FTP Sensor Connector, Harness Side	Point B FTP Sensor Connector, Harness Side	VREF	FTP	Yes INSTALL a new FTP sensor. No REMOVE the jumper. GO to HX22.				
Point A FTP Sensor Connector, Harness Side	Point B FTP Sensor Connector, Harness Side									
VREF	FTP									
HX22	CHECK THE VREF VOLTAGE TO FTP SENSOR - Key in ON position. - Measure the voltage between:<table><tr><td>(+) FTP Sensor Connector, Harness Side</td><td>(-) FTP Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> Is the voltage between 4 V - 6 V?	(+) FTP Sensor Connector, Harness Side	(-) FTP Sensor Connector, Harness Side	VREF	SIGRTN	Yes Key in OFF position. GO to HX23. No GO to C1.				
(+) FTP Sensor Connector, Harness Side	(-) FTP Sensor Connector, Harness Side									
VREF	SIGRTN									
HX23	CHECK THE FTP CIRCUIT(S) FOR A SHORT TO SIGRTN OR GND IN THE HARNESS - PCM connector disconnected. - Diagnostic tool connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FTP</td><td>SIGRTN</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>FTP</td><td>Negative terminal</td></tr></table> Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	FTP	SIGRTN	(+) PCM Connector, Harness Side	(-) Vehicle Battery	FTP	Negative terminal	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
FTP	SIGRTN									
(+) PCM Connector, Harness Side	(-) Vehicle Battery									
FTP	Negative terminal									

HX21-HX23

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take				
HX24	DTC P0453: CHECK FOR HIGH FTP SENSOR VOLTAGE Note: The FTP sensor voltage with no pressure/vacuum on the fuel tank is between 2.4 and 2.8 volts. • Key in ON position. • Access the PCM and monitor the FTP V PID. • Is the voltage greater than 4.5 V?	Yes Key in OFF position. GO to HX25. No The fault that produced the DTC P0453 is intermittent. GO to Z1.				
HX25	CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN CIRCUITS AT THE FTP SENSOR VEHICLE HARNESS CONNECTOR • FTP Sensor connector disconnected. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) FTP Sensor Con- nector, Harness Side</td><td>(-) FTP Sensor Con- nector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> • Is the voltage between 4 V - 6 V?	(+) FTP Sensor Con- nector, Harness Side	(-) FTP Sensor Con- nector, Harness Side	VREF	SIGRTN	Yes GO to HX26. No GO to C1.
(+) FTP Sensor Con- nector, Harness Side	(-) FTP Sensor Con- nector, Harness Side					
VREF	SIGRTN					
HX26	CHECK THE FTP CIRCUIT FOR A SHORT TO POWER • Measure the voltage between:<table><tr><td>(+) FTP Sensor Con- nector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>FTP</td><td>Negative terminal</td></tr></table> • Is the voltage less than 10.5 V?	(+) FTP Sensor Con- nector, Harness Side	(-) Vehicle Battery	FTP	Negative terminal	Yes Key in OFF position. GO to HX28. No Key in OFF position. GO to HX27.
(+) FTP Sensor Con- nector, Harness Side	(-) Vehicle Battery					
FTP	Negative terminal					
HX27	CHECK THE FTP CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS • PCM connector disconnected. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>FTP</td><td>Negative terminal</td></tr></table> • Is the voltage greater than 10.5 V?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	FTP	Negative terminal	Yes REPAIR the short circuit to PWR. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
FTP	Negative terminal					
HX28	CHECK THE FTP CIRCUIT FOR AN OPEN IN THE HARNESS • PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) FTP Sensor Con- nector, Harness Side</td></tr><tr><td>FTP</td><td>FTP</td></tr></table> • Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) FTP Sensor Con- nector, Harness Side	FTP	FTP	Yes GO to HX29. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) FTP Sensor Con- nector, Harness Side					
FTP	FTP					

HX24-HX28

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take						
HX29	CHECK THE FTP CIRCUIT FOR A SHORT TO VREF - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VREF</td><td>FTP</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	VREF	FTP	Yes GO to HX30. No REPAIR the short circuit to VREF.		
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
VREF	FTP							
HX30	CHECK THE OPPOSITE INDUCED LOW FTP SIGNAL - PCM connector connected. - Diagnostic tool connector connected. - Note: If a diagnostic tool communication concern exists, immediately remove the jumper and follow the NO path in the RESULT/ACTION column. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A FTP Sensor Connector, Harness Side</td><td>Point B FTP Sensor Connector, Harness Side</td></tr><tr><td>FTP</td><td>SIGRTN</td></tr></table> - Key in ON position. - Access the PCM and monitor the FTP V PID. - Is the voltage less than 0.1 V?	Point A FTP Sensor Connector, Harness Side	Point B FTP Sensor Connector, Harness Side	FTP	SIGRTN	Yes INSTALL a new FTP sensor. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).		
Point A FTP Sensor Connector, Harness Side	Point B FTP Sensor Connector, Harness Side							
FTP	SIGRTN							
HX31	DTCS P1451 OR P0446: CHECK THE PCM OUTPUT TO EVAP CANISTER VENT SOLENOID Note: For applications that use the engine off natural vacuum (EONV) EVAP leak check monitor, B+ provides power to the CANV solenoid instead of VPWR. - Key in OFF position. - CANV connector disconnected. - Connect a non-powered test lamp between:<table><tr><td>(+) CANV Connector, Harness Side</td><td>(-) CANV Connector, Harness Side</td></tr><tr><td>VPWR</td><td>CANV</td></tr><tr><td>B+</td><td>CANV</td></tr></table> - Key in ON position. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Command the outputs OFF. - Exit output test mode. - Does the test lamp turn on and off when the output(s) is commanded on and off?	(+) CANV Connector, Harness Side	(-) CANV Connector, Harness Side	VPWR	CANV	B+	CANV	Yes Key in OFF position. GO to HX32. No GO to HX33.
(+) CANV Connector, Harness Side	(-) CANV Connector, Harness Side							
VPWR	CANV							
B+	CANV							

HX29-HX31

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take						
HX32	CHECK THE CANV SOLENOID RESISTANCE - Measure the resistance between:<table><tr><th>(+) CANV Connector, Component Side</th><th>(-) CANV Connector, Component Side</th></tr><tr><td>B+</td><td>CANV</td></tr><tr><td>VPWR</td><td>CANV</td></tr></table> - Are the resistances between 48 ohms - 65 ohms?	(+) CANV Connector, Component Side	(-) CANV Connector, Component Side	B+	CANV	VPWR	CANV	Yes Unable to identify the fault at this time. GO to Z1. No INSTALL a new EVAPCV.
(+) CANV Connector, Component Side	(-) CANV Connector, Component Side							
B+	CANV							
VPWR	CANV							
HX33	CHECK THE VPWR VOLTAGE TO CANV SOLENOID - Measure the voltage between:<table><tr><th>(+) CANV Connector, Harness Side</th><th>(-)</th></tr><tr><td>B+</td><td>Ground</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Are the voltages greater than 10.5 V?	(+) CANV Connector, Harness Side	(-)	B+	Ground	VPWR	Ground	Yes Key in OFF position. GO to HX34. No REPAIR the open circuit.
(+) CANV Connector, Harness Side	(-)							
B+	Ground							
VPWR	Ground							
HX34	CHECK THE CANV CIRCUIT FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) CANV Connector, Harness Side</th></tr><tr><td>CANV</td><td>CANV</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) CANV Connector, Harness Side	CANV	CANV	Yes GO to HX35. No REPAIR the open circuit.		
(+) PCM Connector, Harness Side	(-) CANV Connector, Harness Side							
CANV	CANV							
HX35	CHECK THE CANV CIRCUIT FOR A SHORT TO PWRGND IN THE HARNESS - Diagnostic tool connector disconnected. - Measure the resistance between:<table><tr><th>(+) CANV Connector, Harness Side</th><th>(-) Vehicle Battery</th></tr><tr><td>CANV</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) CANV Connector, Harness Side	(-) Vehicle Battery	CANV	Negative terminal	Yes GO to HX36. No REPAIR the short circuit to GND.		
(+) CANV Connector, Harness Side	(-) Vehicle Battery							
CANV	Negative terminal							
HX36	CHECK THE CANV CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><th>(+) CANV Connector, Harness Side</th><th>(-)</th></tr><tr><td>CANV</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) CANV Connector, Harness Side	(-)	CANV	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit to PWR.		
(+) CANV Connector, Harness Side	(-)							
CANV	Ground							

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take				
HX37	DTCS P0460, P0461, P0462 OR P0463: CHECK THE FLI CIRCUIT VOLTAGE					
- Key on engine running. - Access the PCM and monitor the FLI V PID. - Is the voltage between 0.25 V - 4.5 V?		Yes GO to HX38. No GO to HX39.				
HX38	CHECK FOR FUEL TANK FLOAT LEVEL RESPONSE					
- Key in ON position. - Access the PCM and monitor the FLI V PID. - If the fuel level is less than 1/4 (25% on FLI), add approximately 1/4 tank of fuel. - If the fuel level is greater than 3/4 (75% on FLI), drain approximately 1/4 tank of fuel. - Did the FLI PID indicate a movement upward or downward as fuel is either added or drained?		Yes No Fault Found. Problem may be intermittent. GO to Z1. No Key in OFF position. REFER to Instrument Panel, Gauges and Warning Indicators to continue inoperative fuel level sender diagnosis.				
HX39	CHECK THE FLI CIRCUIT AT THE FP MODULE					
- Instrument cluster connector disconnected. Refer to Instrument Panel, Gauges and Warning Indicators or Vehicle/Diagrams for the cluster connector configuration. - Gain access to the fuel pump connector or intermediate fuel pump connector. - FP connector disconnected. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) FP Connector, Har- ness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>FLI</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 5 V?		(+) FP Connector, Har- ness Side	(-) Vehicle Battery	FLI	Negative terminal	Yes Key in OFF position. GO to HX40. No Key in OFF position. GO to HX41.
(+) FP Connector, Har- ness Side	(-) Vehicle Battery					
FLI	Negative terminal					
HX40	CHECK THE FLI CIRCUIT FOR A SHORT TO POWER IN THE HARNESS					
- PCM connector disconnected. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) FP Connector, Har- ness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>FLI</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 10.5 V?		(+) FP Connector, Har- ness Side	(-) Vehicle Battery	FLI	Negative terminal	Yes REPAIR the short circuit to PWR. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
(+) FP Connector, Har- ness Side	(-) Vehicle Battery					
FLI	Negative terminal					

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take								
HX41	CHECK THE FLI CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>FLI</td><td>Negative terminal</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FLI</td><td>CASE GND</td></tr></table> - Are the resistances greater than 10 K Ohms?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	FLI	Negative terminal	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	FLI	CASE GND	Yes GO to HX42. No REPAIR the short circuit to GND.
(+) PCM Connector, Harness Side	(-) Vehicle Battery									
FLI	Negative terminal									
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
FLI	CASE GND									
HX42	CHECK THE FLI CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) IC Connector, Harness Side</td></tr><tr><td>FLI</td><td>FLI</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) FP Connector, Harness Side</td></tr><tr><td>FLI</td><td>FLI</td></tr></table> - Are the resistances less than 5 Ohms?	(+) PCM Connector, Harness Side	(-) IC Connector, Harness Side	FLI	FLI	(+) PCM Connector, Harness Side	(-) FP Connector, Harness Side	FLI	FLI	Yes GO to HX43. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) IC Connector, Harness Side									
FLI	FLI									
(+) PCM Connector, Harness Side	(-) FP Connector, Harness Side									
FLI	FLI									
HX43	CHECK THE CASE GROUND CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) FP Connector, Harness Side</td></tr><tr><td>CASE GND</td><td>CASE GND</td></tr></table> - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) IC Connector, Harness Side</td></tr><tr><td>CASE GND</td><td>GND</td></tr></table> - Are the resistances less than 5 Ohms?	(+) PCM Connector, Harness Side	(-) FP Connector, Harness Side	CASE GND	CASE GND	(+) PCM Connector, Harness Side	(-) IC Connector, Harness Side	CASE GND	GND	Yes REFER to Instrument Panel, Gauges and Warning Indicators to diagnose the instrument cluster. If OK, INSTALL a new PCM. Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) FP Connector, Harness Side									
CASE GND	CASE GND									
(+) PCM Connector, Harness Side	(-) IC Connector, Harness Side									
CASE GND	GND									

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take				
HX44	FUEL CAP INDICATOR LAMP ALWAYS ON WITHOUT DTCS					
	- PCM connector disconnected. - Key in ON position. - Is the fuel cap indicator lamp OFF with the PCM disconnected?	Yes Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No The PCM has not caused the fuel cap indicator lamp to turn ON. REFER to Instrument Panel, Gauges and Warning Indicators to diagnose an always on fuel cap indicator lamp.				
HX45	FUEL CAP INDICATOR LAMP ALWAYS OFF WITHOUT DTCS					
	- Key in OFF position. - Instrument cluster connector disconnected. Refer to Instrument Panel, Gauges and Warning Indicators or Vehicle/Diagrams for the cluster connector configuration. - PCM connector disconnected. - Measure the resistance between: <table border="1"> <tr> <td>(+) PCM Connector, Harness Side</td> <td>(-) IC Connector, Harness Side</td> </tr> <tr> <td>FCIL</td> <td>FCIL</td> </tr> </table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) IC Connector, Harness Side	FCIL	FCIL	Yes REFER to Instrument Panel, Gauges and Warning Indicators to diagnose a never on fuel cap indicator lamp. If the instrument cluster is OK, INSTALL a new PCM. Refer to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit. VERIFY the repair by turning the key to the ON position. (The lamp will turn OFF in 3 seconds).
(+) PCM Connector, Harness Side	(-) IC Connector, Harness Side					
FCIL	FCIL					

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take
HX46	DTC P0451: CLEAR AND ATTEMPT TO RETRIEVE THE DTC	
	• Key in ON position. • CLEAR continuous memory DTCs. • Key on engine running. • Run the engine for approximately 10 seconds. • Retrieve Continuous Memory DTCs. • Is DTC P0451 present in continuous memory?	Yes Key in OFF position. CHECK the PCM and FTP sensor connector for any signs of damage, rust, or pushed out pins. Make sure all connectors are securely connected. If OK, INSTALL a new FTP sensor. CLEAR continuous memory DTCs. Retest If DTC P0451 is still present, INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No The fault that produced the DTC P0451 is intermittent. GO to Z1.
HX47	DTCS P0455 OR P0457: CHECK THE FUEL FILLER CAP	
	Note: Many EVAP leaks are caused by a loose or damaged fuel filler cap. If the fuel filler cap is suspect during visual inspection, do not disturb the fuel filler cap until the repair verification method is complete. If the repair verification method fails, reposition or install a new fuel filler cap and repeat the test. This action isolates the fuel filler cap from the rest of the EVAP system as a potential concern. • Visually inspect the fuel filler cap without initially disturbing it. • Check for missing or loose fuel filler cap. • Check the fuel filler cap for damage. • Is a concern present with the proper installation of the fuel filler cap?	Yes For repair verification, CARRY OUT the Smoke Machine PHASE 1 - Leak Verification Pressure Test. CONNECT or INSTALL a new fuel filler cap. GO to HX52. No GO to HX48.
HX48	CHECK OPERATION OF THE FUEL GAUGE	
	Note: A fuel gauge that always indicates a fuel level less than a 1/2 tank or always a full tank, may be caused by an FLI fault. • Check operation of the fuel gauge. • Is the fuel gauge functioning properly?	Yes Key in OFF position. GO to HX49. No Key in OFF position. CHECK the functionality of the FLI circuit. Concern is elsewhere. RETURN to Symptom Charts for further direction.

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

Test Step		Results / Action to Take
HX49	DTC P1443: EVAPORATIVE EMISSION SYSTEM VISUAL INSPECTION	Yes REPAIR as necessary. For repair verification, CARRY OUT the Smoke Machine PHASE 1 - Leak Verification Pressure Test. GO to HX52. No GO to HX50.
- Visually inspect for: - EVAP system lines/hoses (check for proper connections, damage or blockage). - Loose fuel vapor hose/tube connections to the EVAP system components. - The vacuum line from the input vacuum port to the intake manifold on the EVAP canister purge valve (the control vacuum solenoid part of the valve) is removed. - Blocked vacuum hose between the EVAP canister purge valve solenoid and the engine intake manifold. - Damaged fuel tank or fuel filler pipe. - Are there any concerns found during the visual inspection?		
HX50	CHECK THE FUEL TANK PRESSURE SENSOR VOLTAGE WITH THE FUEL FILLER CAP REMOVED	Yes CONNECT the fuel filler cap. GO to HX51. No Key in OFF position. INSTALL a new FTP sensor. REPEAT the test and VERIFY the results. For repair verification, CARRY OUT the Smoke Machine PHASE 1 - Leak Verification Pressure Test. GO to HX52.
- Remove the fuel filler cap. - Key in ON position. - Access the PCM and monitor the FTP V PID. - Is the voltage between 2.4 V - 2.8 V?		
HX51	EVAP CANISTER PURGE VALVE TEST	Yes Key in OFF position. GO to HX52. No Key in OFF position. INSTALL a new EVAPCP valve. REPEAT the test and VERIFY the results. For repair verification, CARRY OUT the Smoke Machine PHASE 1 - Leak Verification Pressure Test. GO to HX52.
- Key on engine running. - Access the PCM and monitor the EVAPCV, EVAPPDC, EVMV and FTP V PIDs. - Close the EVAPCV by commanding the EVAPCV PID to ON (100% duty cycle). - While monitoring the FTP PID, open the EVAPCP by commanding the EVAPPDC PID to a 100% duty cycle (or EVMV PID to a 1,000 mA). - Does the FTPV PID decrease, engine RPM change, or engine stall as an indication that the EVAPCP is opening?		

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take
HX52	DTCS P0442 OR P0456: HOOK UP THE SMOKE MACHINE (ROTUNDA VACUTEC)	
 CAUTION: Removing the Schrader valve from the test port on vehicles equipped with electronic EVAPCP permanently damages the valve. • Disconnect the larger of 2 manifold lines at the EVAPCP and cap it at the EVAPCP. • Connect the smoke machine power cables to the vehicle battery. Check to see that the smoke machine power indicator lamp is on, indicating a good battery contact. • Locate the evaporative emission test port and remove the green cap. It is located on or close to the EVAPCP. • For vehicles equipped with the vacuum diaphragm type EVAPCP, remove the Schrader valve from the evaporative emission test port by turning it in a clockwise rotation. Do not remove the Schrader valve from vehicles equipped with an electronic type EVAPCP. Refer to the illustration in step HX2 for EVAPCP type identification. • Install the EVAP test port adapter (provided with the Vacutec Smoke Machine) to the test port. • Diagnostic tool connected. • Is the smoke machine hook up complete?		Yes For leak detection, GO to HX53. For leak repair verification, GO to HX54. No Key in OFF position. REFER to the smoke machine operator manual for additional instructions and for helpful tips.

HX52

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take
HX53	CARRY OUT SMOKE MACHINE PHASE 2 - LEAK DETECTION SMOKE TEST	
- Position the control lever located on the smoke machine to SMOKE. - Remove the fuel filler cap. - Connect the smoke supply hose (black hose) nozzle tip into the EVAP service port adapter. - Key in ON position. - Close the EVAPCV by commanding the EVAPCV PID to ON (100% duty cycle). Note: The EVAPCV reopens after 9 minutes of continuous operation. - Press the remote starter button on the smoke machine. Smoke will be introduced into the EVAP system. - Secure the fuel cap once smoke is observed exiting the fuel tank neck area. Note: If smoke does not exit the fuel filler neck after the system is pressurized, command the EVAPCV open to allow air to purge the canister vent solenoid. Once smoke is seen at the canister vent solenoid, close the EVAPCV. - Continue to introduce smoke into the system for 60 seconds to obtain pressure. - Press and release the remote starter button in intervals of approximately 15 seconds on and 15 seconds off while checking for exiting smoke. - Use the halogen spotlight provided with the smoke machine to follow the EVAP system path and look for smoke exiting at the source of the leak(s). Note: If the leak is not detected from the top, check the EVAP system for leaks from under the vehicle. CHECK the EVAP hoses, EVAPCP, EVAPCV, carbon canister, fuel tank, the components around fuel tank area and at the fuel filler cap. Wiggle the components and connections to simulate road bumps while looking for signs of leaking smoke. If the leak is in the fuel filler neck between the check valve and the cap, smoke under pressure may not reach the leak. If leaking smoke is not found, a thorough visual inspection of the fuel filler neck and fuel cap should be done. Is the source of the EVAP leak located?		Yes Key in OFF position. REPAIR as necessary. CONNECT all the disconnected components. For repair verification, CARRY OUT the Smoke Machine PHASE 1 - Leak Verification Pressure Test. GO to HX54. No Key in OFF position. Test passed. CONNECT all the disconnected components. CARRY OUT Smoke Machine PHASE 1 - Leak Verification Pressure Test GO to HX54.

HX53

Evaporative Emission (EVAP) Monitor and System

HX

Test Step		Results / Action to Take
HX54	CARRY OUT THE SMOKE MACHINE PHASE 1 - LEAK VERIFICATION PRESSURE TEST	
	- Position the control lever located on the smoke machine to METER. - Calibrate the smoke machine flow meter using the 0.020 standard as follows: - Insert the air supply hose (transparent hose) nozzle tip into the 0.020 EVAP system standard located on the front of the smoke machine. - Press the remote starter button on the smoke machine. Observe the position of the flow meter indicator ball. - Position the flow meter red pointer flag so that it aligns with the measurement of the indicator ball. - Release the button and remove the air supply hose nozzle tip from the EVAP system standard. - Connect the air supply hose (transparent hose) nozzle tip into the EVAP test port adapter. - Key in ON position. - Close the EVAPCV by commanding the EVAPCV PID to ON (100% duty cycle). - Press the remote starter button on the smoke machine. Notice that the ball in the flowmeter is all the way at the top. This indicates the system is being pressurized. - Continue to press the remote starter button until the ball stops descending. Once the ball stops descending, observe if it is above or below the red pointer flag. If the measurement is below the indicator flag, the system has passed the pressure test. If the measurement is above the indicator flag, the EVAP system has an unacceptable leak. Does the EVAP system pass the smoke machine leak verification pressure test?	Yes Key in OFF position. Test passed, no faults found. No GO to HX53.
HX55	DTC P260F: CHECK FOR THE PRESENCE OF ANY MODULE COMMUNICATION CONCERNS	
	- Key in ON position. - Check for self-test DTCs in all of the vehicle modules. Are any communication concerns or communication DTCs present?	Yes For communication concerns in the PCM: DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions . For communication concerns in other modules: REFER to the applicable Vehicle System to diagnose the communication DTC. No GO to HX56.

HX54-HX55

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

Test Step		Results / Action to Take
HX56	CHECK THE PERFORMANCE OF THE PROCESSOR	Yes GO to HX58. No GO to HX57.
	• Key in OFF position. • Disconnect the battery and wait for 1 minute. • Connect the battery. • Key on engine running. • Allow the engine idle to stabilize. • Access the PCM and monitor the FTP PID. • Is the pressure equal to 0 kPa (0 psi)?	
HX57	CHECK FOR SELF-TEST DTC	Yes GO to HX58. No RETURN the vehicle to the customer.
	• Idle the engine for 2 minutes. • Carry out the self-test. • Is DTC P260F present?	
HX58	CHECK THE PCM FOR THE LATEST CALIBRATION	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No RETURN the vehicle to the customer.
	• Program the PCM to the latest calibration. • Key on engine running. • Idle the engine for 2 minutes. • Carry out the self-test. • Is DTC P260F present?	

HX56-HX58

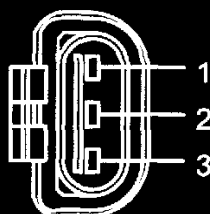
Test HY: Generator/Regulator System

PINPOINT TEST HY: GENERATOR/REGULATOR SYSTEM

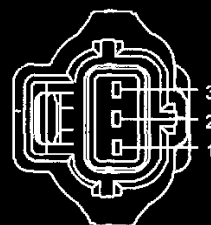
Generator/Regulator System**HY**

This pinpoint test is intended to diagnose the following:

- Generator/Regulator (10346).
- Harness circuits: GENLI, GENRC, BATT-SENSE, ILC.
- Powertrain control module (PCM) (12A650).

Generator (GEN) Assembly Connector**A**

A0077541

B

A0077554

Vehicle	Connector	Circuit	Pin
Aviator, Explorer, Mountaineer	A	B+ GENLI	3 1
Crown Victoria, Escape, Five Hundred, Freestyle standard A/C, Grand Marquis, Mariner, Montego, Sable 4V, Taurus 4V	A	B+ GENRC GENLI	3 2 1
LS, Thunderbird	B	B+ ILC GENLI	3 2 1
All other vehicles	B	B+ GENRC GENLI	3 2 1

Note And Connector

Generator/Regulator System**HY****Powertrain Control Module (PCM) Connector**

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	GENLI	B8
Escape, Mariner	150 (50-50-50) Pin	GENRC GENLI	E7 E16
Expedition, F-150, Navigator	190 Pin	GENRC GENLI	B22 B23
Explorer, Mountaineer	150 (50-50-50) Pin	GENLI	B24
Five Hundred, Freestyle, Montego	150 (50-50-50) Pin	GENRC GENLI	E13 E26
Focus	150 (50-50-50) Pin	GENRC GENLI	E14 E15
Freestar/Monterey, Sable, Taurus	104 Pin	GENRC GENLI	45 20
LS, Thunderbird	150 (60-32-58) Pin	ILC GENLI	E19 E50
Mustang	170 Pin	GENRC GENLI	E13 E5
All other vehicles	150 (50-50-50) Pin	GENRC GENLI	T19 T38

Test Step		Results / Action to Take
HY1	DTCS P0620, P0622, P1244, P1245, P1246: VISUAL INSPECTION	Yes REPAIR as necessary. No Key in OFF position. GO to HY2.
• Check that the output cable is clean at the generator/regulator assembly. • Check that the output cable nut and battery sense line is tightened at the generator/regulator assembly. • Check the generator drive belt condition. • Start the engine, and verify generator is turning. • Are there any concerns found during the visual inspection?		

Connector And HY1

Generator/Regulator System

HY

Test Step		Results / Action to Take					
HY2	CHECK THE GENERATOR CHARGING VOLTAGE	Yes GO to HY4. No GO to HY3.					
	• All accessories OFF (no load on engine). • Key on engine running. • Make sure that the engine is idling. • Connect a voltmeter across the battery terminals. • Accelerate the engine speed to 2,000 RPM and observe the voltage reading across the battery terminals. • Is the battery voltage between 13 and 16 volts?						
HY3	CHECK GENERATOR OUTPUT TO THE BATTERY	Yes Key in OFF position. GO to HY4. No Key in OFF position. REPAIR the open circuit.					
	• Make sure that the engine is idling. • Measure the voltage between the generator output cable and the generator outer shell (for ground) at the generator/regulator assembly. • Is the voltage reading between 12.5 and 15 volts?						
HY4	CHECK THE BATTERY SENSE VOLTAGE AT THE BATTERY	Yes Key in OFF position. For Aviator, Explorer, and Mountaineer, GO to HY5. For LS, and Thunderbird, GO to HY5. For all others, GO to HY6. No Key in OFF position. REPAIR the open circuit.					
	• Battery output cable at generator/regulator assembly connected. • The battery terminals are connected. • Disconnect the generator/regulator harness connector. • Key in ON position. • Measure the battery sense voltage from the B+ pin at the generator harness connector and GND. • Is the battery sense voltage within plus or minus 0.5 volt of the battery voltage?						
HY5	CHECK THE GENLI AND ILC CIRCUITS FOR A SHORT TO PWR	Yes Key in OFF position. GO to HY9. No Key in OFF position. REPAIR the short circuit to PWR.					
	Note: The voltage measurements in this test step are to be taken between the PCM signal harness pin and chassis ground. LS and Thunderbird have GENLI and ILC circuits. Aviator, Explorer/Mountaineer only has a GENLI circuit. • Disconnect the generator/regulator harness connector. • PCM connector disconnected. • Key in ON position. • Measure the voltage between: <table><tr><td>(+) GEN Assembly Connector, Harness Side</td><td>(-)</td></tr><tr><td>GENLI</td><td>Ground</td></tr><tr><td>ILC</td><td>Ground</td></tr></table> • Are the voltages less than 0.5 V?		(+) GEN Assembly Connector, Harness Side	(-)	GENLI	Ground	ILC
(+) GEN Assembly Connector, Harness Side	(-)						
GENLI	Ground						
ILC	Ground						

HY2-HY5

Generator/Regulator System

HY

Test Step		Results / Action to Take						
HY6	CHECK FOR GENRC CIRCUIT FAULT IN THE GENERATOR - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) GEN Assembly Connector, Harness Side</td><td>(-) GEN Assembly Connector, Harness Side</td></tr><tr><td>GENRC</td><td>B+</td></tr></table> - Is the resistance between 900 ohms - 1.2K ohms?	(+) GEN Assembly Connector, Harness Side	(-) GEN Assembly Connector, Harness Side	GENRC	B+	Yes GO to HY7. No INSTALL a new Generator.		
(+) GEN Assembly Connector, Harness Side	(-) GEN Assembly Connector, Harness Side							
GENRC	B+							
HY7	CHECK FOR GENRC CIRCUIT FAULT IN THE GENERATOR - Measure the resistance between:<table><tr><td>(+) GEN Assembly Connector, Harness Side</td><td>(-)</td></tr><tr><td>GENRC</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) GEN Assembly Connector, Harness Side	(-)	GENRC	Ground	Yes GO to HY8. No INSTALL a new Generator.		
(+) GEN Assembly Connector, Harness Side	(-)							
GENRC	Ground							
HY8	CHECK THE GENLI AND GENRC CIRCUITS FOR A SHORT TO PWR Note: The voltage measurements in this test step are to be taken between the PCM signal harness pin and chassis ground. - Disconnect the generator/regulator harness connector. - Disconnect the PCM. - Key In ON position. - Measure the voltage between:<table><tr><td>(+) GEN Assembly Connector, Harness Side</td><td>(-)</td></tr><tr><td>GENLI</td><td>Ground</td></tr><tr><td>GENRC</td><td>Ground</td></tr></table> - Are the voltages less than 1 V?	(+) GEN Assembly Connector, Harness Side	(-)	GENLI	Ground	GENRC	Ground	Yes Key in OFF position. GO to HY10. No Key in OFF position. REPAIR the short circuit to PWR.
(+) GEN Assembly Connector, Harness Side	(-)							
GENLI	Ground							
GENRC	Ground							

HY6-HY8

Generator/Regulator System

HY

Test Step		Results / Action to Take						
HY9	CHECK THE GENLI AND ILC CIRCUITS FOR A SHORT TO GND Note: The resistance measurements in this test step are to be taken between the PCM signal harness pin and chassis ground. LS and Thunderbird have GENLI and ILC circuits. Aviator, Explorer/Mountaineer only has a GENLI circuit. - Measure the resistance between: <table><tr><th>(+) GEN Assembly Connector, Harness Side</th><th>(-)</th></tr><tr><td>GENLI</td><td>Ground</td></tr><tr><td>ILC</td><td>Ground</td></tr></table> - Are the resistances greater than 10K ohms?	(+) GEN Assembly Connector, Harness Side	(-)	GENLI	Ground	ILC	Ground	Yes For LS, and Thunderbird, GO to HY15 . For Aviator, Explorer, and Mountaineer, GO to HY13 . No REPAIR the short circuit to GND.
(+) GEN Assembly Connector, Harness Side	(-)							
GENLI	Ground							
ILC	Ground							
HY10	CHECK THE GENLI AND GENRC CIRCUITS FOR A SHORT TO GND Note: The resistance measurements in this test step are to be taken between the PCM signal harness pin and chassis ground. - Measure the resistance between: <table><tr><th>(+) GEN Assembly Connector, Harness Side</th><th>(-)</th></tr><tr><td>GENLI</td><td>Ground</td></tr><tr><td>GENRC</td><td>Ground</td></tr></table> - Are the resistances greater than 10K ohms?	(+) GEN Assembly Connector, Harness Side	(-)	GENLI	Ground	GENRC	Ground	Yes GO to HY11 . No REPAIR the short circuit to GND.
(+) GEN Assembly Connector, Harness Side	(-)							
GENLI	Ground							
GENRC	Ground							
HY11	CHECK GENLI CIRCUIT SHORT TO GENRC CIRCUIT IN THE HARNESS - Measure the resistance between: <table><tr><th>(+) GEN Assembly Connector, Harness Side</th><th>(-) GEN Assembly Connector, Harness Side</th></tr><tr><td>GENLI</td><td>GENRC</td></tr></table> - Is the resistance greater than 10K ohms?	(+) GEN Assembly Connector, Harness Side	(-) GEN Assembly Connector, Harness Side	GENLI	GENRC	Yes GO to HY12 . No REPAIR the short circuit.		
(+) GEN Assembly Connector, Harness Side	(-) GEN Assembly Connector, Harness Side							
GENLI	GENRC							
HY12	CHECK THE GENLI AND GENRC CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between: <table><tr><th>(+) GEN Assembly Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>GENLI</td><td>GENLI</td></tr><tr><td>GENRC</td><td>GENRC</td></tr></table> - Are the resistances less than 5 ohms?	(+) GEN Assembly Connector, Harness Side	(-) PCM Connector, Harness Side	GENLI	GENLI	GENRC	GENRC	Yes GO to HY14 . No REPAIR the open circuit.
(+) GEN Assembly Connector, Harness Side	(-) PCM Connector, Harness Side							
GENLI	GENLI							
GENRC	GENRC							

HY9-HY12

Generator/Regulator System

HY

Test Step		Results / Action to Take						
HY13	CHECK THE ILC CIRCUIT FOR AN OPEN IN THE HARNESS							
- Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) GEN Assembly Con- nector, Harness Side</td></tr><tr><td>ILC</td><td>ILC</td></tr></table> - Is the resistance less than 5 ohms?		(+) PCM Connector, Harness Side	(-) GEN Assembly Con- nector, Harness Side	ILC	ILC	Yes REFER to Charging System and diagnose the charging system by symptom. No REPAIR the open circuit.		
(+) PCM Connector, Harness Side	(-) GEN Assembly Con- nector, Harness Side							
ILC	ILC							
HY14	CHECK THE GENERATOR MONITOR SIGNAL							
- PCM connector connected. - Reconnect the generator/regulator harness connector. - Key on engine running. - Make sure that the engine is idling. - Access the PCM and monitor the GFS PID. - Is the duty cycle between 5% - 97%?		Yes Key in OFF position. The fault is no longer present. The fault could not be isolated. GO to Z1. No Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).						
HY15	CHECK THE GENLI AND ILC CIRCUITS FOR AN OPEN IN THE HARNESS							
Note: LS and Thunderbird have GENLI and ILC circuits. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) GEN Assembly Con- nector, Harness Side</td></tr><tr><td>GENLI</td><td>GENLI</td></tr><tr><td>ILC</td><td>ILC</td></tr></table> - Are the resistances less than 5 ohms?		(+) PCM Connector, Harness Side	(-) GEN Assembly Con- nector, Harness Side	GENLI	GENLI	ILC	ILC	Yes REFER to Charging System and diagnose the charging system by symptom. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) GEN Assembly Con- nector, Harness Side							
GENLI	GENLI							
ILC	ILC							

HY13-HY15

Test JB: Secondary Ignition (COP)
PINPOINT TEST JB: SECONDARY IGNITION (COP)

Secondary Ignition (COP)

JB

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

This pinpoint test is intended to diagnose the following:

- Spark plugs (12405).
- Secondary side of the coil.

Vehicle	Firing Order for Coil On Plug Applications
BASE, 4-cylinder applications	1 3 4 2
Escape 3.0L, LS 3.0L, Taurus 3.0L 4V, Sable 3.0L 4V, Five Hundred, Freestyle, Mariner, Montego	1 4 2 5 3 6
LS 3.9L, Thunderbird	1 5 4 2 6 3 7 8
BASE, 8-cylinder applications	1 3 7 2 6 5 4 8
BASE, 10-cylinder applications	1 6 5 10 2 7 3 8 4 9

Test Step		Results / Action to Take
JB1	VISUAL INSPECTION OF IGNITION SYSTEM	Yes REPAIR as necessary. No GO to JB2 .
	• Visually inspect the engine compartment to make sure all coils are properly and securely connected. • Examine all the wiring harnesses and connectors for damaged, burned, or overheated insulation, and loose or broken conditions. • Make sure the vehicle battery is in good condition and all of the accessories are turned off. • Is a concern present?	
JB2	DTC P0301 THROUGH P0310: MISFIRE ON CYLINDERS 1 THROUGH 10	Yes GO to JB3 . No GO to JB4 .
	• Are any of the above listed DTCs present?	

Caution And JB1-JB2

Secondary Ignition (COP)**JB**

Test Step		Results / Action to Take
JB3	CHECK FOR SPARK AT CYLINDER(S) INDICATED BY THE DTC(S)	
	• Locate and activate the fuel inertia switch to disable the fuel pump. • Disconnect the ignition coil(s) from the spark plug(s). • Connect the air gap spark tester 303-D037 (D81P-6666-A) or its equivalent to the suspect coil. • If a WDS or equivalent diagnostic tool is available, use the scope function to verify that the coil is the problem. • Observe the spark tester while cranking the engine. • Is a bluish-white spark present?	Yes Key in OFF position. GO to JB5. No Key in OFF position. INSPECT the coil boot(s) for the missing cylinder(s). INSTALL a new coil boot(s) if necessary. INSPECT the spark plug(s) for the missing cylinder(s). MEASURE the resistance of the spark plug(s). INSTALL a new spark plug(s) if the resistance is lower than 2K ohms or higher than 20K ohms. GO to JB4.
JB4	CHECK FOR SPARK AT ALL CYLINDERS	
	• Locate and activate the fuel inertia switch to disable fuel pump. • Disconnect the ignition coil(s) from the spark plug(s). • Connect the air gap spark tester 303-D037 (D81P-6666-A) or its equivalent to the suspect coil. • Observe the spark tester at each cylinder while cranking the engine. • Is a bluish-white spark consistent between all cylinders?	Yes Key in OFF position. GO to JB5. No Key in OFF position. INSPECT the coil boot(s) for the missing cylinder(s). INSTALL a new coil boot(s) if necessary. INSPECT the spark plug(s) for the missing cylinder(s). MEASURE the resistance of the spark plug(s). INSTALL a new spark plug(s) if the resistance is lower than 2K ohms or higher than 20K ohms. RECORD the cylinder(s) with inconsistent spark. GO to JB7.
JB5	CHECK THE SPARK PLUGS	
	• Remove and inspect the plugs for damage, wear, carbon deposits, and proper plug gap. • Are the plugs OK?	Yes GO to JB6. No REPAIR the plug(s). ADJUST the gap or INSTALL a new spark plug(s) as necessary.

Secondary Ignition (COP)**JB**

Test Step		Results / Action to Take
JB6	CHECK SPARK PLUG RESISTANCE - Measure the spark plug resistance. - Is the resistance between 2,000 and 20,000 ohms?	Yes GO to JB7. No INSTALL a new spark plug.
JB7	TEST DIRECTION FOR SYMPTOM CHARTS Were you directed to this pinpoint test from Symptom Charts?	Yes Concern is elsewhere. RETURN to Symptom Charts for further direction. No GO to JB8.
JB8	TEST DIRECTION FOR PINPOINT TEST HD Were you directed to this pinpoint test from pinpoint test step HD4?	Yes GO to HD6. No GO to JB9.
JB9	TEST DIRECTION FOR PINPOINT TEST A Were you directed to this pinpoint test from pinpoint test step A9?	Yes GO to A10. No Intermittent: GO to Z1.

JB6-JB9

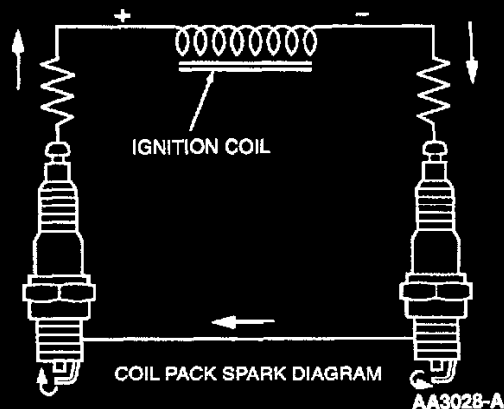
Test JC: Secondary Ignition (Coil Pack)
PINPOINT TEST JC: SECONDARY IGNITION (COIL PACK)

Secondary Ignition (Coil Pack)

JC

This pinpoint test is intended to diagnose the following:

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

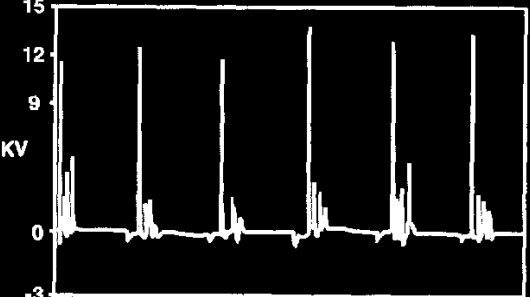


Focus, Taurus 2V, Sable 2V, 4.0L Mustang, Ranger, Monterey, Freestar, 4.0L Explorer, 4.0L Mountaineer, 4.2L F-Series, Explorer Sport Trac.

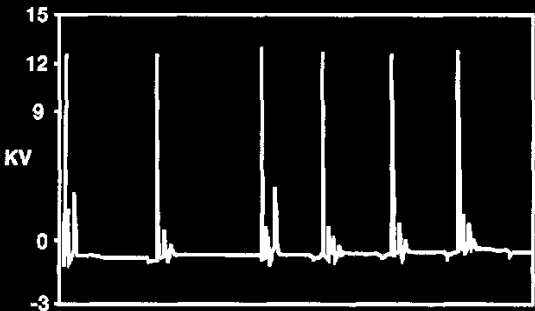
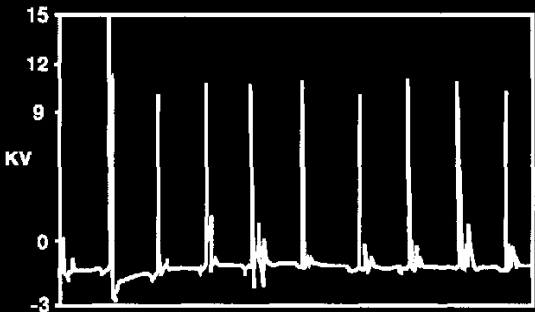
Test Step		Results / Action to Take
JC1	VISUAL INSPECTION OF THE IGNITION SYSTEM	
• Visually inspect the engine compartment to make sure all coils and spark plug wires are properly and securely connected. • Examine all wiring harnesses and connectors for damaged, burned or overheated insulation and loose or broken conditions. • Make sure the vehicle battery is in good condition and all accessories are turned off. • Is a problem indicated?		Yes REPAIR as necessary. No For Coil pack using engine analyzer. GO to JC2 . For Coil pack not using engine analyzer. GO to JC11 .
JC2	CONNECT THE ENGINE ANALYZER	
• Obtain an engine analyzer to diagnose concerns in the secondary side of the ignition system. • Is the engine analyzer connected?		Yes GO to JC3 . No REPEAT Step JC2.

Note And JC1-JC2

Secondary Ignition (Coil Pack)**JC**

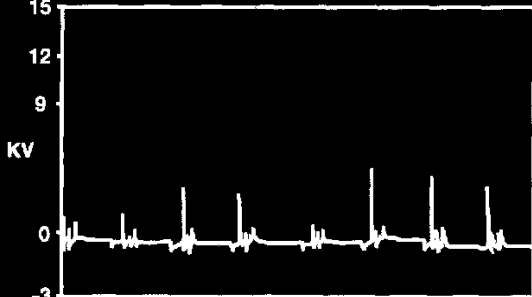
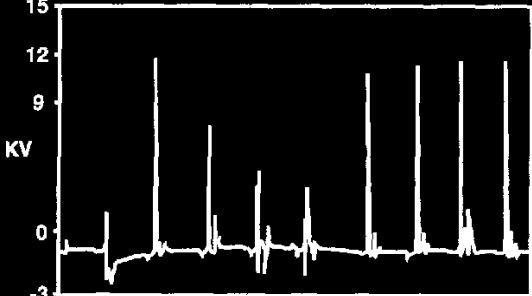
Test Step		Results / Action to Take
JC3	CHECK FOR IGNITION PATTERN •  A0027507 FIRING ORDER Observe the pattern on a scope while cranking the engine. • Is the pattern flat, which indicates no spark on all cylinders?	Yes Key in OFF position. IGN/START/RUN circuit concern. CHECK the condition of related fuses/fuse links. If OK, REPAIR the open circuit. If the fuse/fuse link is damaged, CHECK the IGN START/RUN circuit for a short to ground. REPAIR as necessary. No GO to JC4.
JC4	CHECK FOR A NORMAL IGNITION PATTERN Note: Spark plugs may be fired more than once per combustion event. Multi-strike operating mode is RPM dependent. •  A0027508 FIRING ORDER Key on, start the engine. If no start, crank the engine. • Are the patterns even and is the average value of spark plug firing voltage between 9 kV and 15 kV (higher during engine crank/no start)?	Yes GO to Z1. No GO to JC5.
JC5	IGNITION PATTERN EVALUATION • Is the Ignition pattern normal?	Yes GO to JC6. No GO to JC7.

Secondary Ignition (Coil Pack)**JC**

Test Step		Results / Action to Take
JC6	TEST DIRECTION Were you directed to this pinpoint test from pinpoint test step A9?	Yes GO to A10. No GO to JC7.
JC7	CHECK FOR MISSING SPARK PATTERNS  A0027509 FIRING ORDER - Is the spark pattern inconsistent?	Yes INSPECT the spark plug wires for missing cylinders. MEASURE the resistance of the spark plug wires. INSTALL a new spark plug wire if the resistance is greater than 7,000 ohms per 30.5 cm (1 foot). GO to JE1. No GO to JC8.
JC8	CHECK FOR A HIGH SPARK PLUG FIRING VOLTAGE  A0027511 FIRING ORDER - Is the average value of the spark plug firing voltage greater than 15 Kv?	Yes INSPECT the spark plug wires for missing cylinders. MEASURE the resistance of the spark plug wires. INSTALL a new spark plug wire if the resistance is greater than 7,000 ohms per 30.5 cm (1 foot). No GO to JC9.

Secondary Ignition (Coil Pack)

JC

Test Step		Results / Action to Take
JC9	CHECK FOR LOW SPARK PLUG FIRING VOLTAGE  A0027512 CHECK the spark plug firing voltage average pattern. Is there consistently low spark plug firing voltage or sloping sparkline on one or more cylinders?	Yes INSPECT the spark plug wires for missing cylinders. MEASURE the resistance of the spark plug wires. INSTALL a new spark plug wire if the resistance is greater than 7,000 ohms per 30.5 cm (1 foot). MEASURE the resistance of the spark plug(s). INSTALL a new spark plug(s) if the resistance is lower than 2,000 or higher than 20,000 ohms. No GO to JC10.
JC10	CHECK FOR EVENNESS BETWEEN CYLINDERS  A0027513 CHECK the spark plug firing voltage average pattern. Is the evenness of spark plug firing voltage greater than 6 kV?	Yes INSPECT the spark plug wires for missing cylinders. MEASURE the resistance of the spark plug wires. INSTALL a new spark plug wire if the resistance is greater than 7,000 ohms per 30.5 cm (1 foot). CHECK for damaged spark plugs or narrow spark plug gaps. MEASURE the resistance of the spark plugs. INSTALL a new spark plugs if the resistance is if lower than 2,000 or higher than 20,000 ohms. No GO to Z1.
JC11	DTC P0301 THROUGH P0306: MISFIRE ON CYLINDERS 1 THROUGH 6 Are any of the above listed DTCs present?	Yes GO to JC12. No GO to JC13.

Secondary Ignition (Coil Pack)

JC

Test Step		Results / Action to Take
JC12	CHECK FOR SPARK AT THE CYLINDER(S) INDICATED BY THE DTC(S)	
	- Disable the inertia switch. - Disconnect the spark plug wire(s) from the spark plug(s). - Connect the air gap spark tester 303-D037 (D81P-6666-A) or its equivalent to a spark plug wire. - Check for spark while cranking the engine. Is the bluish-white spark present?	Yes Key in OFF position. GO to JC14. No Key in OFF position. INSPECT the spark plug wires for missing cylinders. MEASURE the resistance of the spark plug wires. INSTALL a new spark plug wire if the resistance is greater than 7,000 ohms per 30.5 cm (1 foot). If the spark plug wires are OK, GO to JE1.
JC13	CHECK FOR SPARK AT ALL CYLINDERS	
	- Disable the inertia switch. - Disconnect the spark plug wire(s) from the spark plug(s). - Connect the air gap spark tester 303-D037 (D81P-6666-A) or its equivalent to a spark plug wire. - Check for spark while cranking the engine. Is the bluish-white spark present?	Yes Key in OFF position. GO to JC14. No Key in OFF position. INSPECT the spark plug wires for missing cylinders. MEASURE the resistance of the spark plug wires. INSTALL a new spark plug wire(s), if the resistance is greater than 7,000 ohms per 30.5 cm (1 foot). If the spark plug wires are OK, GO to JE1.
JC14	CHECK THE SPARK PLUGS	
	- Check for damaged spark plugs or narrow spark plug gaps. Are the plugs OK?	Yes GO to JC15. No REPAIR the plugs. ADJUST the gap or INSTALL a new plug as necessary.
JC15	CHECK THE SPARK PLUG RESISTANCE	
	- Measure the spark plug resistance. Is the resistance between 2,000 and 20,000 ohms?	Yes GO to Z1. No INSTALL a new spark plug(s).

JC12-JC15

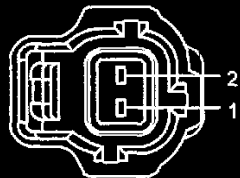
Test JD: Crankshaft Position (CKP) Sensor

PINPOINT TEST JD: CRANKSHAFT POSITION (CKP) SENSOR

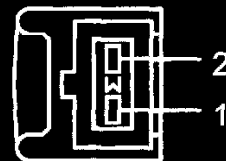
Crankshaft Position (CKP) Sensor**JD**

This pinpoint test is intended to diagnose the following:

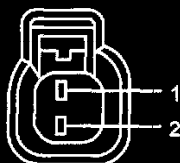
- Crankshaft Position (CKP) Sensor. (6C135).
- Harness Circuits: CKP(+) and CKP(-).
- Powertrain control module (PCM) (12A650).

Crankshaft Position (CKP) Sensor Connector**A**

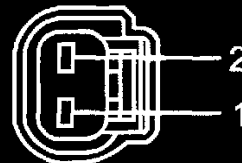
A0077560

B

A0077522

C

A0077568

D

A0077505

Note And Connector

Crankshaft Position (CKP) Sensor**JD**

Vehicle	Connector	Circuit	Pin
Escape, Mariner	A	CKP- CKP+	2 1
Explorer 4.0L, Mountaineer 4.0L, Mustang 4.0L, Ranger 4.0L	B	CKP- CKP+	2 1
LS 3.9L, Thunderbird	C	CKP- CKP+	1 2
All other vehicles	D	CKP- CKP+	2 1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator, LS, Thunderbird	150 (60-32-58) Pin	CKP+ CKP-	E55 E56
E-Series, F-Super Duty, Mustang	170 Pin	CKP+ CKP-	E47 E46
Excursion, Explorer SportTrac, Freestar/Monterey, Ford GT, Ranger, Sable, Taurus	104 Pin	CKP+ CKP-	21 22
Expedition, F-150, Navigator	190 Pin	CKP+ CKP-	E47 E46
All other vehicles	150 (50-50-50) Pin	CKP+ CKP-	E34 E45

Crankshaft Position (CKP) Sensor

JD

Test Step		Results / Action to Take						
JD1	CHECK THE CRANKSHAFT POSITION (CKP) SENSOR SIGNAL SENT TO THE PCM Note: On certain applications with electronic throttle control (ETC), erroneous ignition and ETC-related DTCs may be set due to salt water intrusion into the crankshaft position (CKP) sensor harness connector. These DTCs are set in the following combinations: — P0320, P0351, and P2106. — P0320, P0356, and P2106. Thoroughly clean the connector, pack with di-electric grease and retest. If the problem returns, continue the CKP sensor diagnosis. • Battery fully charged and starting system functioning properly. • Diagnostic tool connector connected. • Disable the inertia switch. • Key in ON position. • Access the PCM and monitor the RPM PID. • Crank the engine. • Is the RPM greater than 150 RPM?	Yes CKP, PCM and harness working properly. Concern is elsewhere. RETURN to Symptom Charts for further direction. No GO to JD2.						
JD2	CHECK THE TIMING COVER, CKP SENSOR AND EXTERNAL TRIGGER WHEEL (OUTSIDE THE TIMING COVER) FOR OBVIOUS PHYSICAL DAMAGE • Key in OFF position. • Visually CHECK the timing cover, CKP sensor and external trigger wheel (outside the timing cover) for obvious physical damage. • Do any parts appear physically damaged?	Yes REPAIR as necessary. No GO to JD3.						
JD3	CHECK FOR PROPER CKP BIAS VOLTAGES IN THE PCM • CKP Sensor connector disconnected. • Key in ON position. • Measure the voltage between:<table border="1"><tr><td>(+) CKP Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>CKP+</td><td>Negative terminal</td></tr><tr><td>CKP-</td><td>Negative terminal</td></tr></table> • Are the voltages between 1 V - 3 V?	(+) CKP Sensor Connector, Harness Side	(-) Vehicle Battery	CKP+	Negative terminal	CKP-	Negative terminal	Yes GO to JD4. No GO to JD6.
(+) CKP Sensor Connector, Harness Side	(-) Vehicle Battery							
CKP+	Negative terminal							
CKP-	Negative terminal							

Crankshaft Position (CKP) Sensor

JD

Test Step		Results / Action to Take						
JD4	CHECK THE CKP SENSOR RESISTANCE • Key in OFF position. • Measure the resistance between:<table><tr><td>(+) CKP Sensor Connector, Component Side</td><td>(-) CKP Sensor Connector, Component Side</td></tr><tr><td>CKP+</td><td>CKP-</td></tr></table> • Note: The CKP sensor resistance values change significantly with temperature rise. • Is the resistance between 250 ohms - 1K ohms?	(+) CKP Sensor Connector, Component Side	(-) CKP Sensor Connector, Component Side	CKP+	CKP-	Yes GO to JD5. No INSTALL a new CKP sensor.		
(+) CKP Sensor Connector, Component Side	(-) CKP Sensor Connector, Component Side							
CKP+	CKP-							
JD5	CHECK THE CKP 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:<table><tr><td>(+) CKP_SHLD Assembly Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>CKP_SHLD</td><td>Negative terminal</td></tr></table> • Is the resistance less than 5 ohms?	(+) CKP_SHLD Assembly Connector, Harness Side	(-) Vehicle Battery	CKP_SHLD	Negative terminal	Yes GO to JD6. No REPAIR the open circuit. CHECK for a poor ground connection.		
(+) CKP_SHLD Assembly Connector, Harness Side	(-) Vehicle Battery							
CKP_SHLD	Negative terminal							
JD6	CHECK FOR SHORT BETWEEN CKP(+) AND CKP(-) IN THE HARNESS • Key in OFF position. • PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) CKP Sensor Connector, Harness Side</td><td>(-) CKP Sensor Connector, Harness Side</td></tr><tr><td>CKP+</td><td>CKP-</td></tr></table> • Is the resistance greater than 10K ohms?	(+) CKP Sensor Connector, Harness Side	(-) CKP Sensor Connector, Harness Side	CKP+	CKP-	Yes GO to JD7. No REPAIR the short circuit.		
(+) CKP Sensor Connector, Harness Side	(-) CKP Sensor Connector, Harness Side							
CKP+	CKP-							
JD7	CHECK THE CKP CIRCUIT(S) FOR AN OPEN IN THE HARNESS • Measure the resistance between:<table><tr><td>(+) CKP Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>CKP-</td><td>CKP-</td></tr><tr><td>CKP+</td><td>CKP+</td></tr></table> • Are the resistances less than 5 ohms?	(+) CKP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	CKP-	CKP-	CKP+	CKP+	Yes GO to JD8. No REPAIR the open circuit.
(+) CKP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side							
CKP-	CKP-							
CKP+	CKP+							

Crankshaft Position (CKP) Sensor**JD**

Test Step		Results / Action to Take						
JD8	CHECK THE CKP CIRCUIT(S) FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) CKP Sensor Connector, Harness Side</th><th>(-) Vehicle Battery</th></tr><tr><td>CKP+</td><td>Negative terminal</td></tr><tr><td>CKP-</td><td>Negative terminal</td></tr></table> - Are the resistances greater than 10K ohms?	(+) CKP Sensor Connector, Harness Side	(-) Vehicle Battery	CKP+	Negative terminal	CKP-	Negative terminal	Yes GO to JD9. No REPAIR the short circuit to GND.
(+) CKP Sensor Connector, Harness Side	(-) Vehicle Battery							
CKP+	Negative terminal							
CKP-	Negative terminal							
JD9	CHECK THE CKP CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) Vehicle Battery</th></tr><tr><td>CKP+</td><td>Negative terminal</td></tr><tr><td>CKP-</td><td>Negative terminal</td></tr></table> - Is any voltage present?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	CKP+	Negative terminal	CKP-	Negative terminal	Yes REPAIR the short circuit to PWR. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
(+) PCM Connector, Harness Side	(-) Vehicle Battery							
CKP+	Negative terminal							
CKP-	Negative terminal							

JD8-JD9

Test JE: Integrated Ignition Coil Pack A, B or C Failure**PINPOINT TEST JE: INTEGRATED IGNITION COIL PACK A, B OR C FAILURE**

Integrated Ignition Coil Pack A, B, or C Failure

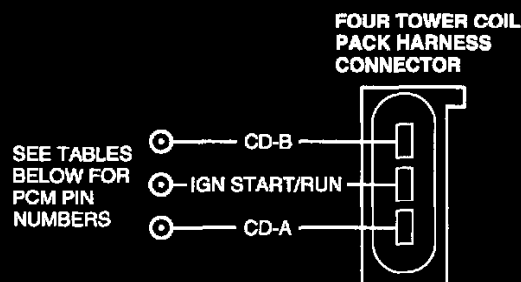
JE

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).

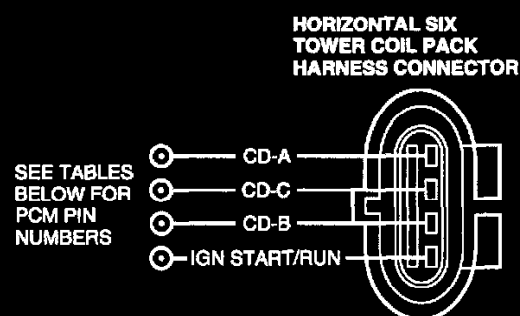
Pinpoint Test Schematics and Connectors

For PCM connector views, refer to Description and Operation, Powertrain Control Hardware.



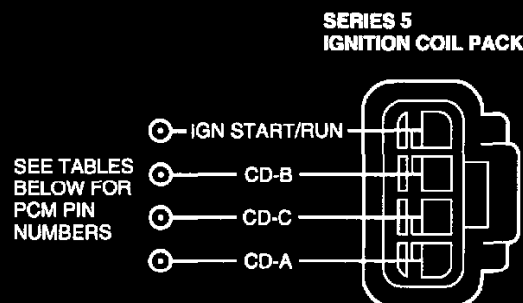
**NOTE: ALL HARNESS CONNECTORS ARE
VIEWED INTO MATING SURFACE**

A0040144



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

A0040145



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

A0040146

Note, Schematics And Connectors

Integrated Ignition Coil Pack A, B, or C Failure

JE

IGNITION COIL TO CYLINDER CORRELATION

Vehicle	Re- lated DTC	Cyl- der Num- ber	Ignition Coil	Coil Driver (CD)	PCM Pin
4 cylinders	P0351	1	A	A	26
	P0352	2	B	B	52
	P0353	3	B	B	52
	P0354	4	A	A	26
6 cylinders	P0351	1	A	A	26
	P0352	4	B	B	52
	P0353	2	C	C	78
	P0351	5	A	A	26
	P0352	3	B	B	52
	P0353	6	C	C	78
Explorer, Mountaineer 4.0L	P0351	1	A	A	E1
	P0352	4	B	B	E12
	P0353	2	C	C	E24
	P0351	5	A	A	E1
	P0352	3	B	B	E12
	P0353	6	C	C	E24
F-150, Mustang	P0351	1	A	A	E17
	P0352	2	B	C	E16
	P0353	3	C	B	E12
	P0351	4	A	B	E12
	P0352	5	B	A	E17
	P0353	6	C	C	E16

Chart

Integrated Ignition Coil Pack A, B, or C Failure**JE**

Test Step		Results / Action to Take
JE1	DETERMINE WHICH COIL IS NOT FIRING PROPERLY	Yes GO to JE2. No To obtain the required information, repeat step JE1.
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. - Record the suspect cylinder, coil and PCM pin number from the table. - Determine which coil is not firing properly using the information from Pinpoint Test JB or a DTC and the table at the beginning of this pinpoint test. - Record the suspect cylinder, coil and PCM pin number from the table. Have the suspect cylinder number, coil driver and PCM pin number been recorded?		
JE2	DTC P0351, P0352, P0353: CHECK IGN START/RUN VOLTAGE TO THE COIL PACK	Yes Key in OFF position. GO to JE3. No IGN START/RUN circuit fault KEY OFF. CHECK the condition of the related fuses/ fuse links. If OK, REPAIR the open circuit. If the fuse/ fuse link is damaged, CHECK the IGN START/RUN circuit for short to ground. REPAIR as necessary. CARRY OUT the misfire monitor drive cycle. REFER to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle.
- Disconnect the suspect coil, as determined from the table. - Key in ON position. - Measure the voltage between the IGN START/RUN circuit at the coil pack harness connector and ground. Is the voltage greater than 10 volts?		
JE3	CHECK THE FUNCTIONALITY OF THE SUSPECT COIL DRIVER (CD) CIRCUIT	Yes Key in OFF position. GO to JE7. No Key in OFF position. GO to JE4.
- Connect an test lamp between IGN START/RUN and the suspect CD circuit (determined from the table) at the coil pack harness connector. - Locate and activate the fuel inertia switch to disable the fuel pump. - Observe the test lamp while cranking the engine. Did the test lamp blink consistently?		

JE1-JE3

Integrated Ignition Coil Pack A, B, or C Failure

JE

Test Step		Results / Action to Take
JE4	CHECK THE SUSPECT CD CIRCUIT FOR AN OPEN IN THE HARNESS	
	- Disconnect the PCM. - Measure the resistance of the suspect CD circuit between the PCM harness connector pin (as determined from the table) and the coil pack connector. Is the resistance less than 5 ohms?	Yes GO to JE5. No REPAIR the open circuit. CARRY OUT the misfire monitor drive cycle. REFER to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle.
JE5	CHECK THE SUSPECT CD CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS	
	- Key in ON position. - Measure the voltage between the suspect CD circuit at the PCM harness connector (as determined from the table) and ground. Is the voltage less than 1 volt?	Yes Key in OFF position. GO to JE6. No Key in OFF position. REPAIR the short circuit. CARRY OUT the misfire monitor drive cycle. REFER to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle.
JE6	CHECK THE SUSPECT CD CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS	
	- Disconnect the diagnostic tool. - Measure the resistance between the suspect CD circuit at the PCM harness connector (as determined from the table) and ground. Is the resistance greater than 10K ohms?	Yes Install a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). GO to JE7. No REPAIR the short circuit. CARRY OUT the misfire monitor drive cycle. REFER to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle.
JE7	CHECK THE SUSPECT COIL FOR DAMAGE	
	- Remove the spark plug wire from the suspect coil tower (as determined from the table). - Connect the air gap spark tester 303-DO37 (D81P-6666-A) or its equivalent in series between the suspect coil tower and the spark plug wire. - Disable the Inertia switch. - Observe the spark tester while cranking the engine. Is a bluish-white spark present?	Yes Key in OFF position. GO to Z1. No INSTALL a new coil pack as needed. CARRY OUT the misfire monitor drive cycle. REFER to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle.

JE4-JE7

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

PINPOINT TEST JF: INTEGRATED IGNITION COIL ON PLUG COIL A THROUGH J FAILURE

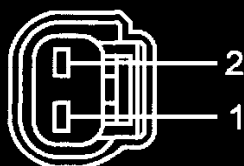
Integrated Ignition Coil On Plug Coil A Through J Failure

JF

This pinpoint test is intended to diagnose the following:

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

Coil On Plug (COP) Connector



A0077505

Vehicle	Connector	Circuit	Pin
Escape, Expedition, Five Hundred 3.0L, Ford GT, Freestyle 3.0L, LS, Mariner, Montego 3.0L, Navigator, Thunderbird	A	COP IGN START/RUN	1 2
All other vehicles	A	COP IGN START/RUN	2 1

IGNITION COIL TO CYLINDER CORRELATION

Vehicle	Related DTC	Cylinder Number	Ignition Coil	Coil Driver (CD)	PCM Pin
4-Cylinder Applications	P0351	1	A	A	E1
	P0352	2	B	D	E12
	P0353	3	C	B	E24

(Continued)

Note, Connector And Chart

Integrated Ignition Coil On Plug Coil A Through J Failure

JF
IGNITION COIL TO CYLINDER CORRELATION

Vehicle	Related DTC	Cylinder Number	Ignition Coil	Coil Driver (CD)	PCM Pin
Five Hundred, Freestyle, Montego	P0354	4	D	C	E35
	P0351	1	A	A	E1
	P0352	2	B	C	E12
	P0353	3	C	E	E24
	P0354	4	D	B	E35
	P0355	5	E	D	E38
LS 3.0L	P0356	6	F	F	E39
	P0351	1	A	A	E58
	P0352	2	B	C	E48
	P0353	3	C	E	E60
	P0354	4	D	B	E12
	P0355	5	E	D	E22
Escape 3.0L, Mariner	P0356	6	F	F	E30
	P0351	1	A	A	E1
	P0352	2	B	C	E12
	P0353	3	C	E	E24
	P0354	4	D	B	E35
	P0355	5	E	D	E36
Taurus, Sable	P0356	6	F	F	E22
	P0351	1	A	A	26
	P0352	2	B	C	78
	P0353	3	C	E	79
	P0354	4	D	B	52
	P0355	5	E	D	2
LS, Thunderbird, 3.9L	P0356	6	F	F	82
	P0351	1	A	A	E58
	P0352	2	B	D	E59
	P0353	3	C	F	E60
	P0354	4	D	C	E48
	P0355	5	E	B	E12
Aviator	P0356	6	F	E	E22
	P0357	7	G	G	E30
	P0358	8	H	H	E38
	P0351	1	A	A	B31
	P0352	2	B	D	B1
	P0353	3	C	B	B23

(Continued)

Chart

Integrated Ignition Coil On Plug Coil A Through J Failure

JF

IGNITION COIL TO CYLINDER CORRELATION

Vehicle	Related DTC	Cylinder Number	Ignition Coil	Coil Driver (CD)	PCM Pin
	P0354	4	D	G	B30
	P0355	5	E	F	B22
	P0356	6	F	E	B12
	P0357	7	G	C	B13
	P0358	8	H	H	B38
Explorer, Mountaineer 4.6L, Crown Victoria, Grand Marquis	P0351	1	A	A	E1
	P0352	2	B	D	E12
	P0353	3	C	B	E24
	P0354	4	D	G	E35
	P0355	5	E	F	E38
	P0356	6	F	E	E39
	P0357	7	G	C	E42
	P0358	8	H	H	E43
F-150	P0351	1	A	A	E17
	P0352	2	B	D	E11
	P0353	3	C	B	E12
	P0354	4	D	G	E14
	P0355	5	E	F	E10
	P0356	6	F	E	E15
	P0357	7	G	C	E16
	P0358	8	H	H	E9
Expedition, Navigator, E-Series, Mustang 4.6L, F-Super Duty 5.4L	P0351	1	A	A	E35
	P0352	2	B	D	E1
	P0353	3	C	B	E24
	P0354	4	D	G	E23
	P0355	5	E	F	E34
	P0356	6	F	E	E46
	P0357	7	G	C	E12
	P0358	8	H	H	E11
Excursion 5.4L	P0351	1	A	A	26
	P0352	2	B	G	104
	P0353	3	C	C	52

(Continued)

Chart

Integrated Ignition Coil On Plug Coil A Through J Failure

JF

IGNITION COIL TO CYLINDER CORRELATION

Vehicle	Related DTC	Cylinder Number	Ignition Coil	Coil Driver (CD)	PCM Pin
	P0354	4	D	F	53
	P0355	5	E	D	27
	P0356	6	F	B	1
	P0357	7	G	E	78
	P0358	8	H	H	79
Ford GT	P0351	1	A	A	75
	P0352	2	B	D	101
	P0353	3	C	B	74
	P0354	4	D	G	100
	P0355	5	E	F	73
	P0356	6	F	E	99
	P0357	7	G	C	72
	P0358	8	H	H	98
Excursion 6.8L	P0351	1	A	A	26
	P0352	2	B	E	78
	P0353	3	C	G	104
	P0354	4	D	J	102
	P0355	5	E	C	52
	P0356	6	F	B	1
	P0357	7	G	F	53
	P0358	8	H	H	79
	P0359	9	J	K	82
	P0360	10	K	D	27
E-Series, F-Superduty 6.8L	P0351	1	A	A	E17
	P0352	2	B	E	E11
	P0353	3	C	G	E12
	P0354	4	D	I	E14
	P0355	5	E	C	E10
	P0356	6	F	B	E15
	P0357	7	G	F	E16
	P0358	8	H	H	E9
	P0359	9	I	J	E13
	P0360	10	J	D	E8
Town Car	P0351	1	A	A	E1
	P0352	2	B	D	E12
	P0353	3	C	B	E24
	P0354	4	D	G	E35
	P0355	5	E	F	E38

(Continued)

Chart

Integrated Ignition Coil On Plug Coil A Through J Failure

JF

IGNITION COIL TO CYLINDER CORRELATION

Vehicle	Related DTC	Cylinder Number	Ignition Coil	Coil Driver (CD)	PCM Pin
	P0356	6	F	E	E39
	P0357	7	G	C	E42
	P0358	8	H	H	E43

Test Step		Results / Action to Take
JF1	DETERMINE WHICH COIL IS NOT FIRING PROPERLY	Yes GO to JF2. No REPEAT the test step to obtain the required information.
	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 the information from Pinpoint Test JB or a DTC and the table at the beginning of this pinpoint test. - Record the suspect cylinder, coil and PCM pin number from the table. - Have the suspect cylinder number, coil driver and PCM pin number been recorded?	
JF2	CHECK THE FUNCTIONALITY OF THE SUSPECT COIL DRIVER CIRCUIT	Yes Key in OFF position. GO to JF3. No Key in OFF position. GO to JF4.
	- Suspect Coil connector disconnected. - Connect a non-powered test lamp between the IGN START/RUN and suspect coil driver, harness side. - Disable the fuel pump by disconnecting the inertia fuel shutoff switch. - Observe the test lamp while cranking the engine. - Is the test lamp blinking consistently?	
JF3	CHECK THE FUNCTIONALITY OF THE SUSPECT COIL	Yes Key in OFF position. GO to Z1. No Key in OFF position. INSTALL a new Suspect Coil. If necessary, INSTALL a new spark plug.
	- Carry out a visual inspection. Closely inspect the coil case and boot for carbon tracking, cracks and torn or improperly installed boots. - Remove the suspect COP from the spark plug. - Connect the air gap spark tester 303-DO37 (D81P-6666-A) or its equivalent in series between the suspect coil tower and the spark plug wire. - Suspect Coil connector connected. - Observe the spark tester while cranking the engine. - Is a bluish-white spark present?	

Chart And JF1-JF3

Integrated Ignition Coil On Plug Coil A Through J Failure

JF

Test Step		Results / Action to Take				
JF4	CHECK IGN START/RUN VOLTAGE TO SUSPECT COIL • Key in ON position. • Suspect Coil connector disconnected. • Measure the voltage between:<table><tr><td>(+) COP Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>IGN START/RUN</td><td>Negative terminal</td></tr></table> • Is the voltage greater than 10.5 V?	(+) COP Connector, Harness Side	(-) Vehicle Battery	IGN START/RUN	Negative terminal	Yes Key in OFF position. GO to JF6. No Key in OFF position. GO to JF5.
(+) COP Connector, Harness Side	(-) Vehicle Battery					
IGN START/RUN	Negative terminal					
JF5	DETERMINE THE VEHICLE BEING DIAGNOSED • Are you diagnosing an LS, Crown Victoria, Grand Marquis, Mustang, Thunderbird or Town Car?	Yes GO to B4. No REPAIR the open circuit.				
JF6	CHECK THE SUSPECT COIL DRIVER CIRCUIT FOR AN OPEN IN THE HARNESS • PCM connector disconnected. • Suspect Coil connector disconnected. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) COP Connector, Harness Side</td></tr><tr><td>Suspect coil driver.</td><td>COP</td></tr></table> • Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) COP Connector, Harness Side	Suspect coil driver.	COP	Yes GO to JF7. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) COP Connector, Harness Side					
Suspect coil driver.	COP					
JF7	CHECK THE SUSPECT COIL DRIVER CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS • Key in ON position. • Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>Suspect coil driver.</td><td>Negative terminal</td></tr></table> • Is the voltage less than 1 V?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	Suspect coil driver.	Negative terminal	Yes Key in OFF position. GO to JF8. No Key in OFF position. REPAIR the short circuit to PWR.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
Suspect coil driver.	Negative terminal					
JF8	CHECK THE SUSPECT COIL DRIVER CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>Suspect coil driver.</td><td>Negative terminal</td></tr></table> • Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	Suspect coil driver.	Negative terminal	Yes INSTALL a new PCM and retest vehicle. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory. If the concern or DTC is still present, GO to JF9. No REPAIR the short circuit to GND.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
Suspect coil driver.	Negative terminal					

JF4-JF8

**Integrated Ignition Coil On Plug Coil A
Through J Failure****JF**

Test Step		Results / Action to Take
JF9	CHECK THE SUSPECT COIL FOR DAMAGE	
	• PCM connector connected. • Connect the air gap spark tester 303-DO37 (D81P-6666-A) or its equivalent in series between the suspect coil tower and the spark plug wire. • Locate and activate the fuel inertia switch to disable fuel pump. • Observe the spark tester while cranking the engine. • Is a bluish-white spark present?	Yes Key in OFF position. If necessary, INSTALL a new spark plug. No Key in OFF position. INSTALL a new Suspect Coil.

JF9**Test JH: Tachometer Signal Output (CTO)**
PINPOINT TEST JH: TACHOMETER SIGNAL OUTPUT (CTO)

Tachometer Signal Output (CTO)**JH**

This pinpoint test is intended to diagnose the following:

- Harness circuits: CTO.
- Powertrain control module (PCM) (12A650).

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Explorer SportTrac, Ranger	104 Pin	SIGRTN PWRGND VREF VPWR CTO	91 103 90 71 48
Mustang	170 Pin	SIGRTN PWRGND VREF VPWR CTO	B43, E33, T41 B47 B40, E24 B35 B25
All other vehicles	170 Pin	SIGRTN PWRGND VREF VPWR CTO	B41, E58, T41 B47 B40, E57 B35 B25

Test Step		Results / Action to Take
JH1	CHECK THE CTO SIGNAL FROM THE PCM	
Note: Refer to Vehicle/Diagrams for module and connector locations. • Disconnect the instrument cluster harness connector. • PCM connector connected. • Key on engine running. • Measure the voltage between the instrument cluster CTO circuit, harness side and battery negative terminal. • Is the voltage between 3 and 9 volts?		Yes REFER to Instrument Panel, Gauges and Warning Indicators to continue diagnosis on the circuitry for the CTO. No Key in OFF position. GO to JH2 .

Note, Connector And JH1

Tachometer Signal Output (CTO)

JH

Test Step		Results / Action to Take						
JH2	CHECK THE CTO FOR A SHORT TO POWER IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>CTO</td><td>VPWR</td></tr><tr><td>CTO</td><td>VREF</td></tr></table> - Are the resistances greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	CTO	VPWR	CTO	VREF	Yes Key in OFF position. GO to JH3. No Key in OFF position. REPAIR the short circuit to PWR.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
CTO	VPWR							
CTO	VREF							
JH3	CHECK THE CTO CIRCUIT FOR A SHORT TO GROUND - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>CTO</td><td>PWRGND</td></tr><tr><td>CTO</td><td>SIGRTN</td></tr></table> - Are the resistances greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	CTO	PWRGND	CTO	SIGRTN	Yes GO to JH4. No REPAIR the short circuit to GND.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
CTO	PWRGND							
CTO	SIGRTN							
JH4	CHECK THE CTO CIRCUIT FOR AN OPEN IN THE HARNESS - CHECK the CTO circuit resistance. - Is the resistance less than 5 ohms?	Yes GO to JH5. No REPAIR the open circuit.						
JH5	CHECK THE CTO CIRCUIT FOR INTERMITTENT FAULTS - Lightly tap on the CTO and wiggle the harness connector to simulate road shock. - Measure the CTO resistance between the PCM and the instrument cluster. - Is the resistance less than 5 ohms?	Yes Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No Key in OFF position. REPAIR the open circuit.						

JH2-JH5

Test KA: Fuel Pump (FP) Relay
PINPOINT TEST KA: FUEL PUMP (FP) RELAY

Fuel Pump (FP) Relay

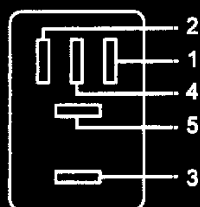
KA

This pinpoint test is intended to diagnose the following:

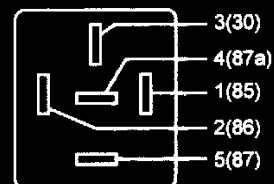
- Fuel pump relay (9345).
- Inertia fuel shutoff (IFS) switch (9341).
- Harness circuits: B+, VPWR, FP, GND, FPM, and FP PWR.
- Powertrain control module (PCM) (12A650).

Fuel Pump (FP) Relay Connector

The VPWR and FP circuits may be reversed in the harness connector. Refer to Vehicle/Diagrams for more information.

A

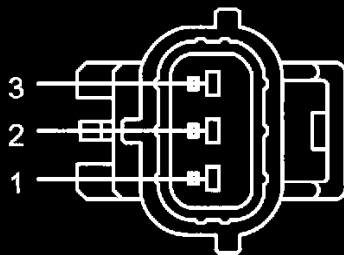
A0077584

B

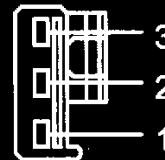
A0077582

Vehicle	Connector	Circuit	Pin
Ranger	A	B+ FPPWR FP VPWR	3 5 1 2
All other vehicles	B	B+ FPPWR FP VPWR	3 5 1 2

Note And Connector

Fuel Pump (FP) Relay**KA****Inertia Fuel Shutoff (IFS) Connector****A**

N0012090

B

A0077528

Vehicle	Connector	Circuit	Pin
Excursion, Focus	A	FPPWR-B FPPWR-A	1 3
All other vehicles	B	FPPWR-B FPPWR-A	1 2

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Connector	Circuit	Pin
104 Pin	FPM FP	40 80

FP Relay Integral to the PDJB

Excursion.

KA



Item	Description
1	PCM Power Relay
2	Fuel Pump Relay (Integral to the circuit board)
3	Inertia Fuel Shutoff (IFS) Switch
4	Fuel Pump
5	To Powertrain Control System
A	Power Distribution Junction Box (PDJB) harness connector

Schematics

Fuel Pump (FP) Relay

KA

Item	Description
F	Power Distribution Junction Box (PDJB) harness connector
H	Power Distribution Junction Box (PDJB) harness connector

Test Step		Results / Action to Take				
KA1	KOEO DTC P0230: CHECK THE VPWR VOLTAGE TO FUEL PUMP RELAY - FP Relay connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) FP Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) FP Relay Connector, Harness Side	(-)	VPWR	Ground	Yes Key in OFF position. GO to KA2. No REPAIR the open circuit.
(+) FP Relay Connector, Harness Side	(-)					
VPWR	Ground					
KA2	CHECK THE FUEL PUMP RELAY - Refer to the pin numbers indicated on the FP relay. There will be either a pin 1 or pin 85. - Measure the resistance between either pin 1 or pin 85 and all the 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 GO to KA3. No INSTALL a new FP relay.				
KA3	CHECK THE FP CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) FP Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>FP</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) FP Relay Connector, Harness Side	(-)	FP	Ground	Yes Key in OFF position. GO to KA4. No REPAIR the short circuit.
(+) FP Relay Connector, Harness Side	(-)					
FP	Ground					
KA4	CHECK THE FUEL PUMP CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) FP Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>FP</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) FP Relay Connector, Harness Side	(-)	FP	Ground	Yes GO to KA5. No REPAIR the short circuit.
(+) FP Relay Connector, Harness Side	(-)					
FP	Ground					

Schematic And KA1-KA4

Fuel Pump (FP) Relay**KA**

Test Step		Results / Action to Take				
KA5	CHECK THE FUEL PUMP CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) FP Relay Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FP</td><td>FP - Pin 80</td></tr></table> - Is the resistance less than 5 ohms?	(+) FP Relay Connector, Harness Side	(-) PCM Connector, Harness Side	FP	FP - Pin 80	Yes GO to KA6. No REPAIR the open circuit.
(+) FP Relay Connector, Harness Side	(-) PCM Connector, Harness Side					
FP	FP - Pin 80					
KA6	CHECK FOR KOEO DTCS: - Check for KOEO DTCs: - Are DTCs P0231 or P0232 present?	Yes GO to KA7. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).				
KA7	CHECK THE FP PRIMARY CIRCUIT INSIDE THE PCM - PCM connector connected. - FP Relay connector connected. - Key in ON position. - Access the PCM and monitor the FPF PID. - Is the PID state FAULT?	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No GO to KA8.				
KA8	CHECK THE FUEL PUMP PRIMARY CIRCUIT INSIDE THE PCM WHILE CRANKING THE ENGINE - Access the PCM and monitor the FPF PID. - While observing the PID, crank the engine. - Does the PID display indicate a fault during crank?	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No Key in OFF position. Fuel pump primary circuit is OK in the harness and PCM. GO to KA9.				
KA9	IS DTC P0231 PRESENT IN THE KOEO SELF-TEST? - Check for KOEO DTCs: - Is DTC P0231 present?	Yes GO to KA22. No DTC P0232 is present GO to KA10.				

KA5-KA9

Fuel Pump (FP) Relay**KA**

Test Step		Results / Action to Take				
KA10	KOEO DTC P0232: DOES THE ENGINE START? Does the engine start?	Yes GO to KA11. No GO to KA16.				
KA11	VERIFY THAT FUEL PUMP IS OFF - Key in ON position. - Wait for 5 seconds. - The fuel pump is located above the fuel tank. Listen for the sound of the fuel pump operating which can be heard from outside the vehicle. - Is fuel pump OFF with the key on?	Yes GO to KA13. No GO to KA12.				
KA12	CHECK FOR FUEL PUMP RELAY CONTACTS ALWAYS CLOSED - FP Relay connector disconnected. - Key in ON position. - Is fuel pump OFF with the key on?	Yes INSTALL a new FP relay. No REPAIR the short circuit to PWR. (FPPWR/FPM circuit)				
KA13	CHECK THE FPM CIRCUIT FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - FP Relay connector disconnected. - Measure the resistance between:<table><tr><td>(+) FP Relay Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FPPWR</td><td>FPM - Pin 40</td></tr></table> - Is the resistance less than 5 ohms?	(+) FP Relay Connector, Harness Side	(-) PCM Connector, Harness Side	FPPWR	FPM - Pin 40	Yes GO to KA14. No REPAIR the open circuit. (fault is between splice and PCM)
(+) FP Relay Connector, Harness Side	(-) PCM Connector, Harness Side					
FPPWR	FPM - Pin 40					
KA14	WAS KOEO DTC P0231 PRESENT? - Check for KOEO DTCs: - Is DTC P0231 present?	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No GO to KA15.				

Fuel Pump (FP) Relay**KA**

Test Step		Results / Action to Take				
KA15	CHECK THE FPM PRIMARY CIRCUIT INSIDE THE PCM - PCM connector connected. - FP Relay connector connected. - Key in ON position. - Access the PCM and monitor the FPM PID. - Is the PID state OFF?	Yes Key in OFF position. The fault is not present at this time The FPM circuit is OK in the harness and PCM. Disregard DTC P0232 at this time. Concern is elsewhere. RETURN to Symptom Charts for further direction. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).				
KA16	CHECK IF INERTIA FUEL SHUTOFF TRIPPED Is the IFS switch tripped?	Yes RESET the IFS switch. No GO to KA17.				
KA17	CHECK THE INERTIA FUEL SHUTOFF - IFS connector disconnected. - Measure the resistance between:<table><tr><td>(+) IFS Connector, Component Side</td><td>(-) IFS Connector, Component Side</td></tr><tr><td>FPPWR-A</td><td>FPPWR-B</td></tr></table> - Is the resistance less than 5 ohms?	(+) IFS Connector, Component Side	(-) IFS Connector, Component Side	FPPWR-A	FPPWR-B	Yes GO to KA18. No INSTALL a new IFS.
(+) IFS Connector, Component Side	(-) IFS Connector, Component Side					
FPPWR-A	FPPWR-B					
KA18	CHECK THE FP PWR CIRCUIT FOR AN OPEN IN THE HARNESS - FP Relay connector disconnected. - Measure the resistance between:<table><tr><td>(+) IFS Connector, Har-ness Side</td><td>(-) FP Relay Connector, Harness Side</td></tr><tr><td>FPPWR-A</td><td>FPPWR</td></tr></table> - Is the resistance less than 5 ohms?	(+) IFS Connector, Har-ness Side	(-) FP Relay Connector, Harness Side	FPPWR-A	FPPWR	Yes GO to KA19. No REPAIR the open circuit. CHECK for an open circuit between IFS and FPM splice REFER to the Vehicle/Diagrams for additional information.
(+) IFS Connector, Har-ness Side	(-) FP Relay Connector, Harness Side					
FPPWR-A	FPPWR					

Fuel Pump (FP) Relay

KA

Test Step		Results / Action to Take			
KA19	CHECK THE FUEL PUMP GROUND CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to KA20. No REPAIR the open circuit.			
- FP connector disconnected. - Measure the resistance between:<table><tr><td>(+) FP Connector, Har- ness Side</td><td>(-)</td></tr><tr><td>FPGND</td><td>Ground</td></tr></table> - Is the resistance less than 5 ohms?			(+) FP Connector, Har- ness Side	(-)	FPGND
(+) FP Connector, Har- ness Side	(-)				
FPGND	Ground				
KA20	CHECK THE FP PWR CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to KA21. No REPAIR the open circuit.			
- Measure the resistance between:<table><tr><td>(+) FP Connector, Har- ness Side</td><td>(-) IFS Connector, Har- ness Side</td></tr><tr><td>FPPWR</td><td>FPPWR-B</td></tr></table> - Is the resistance less than 5 ohms?			(+) FP Connector, Har- ness Side	(-) IFS Connector, Har- ness Side	FPPWR
(+) FP Connector, Har- ness Side	(-) IFS Connector, Har- ness Side				
FPPWR	FPPWR-B				
KA21	CHECK THE INTERNAL RESISTANCE OF FUEL PUMP	Yes The fuel pump circuit is OK in the harness and PCM. Disregard DTC P0232 at this time. Concern is elsewhere. RETURN to Symptom Charts for further direction. No INSTALL a new FP.			
- Measure the resistance between:<table><tr><td>(+) FP Connector, Har- ness Side</td><td>(-) FP Connector, Har- ness Side</td></tr><tr><td>FPPWR</td><td>FPGND</td></tr></table> - Is the resistance less than 10 ohms?			(+) FP Connector, Har- ness Side	(-) FP Connector, Har- ness Side	FPPWR
(+) FP Connector, Har- ness Side	(-) FP Connector, Har- ness Side				
FPPWR	FPGND				
KA22	KOEO DTC P0231: WAS KOEO DTC P0230 ALSO PRESENT?	Yes GO to KA1. No GO to KA23.			
- Check for KOEO DTCs: - Is DTC P0230 present?					
KA23	DOES THE ENGINE START?	Yes GO to KA13. No GO to KA24.			
Does the engine start?					
KA24	CHECK IF IFS TRIPPED	Yes RESET the IFS switch. No GO to KA25.			
Is the IFS switch tripped?					

Fuel Pump (FP) Relay

KA

Test Step		Results / Action to Take				
KA25	CHECK THE B+ CIRCUIT VOLTAGE TO THE FP RELAY - FP Relay connector disconnected. - Measure the voltage between:<table><tr><td>(+) FP Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>B+</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) FP Relay Connector, Harness Side	(-)	B+	Ground	Yes GO to KA26. No B+ circuit fault. CHECK the condition of the related fuse/fuse links. If OK, REPAIR the open circuit. If the fuse/fuse link is damaged, CHECK the circuit for short to ground before replacing.
(+) FP Relay Connector, Harness Side	(-)					
B+	Ground					
KA26	CHECK THE FP PWR CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) FP Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPPWR</td><td>Ground</td></tr></table> - Is the resistance less than 10 ohms?	(+) FP Relay Connector, Harness Side	(-)	FPPWR	Ground	Yes INSTALL a new FP relay. No REPAIR the open circuit. (The open is between the splice and the FP relay)
(+) FP Relay Connector, Harness Side	(-)					
FPPWR	Ground					
KA27	CONTINUOUS MEMORY DTC P0232: IS A CONTINUOUS DTC P0230 PRESENT? - Check for continuous memory DTCs: - Is DTC P0230 present?	Yes GO to KA30. No GO to KA28.				
KA28	CHECK THE FUEL PUMP SECONDARY CIRCUITS FOR FAULT Note: Be aware that P0232 could be set if the IFS switch is tripped then reset, or if power is supplied to the FP PWR circuit when the PCM expects the fuel pump to be off (fuel pump prime procedure will produce this). - Key in ON position. - Access the PCM and monitor the FPM PID. - Observe the FPM PID for an indication of a fault while completing the following: The FPM PID will turn ON when a fault is indicated. - Shake, wiggle, and bend the FPPWR circuit between the FP RLY and the FP. - Shake, wiggle, and bend the FP GND. - Shake, wiggle, and bend the FPM circuit between the PCM and the splice to the FPPWR circuit. - Lightly tap on the FP, IFS, and FP RLY to simulate road shock. - Is a concern present?	Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1.				

Fuel Pump (FP) Relay**KA**

Test Step		Results / Action to Take								
KA29	CONTINUOUS MEMORY DTC P0231: CHECK THE HARNESS - PCM connector disconnected. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A PCM Connector, Harness Side</td><td>Point B</td></tr><tr><td>FP - Pin 80</td><td>Ground</td></tr></table> - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPM - Pin 40</td><td>Ground</td></tr></table> - The FP will turn on and voltage will be greater than 10 V. - Check for an indication of a fault while completing the following. The voltage changes suddenly when a fault is detected. - Shake, wiggle, and bend the B+ supply to the FPR. - Shake, wiggle, and bend the FP PWR circuit between the FPR and the FPM splice. - Lightly tap on the FPR to simulate road shock. - Key in OFF position. - Visually inspect the FPR and its loom connector for damage and corrosion, repair or clean as necessary. - Is a concern present?	Point A PCM Connector, Harness Side	Point B	FP - Pin 80	Ground	(+) PCM Connector, Harness Side	(-)	FPM - Pin 40	Ground	Yes ISOLATE the fault and REPAIR as necessary. No Unable to duplicate or identify the fault at this time. GO to Z1.
Point A PCM Connector, Harness Side	Point B									
FP - Pin 80	Ground									
(+) PCM Connector, Harness Side	(-)									
FPM - Pin 40	Ground									
KA30	CONTINUOUS MEMORY DTC P0230: CHECK THE FP PRIMARY CIRCUITS - Key in ON position. - Wait for 5 seconds. - Access the PCM and monitor the FPF PID. - Observe the FPF PID for an indication of a fault while completing the following: The PID indicates a fault (or YES), when a fault is detected. Shake, wiggle, and bend the FP circuit between the PCM and the FPR. Shake, wiggle, and bend the VPWR circuit between the electronic engine control power relay and the FPR. Lightly tap on the FPR to simulate road shock. - Key in OFF position. - Visually inspect the PCM connector and wires as far back as the main loom for damage. Repair or clean as necessary. - Visually inspect the FPR connector and wires as far back as the main loom for damage. Repair or clean as necessary. - Is a concern present?	Yes ISOLATE the fault and REPAIR as necessary. No Unable to duplicate or identify the fault at this time. GO to Z1.								

KA29-KA30

Fuel Pump (FP) Relay

KA

Test Step		Results / Action to Take								
KA31	KOEO AND KOER DTC P0230: CHECK FOR FP CIRCUIT CYCLING AT THE PDJB Note: Related to applications with the FP relay integral to the PDJB circuit board. - Disconnect the PDJB connector that contains the FP circuit. - Connect a non-powered test lamp between:<table><tr><td>(+) PDJB Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>FP</td><td>Negative terminal</td></tr></table> - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A PDJB Connector, Harness Side</td><td>Point B</td></tr><tr><td>GND</td><td>Ground</td></tr></table> - Key in ON position. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Command the outputs OFF. Does the test lamp turn on and off when the output(s) is commanded on and off?	(+) PDJB Connector, Harness Side	(-) Vehicle Battery	FP	Negative terminal	Point A PDJB Connector, Harness Side	Point B	GND	Ground	Yes GO to KA32 . No Key in OFF position. GO to KA33 .
(+) PDJB Connector, Harness Side	(-) Vehicle Battery									
FP	Negative terminal									
Point A PDJB Connector, Harness Side	Point B									
GND	Ground									
KA32	CHECK THE VPWR VOLTAGE THROUGH FP RLY AT PDJB - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PDJB Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>FP</td><td>Negative terminal</td></tr></table> Is the voltage greater than 10 V?	(+) PDJB Connector, Harness Side	(-) Vehicle Battery	FP	Negative terminal	Yes Concern is elsewhere. RETURN to Symptom Charts for further direction. No INSTALL a new PDJB.				
(+) PDJB Connector, Harness Side	(-) Vehicle Battery									
FP	Negative terminal									
KA33	CHECK THE FP CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PDJB Connector, Harness Side</td><td>(-)</td></tr><tr><td>FP</td><td>Ground</td></tr></table> Is the voltage less than 1 V?	(+) PDJB Connector, Harness Side	(-)	FP	Ground	Yes Key in OFF position. GO to KA34 . No REPAIR the short circuit.				
(+) PDJB Connector, Harness Side	(-)									
FP	Ground									

Fuel Pump (FP) Relay**KA**

Test Step		Results / Action to Take			
KA34	CHECK THE FUEL PUMP CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS	Yes GO to KA35. No REPAIR the short circuit.			
- Measure the resistance between:<table><tr><td>(+) PDJB Connector, Harness Side</td><td>(-)</td></tr><tr><td>FP</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?			(+) PDJB Connector, Harness Side	(-)	FP
(+) PDJB Connector, Harness Side	(-)				
FP	Ground				
KA35	CHECK THE FUEL PUMP CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to KA36. No REPAIR the open circuit.			
- Measure the resistance between:<table><tr><td>(+) PDJB Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FP</td><td>FP - Pin 80</td></tr></table> - Is the resistance less than 5 ohms?			(+) PDJB Connector, Harness Side	(-) PCM Connector, Harness Side	FP
(+) PDJB Connector, Harness Side	(-) PCM Connector, Harness Side				
FP	FP - Pin 80				
KA36	KOEO DTCS P0231 OR P0232: CHECK FOR DTCS	Yes GO to KA37. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).			
Is KOEO DTC P0231 or P0232 also present?					
KA37	CHECK THE FUEL PUMP PRIMARY CIRCUIT INSIDE THE PCM	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No GO to KA38.			
Note: The following step(s) monitor the FPF PID to indicate if a fault is detected in the FP circuit in the PCM. - PCM connector connected. - PDJB connector connected. - Key in ON position. - Access the PCM and monitor the FPF PID. - Is the PID state FAULT?					
KA38	CHECK THE FUEL PUMP PRIMARY CIRCUIT INSIDE THE PCM WHILE CRANKING THE ENGINE	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No Key in OFF position. GO to KA39.			
- Observe the FPF PID for an indication of a fault while cranking the engine. - Does the PID display indicate a fault during crank?					

Fuel Pump (FP) Relay**KA**

Test Step		Results / Action to Take
KA39	IS KOEO DTC P0231 ALSO PRESENT?	Yes GO to KA56 . No DTC P0232 is present GO to KA40 .
	Was KOEO DTC P0231 also present?	
KA40	KOEO AND KOER DTC P0232: DOES THE ENGINE START?	Yes GO to KA41 . No GO to KA49 .
	Note: Related to applications with the FP relay integral to the PDJB circuit board. Does the engine start?	
KA41	VERIFY THAT FP IS OFF	Yes Key in OFF position. GO to KA45 . No Key in OFF position. GO to KA42 .
	- Key in ON position. - Wait for 5 seconds. - The fuel pump is located above the fuel tank. Listen for the sound of the fuel pump operating which can be heard from outside the vehicle. - Is FP OFF with the key on?	
KA42	CHECK THE FPPWR CIRCUIT FOR A SHORT TO POWER IN THE HARNESS	Yes GO to KA43 . No REPAIR the short circuit to PWR.
	- PDJB connector disconnected. - Key in ON position. - Is FP OFF with the key on?	
KA43	CHECK FOR FPR CONTACTS ALWAYS CLOSED	Yes GO to KA44 . No INSTALL a new PDJB.
	- PDJB connector connected. - Disconnect the PDJB connector that contains the FPPWR circuit. - Key in ON position. - Wait for 5 seconds. - Is FP OFF with the key on?	
KA44	CHECK THE FPM CIRCUIT FOR A SHORT TO POWER IN THE HARNESS	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit to PWR.
	- PDJB connector connected. - PCM connector disconnected. - Key in ON position. - Is FP OFF with the key on?	

KA39-KA44

Fuel Pump (FP) Relay**KA**

Test Step		Results / Action to Take				
KA45	CHECK THE FUEL PUMP SECONDARY CIRCUITS FOR OPEN IN THE PDJB • Disconnect the PDJB connector that contains the FPPWR circuit. • Disconnect the PDJB connector that contains the FPM circuit. • Measure the resistance between:<table><tr><td>(+) PDJB Connector, Component Side</td><td>(-) PDJB Connector, Component Side</td></tr><tr><td>FPM</td><td>FPPWR-A</td></tr></table> • Is the resistance less than 5 ohms?	(+) PDJB Connector, Component Side	(-) PDJB Connector, Component Side	FPM	FPPWR-A	Yes GO to KA46. No REPAIR the open circuit. INSTALL a new PDJB.
(+) PDJB Connector, Component Side	(-) PDJB Connector, Component Side					
FPM	FPPWR-A					
KA46	CHECK THE FPM CIRCUIT FOR AN OPEN IN THE HARNESS • PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PDJB Connector, Harness Side</td></tr><tr><td>FPM - Pin 40</td><td>FPM</td></tr></table> • Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) PDJB Connector, Harness Side	FPM - Pin 40	FPM	Yes GO to KA47. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) PDJB Connector, Harness Side					
FPM - Pin 40	FPM					
KA47	WAS KOEO DTC P0231 PRESENT? • Was KOEO DTC P0231 present?	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No DTC P0232 is present GO to KA48.				
KA48	CHECK THE FPM PID • PCM connector connected. • PDJB connector disconnected. • Access the PCM and monitor the FPM PID. • Is the PID state OFF?	Yes Key in OFF position. The FPM circuit is OK in the harness and PCM. Disregard DTC P0232 at this time. Concern is elsewhere. RETURN to Symptom Charts for further direction. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).				

KA45-KA48

Fuel Pump (FP) Relay

KA

Test Step		Results / Action to Take				
KA49	CHECK IF IFS TRIPPED Is the IFS switch tripped?	Yes RESET the IFS switch. No GO to KA50.				
KA50	CHECK THE IFS SWITCH - Inertia Switch connector disconnected. - Measure the resistance between:<table><tr><td>(+) IFS Connector, Component Side</td><td>(-) IFS Connector, Component Side</td></tr><tr><td>FPPWR-A</td><td>FPPWR-B</td></tr></table> - Is the resistance less than 5 ohms?	(+) IFS Connector, Component Side	(-) IFS Connector, Component Side	FPPWR-A	FPPWR-B	Yes GO to KA51. No INSTALL a new IFS.
(+) IFS Connector, Component Side	(-) IFS Connector, Component Side					
FPPWR-A	FPPWR-B					
KA51	CHECK THE FUEL PUMP SECONDARY CIRCUITS FOR OPEN IN THE PDJB - Disconnect the PDJB connector that contains the FPPWR circuit. - Disconnect the PDJB connector that contains the FPM circuit. - Measure the resistance between:<table><tr><td>(+) PDJB Connector, Component Side</td><td>(-) PDJB Connector, Component Side</td></tr><tr><td>FPM</td><td>FPPWR-A</td></tr></table> - Is the resistance less than 5 ohms?	(+) PDJB Connector, Component Side	(-) PDJB Connector, Component Side	FPM	FPPWR-A	Yes GO to KA52. No REPAIR the open circuit. INSTALL a new PDJB.
(+) PDJB Connector, Component Side	(-) PDJB Connector, Component Side					
FPM	FPPWR-A					
KA52	CHECK THE FPPWR CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) IFS Connector, Har- ness Side</td><td>(-) PDJB Connector, Harness Side</td></tr><tr><td>FPPWR-A</td><td>FPPWR-A</td></tr></table> - Is the resistance less than 5 ohms?	(+) IFS Connector, Har- ness Side	(-) PDJB Connector, Harness Side	FPPWR-A	FPPWR-A	Yes GO to KA53. No REPAIR the open circuit.
(+) IFS Connector, Har- ness Side	(-) PDJB Connector, Harness Side					
FPPWR-A	FPPWR-A					
KA53	CHECK THE FUEL PUMP GROUND CIRCUIT FOR AN OPEN IN THE HARNESS - FP connector disconnected. - Measure the resistance between:<table><tr><td>(+) FP Connector, Har- ness Side</td><td>(-)</td></tr><tr><td>FPGND</td><td>Ground</td></tr></table> - Is the resistance less than 5 ohms?	(+) FP Connector, Har- ness Side	(-)	FPGND	Ground	Yes GO to KA54. No REPAIR the open circuit.
(+) FP Connector, Har- ness Side	(-)					
FPGND	Ground					

KA49-KA53

Fuel Pump (FP) Relay**KA**

Test Step		Results / Action to Take				
KA54	CHECK THE FPPWR CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) IFS Connector, Har- ness Side</td><td>(-) FP Connector, Har- ness Side</td></tr><tr><td>FPPWR-A</td><td>FPPWR</td></tr></table> - Is the resistance less than 5 ohms?	(+) IFS Connector, Har- ness Side	(-) FP Connector, Har- ness Side	FPPWR-A	FPPWR	Yes GO to KA55. No REPAIR the open circuit.
(+) IFS Connector, Har- ness Side	(-) FP Connector, Har- ness Side					
FPPWR-A	FPPWR					
KA55	CHECK THE INTERNAL RESISTANCE OF FP - Measure the resistance between:<table><tr><td>(+) FP Connector, Har- ness Side</td><td>(-) FP Connector, Har- ness Side</td></tr><tr><td>FPPWR</td><td>FPGND</td></tr></table> - Is the resistance less than 10 ohms?	(+) FP Connector, Har- ness Side	(-) FP Connector, Har- ness Side	FPPWR	FPGND	Yes All FP circuit checks are OK Disregard DTC P0232 at this time Concern is elsewhere. RETURN to Symptom Charts for further direction. No INSTALL a new FP.
(+) FP Connector, Har- ness Side	(-) FP Connector, Har- ness Side					
FPPWR	FPGND					
KA56	KOEO AND KOER DTC P0231: WAS KOEO DTC P0230 ALSO PRESENT? Note: Related to applications with the FP relay integral to the PDJB circuit board. - Check the PCM for KOEO DTCs: - Is DTC P0230 present?	Yes GO to KA46. No GO to KA57.				
KA57	KOEO DTC P0231: DOES THE ENGINE START? Does the engine start?	Yes GO to KA46. No GO to KA58.				
KA58	CHECK THE FUEL PUMP FUSE - Check the FP fuse. - Is a concern present?	Yes CHECK for damage to the wiring. CHECK for a damaged or seized motor. If OK, INSTALL a new FP fuse. No GO to KA59.				

Fuel Pump (FP) Relay**KA**

Test Step		Results / Action to Take				
KA59	CHECK THE FUEL PUMP SECONDARY CIRCUITS FOR OPEN IN THE PDJB • Disconnect the PDJB connector that contains the FPPWR circuit. • Key in ON position. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the outputs ON. • Measure the voltage between:<table border="1"><tr><td>(+) PDJB Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPPWR-A</td><td>Ground</td></tr></table> • Is the voltage greater than 10.5 V?	(+) PDJB Connector, Harness Side	(-)	FPPWR-A	Ground	Yes All fuel pump circuit checks are OK Disregard DTC P0232 at this time Concern is elsewhere. RETURN to Symptom Charts for further direction. No INSTALL a new PDJB.
(+) PDJB Connector, Harness Side	(-)					
FPPWR-A	Ground					
KA60	CONTINUOUS MEMORY DTC P0230: CHECK THE FP PRIMARY CIRCUITS Note: Related to applications with the FP relay integral to the PDJB circuit board. • Key in ON position. • Wait for 5 seconds. • Access the PCM and monitor the FPF PID. • Observe the FPF PID for an indication of a fault while completing the following: The PID indicates a fault (or YES), when a fault is detected. Shake, wiggle, and bend the FP circuit between the PCM and the PDJB. Lightly tap on the PDJB to simulate road shock. • Key in OFF position. • Visually inspect the PCM and its loom connector for damage and corrosion, repair or clean as necessary. Visually inspect the PDJB and its loom connector for damage and corrosion, repair or clean as necessary. • Is a concern present?	Yes ISOLATE the fault and REPAIR as necessary. No Unable to duplicate or identify the fault at this time. GO to Z1.				

Fuel Pump (FP) Relay**KA**

Test Step		Results / Action to Take				
KA61	CONTINUOUS MEMORY DTC P0231: CHECK THE FUEL PUMP SECONDARY CIRCUITS FOR FAULT • Disconnect the PDJB connector that contains the FPPWR circuit. • Key in ON position. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the outputs ON. • Measure the voltage between:<table border="1"><tr><td>(+) PDJB Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPPWR-A</td><td>Ground</td></tr></table> • Observe the voltage for an indication of a fault while completing the following: Voltage drops suddenly when a fault is detected. 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. — Lightly tap on the FP FUSE to simulate road shock. — Lightly tap on the PDJB to simulate road shock. • Is a concern present?	(+) PDJB Connector, Harness Side	(-)	FPPWR-A	Ground	Yes ISOLATE the fault and REPAIR as necessary. No Unable to duplicate or identify the fault at this time. GO to Z1.
(+) PDJB Connector, Harness Side	(-)					
FPPWR-A	Ground					
KA62	KOEO DTC P0232: CHECK THE FUEL PUMP SECONDARY CIRCUITS FOR FAULT • Check for self-test DTCs: • Is DTC P0230 present?	Yes GO to KA60. No GO to KA63.				

KA61-KA62

Fuel Pump (FP) Relay**KA**

Test Step		Results / Action to Take
KA63	KOEO DTC P0232: CHECK THE FUEL PUMP SECONDARY CIRCUITS FOR FAULT	
Note: Be aware that P0232 could be set if the IFS switch is tripped then reset, or if power is supplied to the FP PWR circuit when the PCM expects the fuel pump to be off (fuel pump prime procedure will produce this). • Key in ON position. • Access the PCM and monitor the FPF PID. • Observe the PID for an indication of a fault while completing the following: The PID indicates a fault (or YES), when a fault is detected. Shake, wiggle, and bend the FPPWR circuit between the FPPWR pin at the PDJB and the FP. Shake, wiggle, and bend the FP GND. Shake, wiggle, and bend the FPM circuit between the PDJB and the PCM. Lightly tap on the FP to simulate road shock. Lightly tap on the IFS to simulate road shock. Lightly tap on the PDJB to simulate road shock. • Is a concern present?		Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1.

KA63

Test KB: Fuel Pump Driver Module

PINPOINT TEST KB: FUEL PUMP DRIVER MODULE

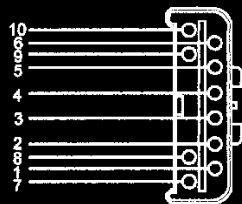
Fuel Pump Driver Module

KB

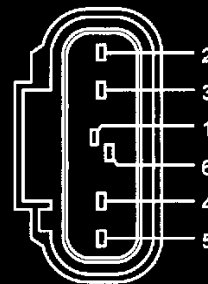
This pinpoint test is intended to diagnose the following:

- Fuel pump driver module (FPDM) (9D370).
- FPDM power supply relay.
- Inertia fuel shutoff (IFS) switch (9341).
- Harness circuits: B+, GND, FPDM GND, FPDM2 GND, FPDMR GND, FPM, FPM2, FP, FP PWR, FP2PWR, FP RTN, FP2RTN, FPDM PWR, and FPDM2 PWR.
- Powertrain control module (PCM) (12A650).

Fuel Pump Driver Module (FPDM) Connector

A

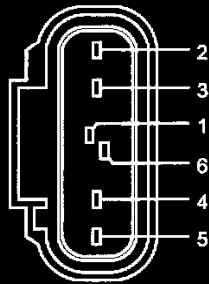
A0077574

B

A0077514

Vehicle	Connector	Circuit	Pin
Aviator, Crown Victoria, Focus, Grand Marquis, Sable, Taurus, Town Car	A	FPRTN FPPWR FP FPM GND FPDM PWR	4 7 6 10 5 8
All other vehicles	B	FPRTN FPPWR FP FPM GND FPDM PWR	2 4 6 1 3 5

Note And Connector

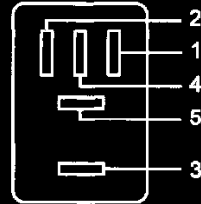
Fuel Pump Driver Module**KB****Fuel Pump Driver Module 2 (FPDM2) Connector**

A0077514

Circuit	Pin
FP2RTN (Fuel Pump 2 Return)	2
FP2PWR (Fuel Pump 2 Power)	4
FP (Fuel Pump)	6
FPM2 (Fuel Pump Monitor 2 - Rear\Secondary Pump)	1
GND (Ground)	3
FPDM2 PWR (Fuel Pump Driver Module 2 Power)	5

Fuel Pump Driver Module Power (FPDM PWR) Relay Connector

Refer to Vehicle/Diagrams for specific vehicle application and pin locations.

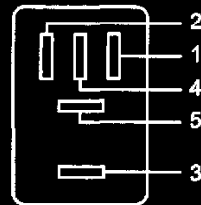
Fuel Pump Driver Module**KB**

A0077584

Circuit	Pin
FPDM PWR (Fuel Pump Driver Module Power)	5
GND (Ground)	2
VPWR (Power Supply)	1
B+ (Battery Positive Voltage)	3

Fuel Pump Driver Module 2 Power (FPDM2 PWR) Relay Connector

Refer to Vehicle/Diagrams for specific vehicle application and pin locations.



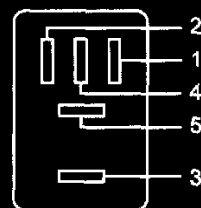
A0077584

Fuel Pump Driver Module**KB**

Circuit	Pin
FPDM2 PWR (Fuel Pump Driver Module 2 Power)	5
GND (Ground)	2
VPWR (Power Supply)	1
B+ (Battery Positive Voltage)	3

Fuel Pump/Rear Electronics Module Power (FP/REM PWR) Relay Connector

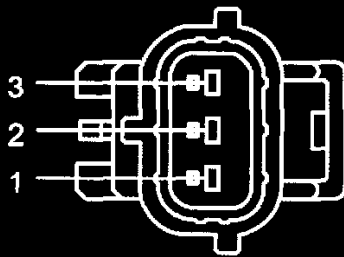
Refer to Vehicle/Diagrams for specific vehicle application and pin locations.



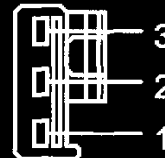
A0077584

Circuit	Pin
REM/FP PWR (REM/Fuel Pump Power)	5
GND (Ground)	1
IGN START/RUN	2
B+ (Battery Positive Voltage)	3

Connectors

Fuel Pump Driver Module**KB****Inertia Fuel Shutoff (IFS) Connector****A**

N0012090

B

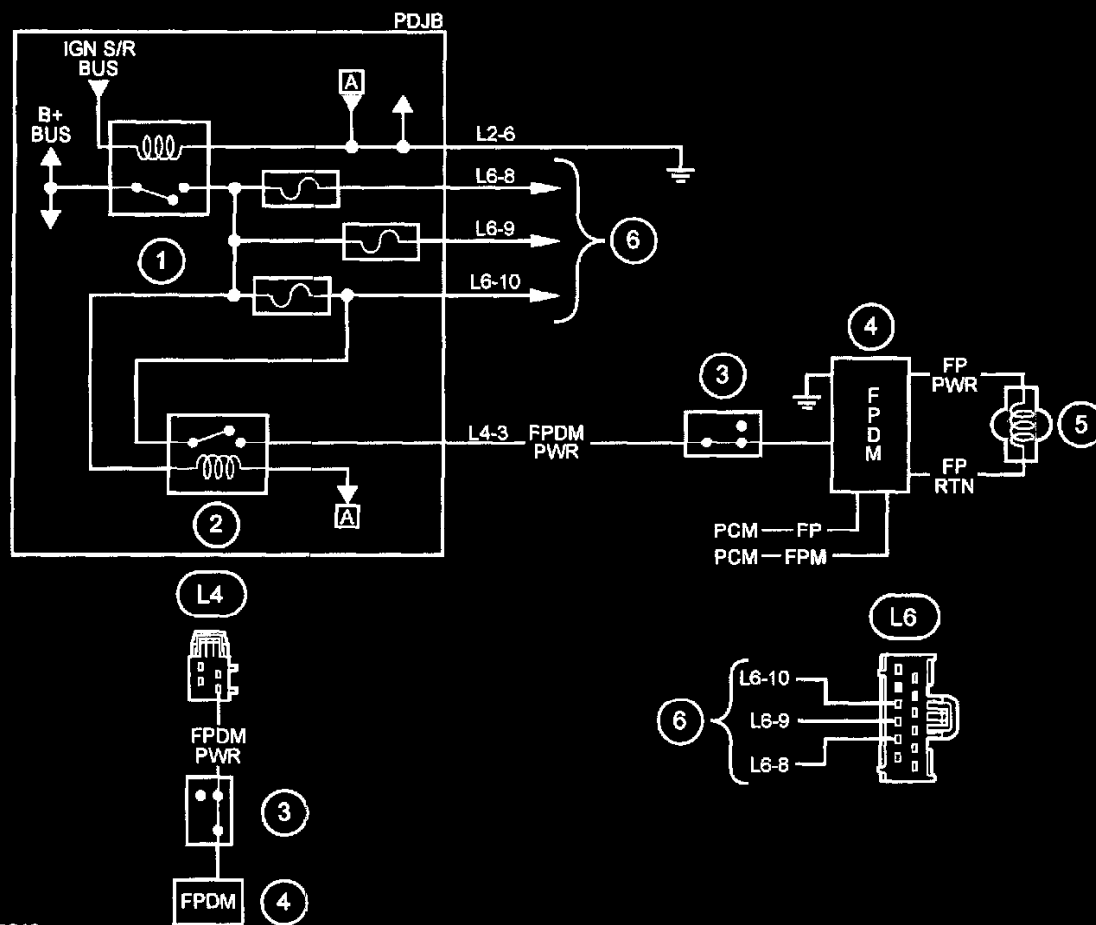
A0077528

Vehicle	Connector	Circuit	Pin
Excursion, Focus	A	FPDMPWR-A FPDMPWR-B	3 1
All other vehicles	B	FPDMPWR-A FPDMPWR-B	2 1

FPDM PWR Relay Integral to the PDJB

Expedition, F-150, F-Super Duty and Navigator.

Connector And Schematic

Fuel Pump Driver Module**KB**

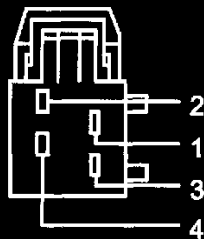
N0009218

Item	Description
1	PCM Power Relay
2	Fuel Pump Relay (integral to the circuit board)
3	Inertia Fuel Shutoff (IFS) Switch
4	Fuel Pump Driver Module (FPDM)
5	Fuel Pump
6	To Powertrain Control System
L4	Power Distribution Junction Box (PDJB) harness connector
L6	Power Distribution Junction Box (PDJB) harness connector

Schematic

Fuel Pump Driver Module**KB****Power Distribution Junction Box (PDJB)
Connector**

For applications with an FPDM PWR relay integral to the PDJB.



A0077565

Circuit	Pin
FPDM PWR (Fuel Pump Driver Module Power)	3

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	FP FPM	B58 B2
E-Series, F-Super Duty, Mustang	170 Pin	FP FPM	B12 B21
Expedition, F-150, Navigator	190 Pin	FP FPM	B62 B30
Explorer SportTrac, Freestar/Monterey, Sable, Taurus	104 Pin	FP FPM	80 40

(Continued)

Fuel Pump Driver Module**KB**

Vehicle	Connector	Circuit	Pin
Ford GT	104 Pin	FPM2 FP FPM	34 80 40
LS, Thunderbird	150 (60-32-58) Pin	FP	B49
All other vehicles	150 (50-50-50) Pin	FP FPM	B12 B21

Test Step		Results / Action to Take
KB1	DTC P1233: IS DTC P1233 PRESENT IN THE KOEO SELF-TEST?	
	Note: The Ford GT is equipped with 2 FPDMs. DTC P1233 applies to the FPDM mounted in the upper position on the bracket. • Check for KOEO DTCs: • Is DTC P1233 present?	Yes A hard fault is present. GO to KB2. No The PCM is now receiving a signal from the FPDM. One possible cause of DTC P1233 is that the IFS switch was tripped, then reset. If the engine is a no start: DISREGARD the DTC at this time. RETURN to Symptom Charts and continue as directed. After repairing the no start, to diagnose intermittent causes of P1233, RETURN to this test step and follow the, if the engine starts path. If the engine starts: GO to KB18.
KB2	DOES THE ENGINE START?	
	Note: The Ford GT will start with 1 FPDM disabled. • Does the engine start?	Yes For Ford GT, GO to KB3. For all others, To check the FPM circuit, GO to KB14. No Verify the IFS switch is set (button pressed). If OK, GO to KB3.

Chart, KB1-KB2

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB3	CHECK POWER AND GROUND CIRCUITS TO THE FPDM - FPDM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-) FPDM Connector, Harness Side</td></tr><tr><td>FPDM PWR</td><td>GND</td></tr></table> - Is the voltage greater than 10.5 V?	(+) FPDM Connector, Harness Side	(-) FPDM Connector, Harness Side	FPDM PWR	GND	Yes For Ford GT, To check the FPM circuit, GO to KB14 . For all others, INSTALL a new FPDM. No GO to KB4 .
(+) FPDM Connector, Harness Side	(-) FPDM Connector, Harness Side					
FPDM PWR	GND					
KB4	CHECK POWER TO FPDM - Key In ON position. - Measure the voltage between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPDM PWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) FPDM Connector, Harness Side	(-)	FPDM PWR	Ground	Yes REPAIR the open circuit. (Open FPDM ground circuit) No Key in OFF position. No power to the FPDM For F-150, F-Super Duty, Expedition, and Navigator, GO to KB10 . For all others, GO to KB5 .
(+) FPDM Connector, Harness Side	(-)					
FPDM PWR	Ground					
KB5	CHECK THE B+ VOLTAGE TO THE FPDM POWER SUPPLY RELAY - FPDM PWR Relay connector disconnected. - Measure the voltage between:<table><tr><td>(+) FPDM PWR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>B+ - Pin 3</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) FPDM PWR Relay Connector, Harness Side	(-)	B+ - Pin 3	Ground	Yes GO to KB6 . No B+ circuit fault. CHECK the condition of the related fuse/fuse links. If OK, REPAIR the open circuit. If the fuse/fuse link is damaged, CHECK the circuit for short to ground before replacing.
(+) FPDM PWR Relay Connector, Harness Side	(-)					
B+ - Pin 3	Ground					
KB6	CHECK THE VPWR VOLTAGE TO FPDM POWER SUPPLY RELAY - Key in ON position. - Measure the voltage between:<table><tr><td>(+) FPDM PWR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 1</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) FPDM PWR Relay Connector, Harness Side	(-)	VPWR - Pin 1	Ground	Yes GO to KB7 . No REPAIR the open circuit.
(+) FPDM PWR Relay Connector, Harness Side	(-)					
VPWR - Pin 1	Ground					

KB3-KB6

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take								
KB7	CHECK FOR GROUND TO THE FPDM POWER SUPPLY RELAY - Measure the resistance between:<table><tr><td>(+) FPDM PWR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>GND - Pin 2</td><td>Ground</td></tr></table> - Is the resistance less than 5 ohms?	(+) FPDM PWR Relay Connector, Harness Side	(-)	GND - Pin 2	Ground	Yes GO to KB8. No REPAIR the open circuit.				
(+) FPDM PWR Relay Connector, Harness Side	(-)									
GND - Pin 2	Ground									
KB8	CHECK THE FPDM PWR CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-) FPDM PWR Relay Connector, Harness Side</td></tr><tr><td>FPDM PWR</td><td>FPDM PWR - Pin 5</td></tr></table> - Is the resistance less than 5 ohms?	(+) FPDM Connector, Harness Side	(-) FPDM PWR Relay Connector, Harness Side	FPDM PWR	FPDM PWR - Pin 5	Yes INSTALL a new FPDM relay. No GO to KB9.				
(+) FPDM Connector, Harness Side	(-) FPDM PWR Relay Connector, Harness Side									
FPDM PWR	FPDM PWR - Pin 5									
KB9	ISOLATE THE OPEN IN THE FPDM CIRCUIT - IFS connector disconnected. - Measure the resistance between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-) IFS Connector, Harness Side</td></tr><tr><td>FPDM PWR</td><td>FPDMPWR-B</td></tr></table> - Measure the resistance between:<table><tr><td>(+) FPDM PWR Relay Connector, Harness Side</td><td>(-) IFS Connector, Harness Side</td></tr><tr><td>FPDM PWR - Pin 5</td><td>FPDMPWR-A</td></tr></table> - Is the resistance less than 5 ohms?	(+) FPDM Connector, Harness Side	(-) IFS Connector, Harness Side	FPDM PWR	FPDMPWR-B	(+) FPDM PWR Relay Connector, Harness Side	(-) IFS Connector, Harness Side	FPDM PWR - Pin 5	FPDMPWR-A	Yes INSTALL a new IFS. VERIFY the IFS switch is set (button pressed). No REPAIR the open circuit.
(+) FPDM Connector, Harness Side	(-) IFS Connector, Harness Side									
FPDM PWR	FPDMPWR-B									
(+) FPDM PWR Relay Connector, Harness Side	(-) IFS Connector, Harness Side									
FPDM PWR - Pin 5	FPDMPWR-A									
KB10	CHECK THE FUEL PUMP FUSE Note: These steps are for applications with FPDM PWR relay integral to the PDJB. - Check the FPDM power supply relay fuse. (located on the PDJB). - Is the fuse OK?	Yes GO to KB11. No INSTALL a new fuse. CHECK the associated circuits for a short to ground before installing the fuse.								

KB7-KB10

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB11	CHECK POWER TO IFS - IFS connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) IFS Connector, Har- ness Side</td><td>(-)</td></tr><tr><td>FPDMPWR-A</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) IFS Connector, Har- ness Side	(-)	FPDMPWR-A	Ground	Yes Key in OFF position. GO to KB13 . No Key in OFF position. GO to KB12 .
(+) IFS Connector, Har- ness Side	(-)					
FPDMPWR-A	Ground					
KB12	CHECK THE FPDMPWR CIRCUIT FOR AN OPEN BETWEEN THE IFS AND PDJB - PDJB connector disconnected. (connector with FPDMPWR circuit) - Measure the resistance between:<table><tr><td>(+) IFS Connector, Har- ness Side</td><td>(-) PDJB Connector, Harness Side</td></tr><tr><td>FPDMPWR-A</td><td>FPDMPWR - Pin 3</td></tr></table> - Is the resistance less than 5 ohms?	(+) IFS Connector, Har- ness Side	(-) PDJB Connector, Harness Side	FPDMPWR-A	FPDMPWR - Pin 3	Yes CHECK the fuel pump fuse. If OK, INSTALL a new FP RLY/PDJB. No REPAIR the open circuit.
(+) IFS Connector, Har- ness Side	(-) PDJB Connector, Harness Side					
FPDMPWR-A	FPDMPWR - Pin 3					
KB13	CHECK THE IFS FOR AN OPEN - Measure the resistance between:<table><tr><td>(+) IFS Connector, Component Side</td><td>(-) IFS Connector, Component Side</td></tr><tr><td>FPDMPWR-A</td><td>FPDMPWR-B</td></tr></table> - Is the resistance less than 5 ohms?	(+) IFS Connector, Component Side	(-) IFS Connector, Component Side	FPDMPWR-A	FPDMPWR-B	Yes REPAIR the open circuit. (Open FPDMPWR circuit) No INSTALL a new IFS.
(+) IFS Connector, Component Side	(-) IFS Connector, Component Side					
FPDMPWR-A	FPDMPWR-B					
KB14	CHECK THE FPM CIRCUIT FOR AN OPEN IN THE HARNESS - FPDMPWR connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) FPDMPWR Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FPM</td><td>FPM</td></tr></table> - Is the resistance less than 5 ohms?	(+) FPDMPWR Connector, Harness Side	(-) PCM Connector, Harness Side	FPM	FPM	Yes GO to KB15 . No REPAIR the open circuit.
(+) FPDMPWR Connector, Harness Side	(-) PCM Connector, Harness Side					
FPM	FPM					
KB15	CHECK THE FPM CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) FPDMPWR Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPM</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) FPDMPWR Connector, Harness Side	(-)	FPM	Ground	Yes Key in OFF position. GO to KB16 . No REPAIR the short circuit.
(+) FPDMPWR Connector, Harness Side	(-)					
FPM	Ground					

KB11-KB15

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB16	CHECK THE FPM CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPM</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) FPDM Connector, Harness Side	(-)	FPM	Ground	Yes GO to KB17. No REPAIR the short circuit.
(+) FPDM Connector, Harness Side	(-)					
FPM	Ground					
KB17	CHECK FOR FPM OUTPUT FROM THE FPDM - FPDM connector connected. - Key in ON position. Note: It is OK for the voltage to cycle below this range and then return within range. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPM</td><td>Ground</td></tr></table> - Is the voltage between 0.02 V - 1 V?	(+) PCM Connector, Harness Side	(-)	FPM	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new FPDM.
(+) PCM Connector, Harness Side	(-)					
FPM	Ground					
KB18	CHECK CIRCUITS THAT MAY CAUSE AN INTERMITTENT LOSS OF POWER SUPPLY TO THE FPDM Note: Be aware that P1233 could be set if the inertia fuel shutoff IFS switch is tripped then reset. - Key in ON position. - Access the PCM and monitor the FPM PID. Note: With no fault detected, the FPDM sends a 50% duty cycle (all OK) to the PCM on the FPM circuit. Depending on diagnostic 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 percent value, or to stop fluctuating). - Shake, wiggle, and bend the following circuits: - FPDM GND. - FPDM PWR circuit to the FPDM. - FPM circuit between the FPDM and the PCM. - B+ and ground circuits to the FPDM power supply relay. - Lightly tap on the IFS to simulate road shock. - Lightly tap on the FPDM to simulate road shock. - Lightly tap on the FPDM power supply relay to simulate road shock. - Key in OFF position. - Is a concern present?	Yes ISOLATE the fault and REPAIR as necessary. No Unable to duplicate or identify the fault at this time. GO to Z1.				

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take			
KB19	DTC P1235: IS DTC P1235 PRESENT IN THE KOEO SELF-TEST?	Yes GO to KB20. No For LS, and Thunderbird, GO to KB29. For all others, GO to KB30.			
	Note: The Ford GT is equipped with 2 FPDMs. DTC P1235 applies to the FPDM mounted in the upper position on the bracket. Note: For ETC applications, check if ETC DTC P2105 is present. An ETC system concern could cause P1235, and should be diagnosed first. - Check for KOEO DTCs: - Is DTC P1235 present?				
KB20	CHECK THE FP CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to KB21. No REPAIR the open circuit.			
	Note: For the LS and Thunderbird the FPDM functions are incorporated into the rear electronics module (REM). In the following steps, if directed to carry out an action with the FPDM, carry out the action with the REM. - FPDM connector disconnected. - PCM connector disconnected. - Measure the resistance between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) FPDM Connector, Harness Side</td></tr><tr><td>FP</td><td>FP</td></tr></table> - Is the resistance less than 5 ohms?		(+) PCM Connector, Harness Side	(-) FPDM Connector, Harness Side	FP
(+) PCM Connector, Harness Side	(-) FPDM Connector, Harness Side				
FP	FP				
KB21	CHECK THE FP CIRCUIT FOR A SHORT TO POWER IN THE HARNESS	Yes Key in OFF position. GO to KB22. No REPAIR the short circuit.			
	- FPDM2 connector disconnected (Ford GT). - Key in ON position. - Measure the voltage between: <table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FP</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?		(+) FPDM Connector, Harness Side	(-)	FP
(+) FPDM Connector, Harness Side	(-)				
FP	Ground				

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB22	CHECK THE FP CIRCUIT FOR A SHORT TO GROUND - Measure the resistance between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FP</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) FPDM Connector, Harness Side	(-)	FP	Ground	Yes For Aviator, Crown Victoria, Focus, Grand Marquis, Sable, Taurus, and Town Car, GO to KB23 . For LS, and Thunderbird, GO to KB25 . For all others, GO to KB24 . No REPAIR the short circuit.
(+) FPDM Connector, Harness Side	(-)					
FP	Ground					
KB23	CHECK THE FP CIRCUIT IN THE FPDM - FPDM connector connected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FP</td><td>Ground</td></tr></table> - Is the voltage between 4.5 V - 5.5 V?	(+) PCM Connector, Harness Side	(-)	FP	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new FPDM.
(+) PCM Connector, Harness Side	(-)					
FP	Ground					
KB24	CHECK THE FP CIRCUIT IN THE FPDM - FPDM connector connected. - FPDM2 connector disconnected (Ford GT). - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FP</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) PCM Connector, Harness Side	(-)	FP	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new FPDM.
(+) PCM Connector, Harness Side	(-)					
FP	Ground					
KB25	CHECK THE FPF PID - PCM connector connected. - REM connector connected. - Key in ON position. - Access the PCM and monitor the FPF PID. - While viewing the FPF PID, check if PID indicates YES sometime within 20 seconds. - Does the FPF PID indicate YES sometime within 20 seconds?	Yes GO to KB28 . No GO to KB26 .				

KB22-KB25

Fuel Pump Driver Module**KB**

Test Step		Results / Action to Take				
KB26	CHECK THE FP PID - Access the PCM and monitor the FP PID. - Is the duty cycle between 70% - 80%?	Yes GO to KB27. No Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).				
KB27	CHECK THE PWM_DC1 PID - Access the REM and monitor the PWM_DC1 PID. - Is the duty cycle between 70% - 80%?	Yes Key in OFF position. No fault found. DISREGARD DTC P1235 at this time. Concern is elsewhere. RETURN to Symptom Charts for further direction. No INSTALL a new REM.				
KB28	CHECK THE REM CIRCUITRY VOLTAGE ON THE FP CIRCUIT AT THE PCM - Key in OFF position. - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FP</td><td>Ground</td></tr></table> - Is the voltage greater than 8 V?	(+) PCM Connector, Harness Side	(-)	FP	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new REM.
(+) PCM Connector, Harness Side	(-)					
FP	Ground					
KB29	CHECK THE FP CIRCUIT(S) FOR INTERMITTENT CONCERNS - Key in ON position. - Access the REM and monitor the PWM_DC1 PID. - Observe the PWM_DC1 PID for an indication of a fault while completing the following: (the PID value changes when a fault is detected). - Shake, wiggle, and bend the FP circuit between the PCM and REM. - Lightly tap on the FPDM to simulate road shock. - Is a concern present?	Yes ISOLATE the fault and REPAIR as necessary. No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1.				

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take			
KB30	CHECK THE FP CIRCUIT FOR AN INTERMITTENT OPEN OR SHORTS	Yes ISOLATE the fault and REPAIR as necessary. No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1.			
	• Key in ON position. • Access the PCM and monitor the FPM PID. Note: With no fault detected, the FPDM sends a 50% duty cycle (all OK) to the PCM on the FPM circuit. Depending on diagnostic 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, and bend the FP circuit between FPDM and the PCM. — Lightly tap on the FPDM to simulate road shock. • Is a concern present?				
KB31	DTC P1237: IS DTC P1237 PRESENT IN THE KOEO SELF-TEST?	Yes A hard fault is present. GO to KB32. No DTC P1237 is possibly intermittent. For LS, and Thunderbird, GO to KB49. For all others, GO to KB38.			
	Note: The Ford GT is equipped with 2 FPDMs. DTC P1237 applies to the FPDM mounted in the upper position on the bracket. • Check for KOEO DTCs: • Is DTC P1237 present?				
KB32	DOES THE ENGINE START?	Yes For LS, and Thunderbird, GO to KB52. For all others, GO to KB41. No For LS, and Thunderbird, GO to KB43. For all others, GO to KB33.			
	Note: The Ford GT will start with 1 FPDM disabled. • FPDM2 connector disconnected (Ford GT). • Does the engine start?				
KB33	CHECK FPPWR, FPRTN AND INTERNAL FUEL PUMP CIRCUIT RESISTANCE	Yes GO to KB34. No To ISOLATE the fault, GO to KB37.			
	• FPDM connector disconnected. • Measure the resistance between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-) FPDM Connector, Harness Side</td></tr><tr><td>FPPWR</td><td>FPRTN</td></tr></table> • Is the resistance less than 10 ohms?		(+) FPDM Connector, Harness Side	(-) FPDM Connector, Harness Side	FPPWR
(+) FPDM Connector, Harness Side	(-) FPDM Connector, Harness Side				
FPPWR	FPRTN				

KB30-KB33

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB34	CHECK THE FPRTN CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPRTN</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) FPDM Connector, Harness Side	(-)	FPRTN	Ground	Yes GO to KB35. No REPAIR the short circuit.
(+) FPDM Connector, Harness Side	(-)					
FPRTN	Ground					
KB35	CHECK THE FPPWR CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - FP connector disconnected. - Measure the resistance between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPPWR</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) FPDM Connector, Harness Side	(-)	FPPWR	Ground	Yes GO to KB36. No REPAIR the short circuit.
(+) FPDM Connector, Harness Side	(-)					
FPPWR	Ground					
KB36	CHECK FOR VOLTAGE TO FP - FPDM connector connected. - FP connector disconnected. - Key in ON position. Note: During Output Test Mode, the fuel pump stays commanded on for only about 5 seconds. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Measure the voltage between:<table><tr><td>(+) FP Connector, Harness Side</td><td>(-) FP Connector, Harness Side</td></tr><tr><td>FPPWR</td><td>FPRTN</td></tr></table> - Is the voltage greater than 10 V?	(+) FP Connector, Harness Side	(-) FP Connector, Harness Side	FPPWR	FPRTN	Yes INSTALL a new FP. No VERIFY the vehicle battery was at a proper charge during the test. VERIFY the pump ON command did not time out before the voltage check was made. If OK, INSTALL a new FPDM.
(+) FP Connector, Harness Side	(-) FP Connector, Harness Side					
FPPWR	FPRTN					

Fuel Pump Driver Module**KB**

Test Step		Results / Action to Take										
KB37	ISOLATE THE OPEN IN THE FP CIRCUIT • FP connector disconnected. • Measure the resistance between:<table><tr><td>(+) FP Connector, Har- ness Side</td><td>(-) FPDM Connector, Harness Side</td></tr><tr><td>FPPWR</td><td>FPPWR</td></tr><tr><td>FPRTN</td><td>FPRTN</td></tr></table> • Measure the resistance between:<table><tr><td>(+) FP Connector, Component Side</td><td>(-) FP Connector, Com- ponent Side</td></tr><tr><td>FPPWR</td><td>FPRTN</td></tr></table> • Is the resistance less than 10 ohms?	(+) FP Connector, Har- ness Side	(-) FPDM Connector, Harness Side	FPPWR	FPPWR	FPRTN	FPRTN	(+) FP Connector, Component Side	(-) FP Connector, Com- ponent Side	FPPWR	FPRTN	Yes Unable to duplicate or identify the fault at this time. GO to Z1. No REPAIR the open circuit. If the open is internal to the pump, INSTALL a new FP
(+) FP Connector, Har- ness Side	(-) FPDM Connector, Harness Side											
FPPWR	FPPWR											
FPRTN	FPRTN											
(+) FP Connector, Component Side	(-) FP Connector, Com- ponent Side											
FPPWR	FPRTN											
KB38	VERIFY THE DTC P1237 IS INTERMITTENT • Key in ON position. • Access the PCM and monitor the FPM PID. • Is the FPM PID 75% (or varying between 250% and 400%)?	Yes A hard fault is present. GO to KB32. No DTC P1237 is possibly intermittent. GO to KB39.										
KB39	CHECK THE FPPWR AND FPRTN CIRCUIT FOR AN INTERMITTENT OPEN OR SHORTS • Key in ON position. • Access the PCM and monitor the FPM PID. Note: With no fault detected, the FPDM sends a 50% duty cycle (all OK) to the PCM on the FPM circuit. Depending on diagnostic 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, and bend the FPPWR and FPRTN circuits between the FPDM and the FP. — Lightly tap on the FP and FPDM to simulate road shock. • Is a concern present?	Yes ISOLATE the fault and REPAIR as necessary. No Key in OFF position. GO to KB40.										

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB40	CHECK THE FPPWR CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - FPDM connector disconnected. - Connect a non-powered test lamp between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-) FPDM Connector, Harness Side</td></tr><tr><td>FPPWR</td><td>FPDM PWR</td></tr></table> - Key in ON position. Note: The lamp turns ON when a fault is detected. - Observe the test lamp for an indication of a fault while completing the following. - Shake, wiggle, and bend the FPPWR circuit between the FPDM and the FP. - Is a concern present?	(+) FPDM Connector, Harness Side	(-) FPDM Connector, Harness Side	FPPWR	FPDM PWR	Yes ISOLATE the fault and REPAIR as necessary. No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1.
(+) FPDM Connector, Harness Side	(-) FPDM Connector, Harness Side					
FPPWR	FPDM PWR					
KB41	CHECK THE FPPWR CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - FPDM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPPWR</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) FPDM Connector, Harness Side	(-)	FPPWR	Ground	Yes GO to KB42. No REPAIR the short circuit to PWR.
(+) FPDM Connector, Harness Side	(-)					
FPPWR	Ground					
KB42	CHECK THE FPRTN CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - FPDM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-) FPDM Connector, Harness Side</td></tr><tr><td>FPDM PWR</td><td>FPRTN</td></tr></table> - Is the voltage less than 1 V?	(+) FPDM Connector, Harness Side	(-) FPDM Connector, Harness Side	FPDM PWR	FPRTN	Yes INSTALL a new FPDM. No REPAIR the short circuit to GND.
(+) FPDM Connector, Harness Side	(-) FPDM Connector, Harness Side					
FPDM PWR	FPRTN					

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB43	CHECK THE REM/FP PWR AND GROUND CIRCUIT TO REM PINS J1-1, J1-2 Note: Verify the IFS switch is not tripped. • REM-J1 connector disconnected. • Key in ON position. • Measure the voltage between: <table><tr><td>(+) REM-J1 Connector, Harness Side</td><td>(-) REM-J1 Connector, Harness Side</td></tr><tr><td>REM/FP PWR</td><td>GND</td></tr></table> • Is the voltage greater than 10.5 V?	(+) REM-J1 Connector, Harness Side	(-) REM-J1 Connector, Harness Side	REM/FP PWR	GND	Yes Key in OFF position. For these applications, the FPDM functions are incorporated into the rear electronics module (REM). In the following steps, if directed to carry out an action with the FPDM, carry out the action with the REM. GO to KB33. No GO to KB44.
(+) REM-J1 Connector, Harness Side	(-) REM-J1 Connector, Harness Side					
REM/FP PWR	GND					
KB44	CHECK THE REM/FP PWR CIRCUIT VOLTAGE TO THE REM USING CHASSIS GROUND AS A REFERENCE • Key in ON position. • Measure the voltage between: <table><tr><td>(+) REM-J1 Connector, Harness Side</td><td>(-)</td></tr><tr><td>REM/FP PWR</td><td>Ground</td></tr></table> • Is the voltage greater than 10.5 V?	(+) REM-J1 Connector, Harness Side	(-)	REM/FP PWR	Ground	Yes REPAIR the open circuit. (Open FPDM ground circuit) No Key in OFF position. GO to KB45.
(+) REM-J1 Connector, Harness Side	(-)					
REM/FP PWR	Ground					
KB45	CHECK THE B+ VOLTAGE TO THE FP/REM POWER SUPPLY RELAY • FP/REM PWR Relay connector disconnected. • Measure the voltage between: <table><tr><td>(+) FP/REM PWR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>B+ - Pin 3</td><td>Ground</td></tr></table> • Is the voltage greater than 10.5 V?	(+) FP/REM PWR Relay Connector, Harness Side	(-)	B+ - Pin 3	Ground	Yes GO to KB46. No B+ circuit fault. CHECK the condition of the related fuse/fuse links. If OK, REPAIR the open circuit. If the fuse/fuse link is damaged, CHECK the circuit for short to ground before replacing.
(+) FP/REM PWR Relay Connector, Harness Side	(-)					
B+ - Pin 3	Ground					
KB46	CHECK FOR IGN START/RUN VOLTAGE (THROUGH THE IFS SWITCH) TO THE RELAY HARNESS CONNECTOR • REM-J3 connector disconnected. • Key in ON position. • Measure the voltage between: <table><tr><td>(+) FP/REM PWR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>IGN START/RUN - Pin 2</td><td>Ground</td></tr></table> • Is the voltage greater than 10.5 V?	(+) FP/REM PWR Relay Connector, Harness Side	(-)	IGN START/RUN - Pin 2	Ground	Yes Key in OFF position. GO to KB47. No To ISOLATE the fault, GO to KB51.
(+) FP/REM PWR Relay Connector, Harness Side	(-)					
IGN START/RUN - Pin 2	Ground					

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB47	CHECK THE GROUND CIRCUIT TO FP/REM PWR RLY - Measure the resistance between:<table><tr><td>(+) FP/REM PWR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>GND - Pin 1</td><td>Ground</td></tr></table> - Is the resistance less than 5 ohms?	(+) FP/REM PWR Relay Connector, Harness Side	(-)	GND - Pin 1	Ground	Yes GO to KB48. No REPAIR the open circuit.
(+) FP/REM PWR Relay Connector, Harness Side	(-)					
GND - Pin 1	Ground					
KB48	CHECK REM/FP PWR CIRCUIT CONTINUITY - Measure the resistance between:<table><tr><td>(+) FP/REM PWR Relay Connector, Harness Side</td><td>(-) REM-J1 Connector, Harness Side</td></tr><tr><td>REM/FP PWR - Pin 5</td><td>REM/FP PWR</td></tr></table> - Is the resistance less than 5 ohms?	(+) FP/REM PWR Relay Connector, Harness Side	(-) REM-J1 Connector, Harness Side	REM/FP PWR - Pin 5	REM/FP PWR	Yes INSTALL a new FP/REM PWR relay. No REPAIR the open circuit.
(+) FP/REM PWR Relay Connector, Harness Side	(-) REM-J1 Connector, Harness Side					
REM/FP PWR - Pin 5	REM/FP PWR					
KB49	CHECK THE REMJ1 GND AND CIRCUITS ASSOCIATED WITH THE FPDM PWR RLY FOR INTERMITTENTS - REM/J1 connector disconnected. - Connect a non-powered test lamp between:<table><tr><td>(+) REM-J1 Connector, Harness Side</td><td>(-) REM-J1 Connector, Harness Side</td></tr><tr><td>REM/FP PWR</td><td>GND</td></tr></table> - Key in ON position. Note: The lamp turns OFF when a fault is detected. - Observe the test lamp for an indication of a fault while completing the following. - Shake, wiggle, and bend the REM/FP PWR and GND circuits to REM. - Shake, wiggle, and bend the circuits going to the FPDM PWR RLY. - Lightly tap on the FPDM PWR RLY and IFS to simulate road shock. - Is a concern present?	(+) REM-J1 Connector, Harness Side	(-) REM-J1 Connector, Harness Side	REM/FP PWR	GND	Yes ISOLATE the fault and REPAIR as necessary. No Key in OFF position. GO to KB50.
(+) REM-J1 Connector, Harness Side	(-) REM-J1 Connector, Harness Side					
REM/FP PWR	GND					

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take								
KB50	CHECK THE FPPWR AND FPRTN CIRCUIT(S) FOR INTERMITTENT CONCERNS - Measure the resistance between:<table><tr><td>(+) REM-J1 Connector, Harness Side</td><td>(-) REM-J1 Connector, Harness Side</td></tr><tr><td>FPPWR</td><td>FPRTN</td></tr></table> Note: Resistance changes suddenly when a fault is detected. - Observe the DMM for an indication of a fault while completing the following. - Shake, wiggle, and bend the FPPWR and FPRTN circuits between the FP and the REM. - Measure the resistance between:<table><tr><td>(+) REM-J1 Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPRTN</td><td>Ground</td></tr></table> Note: Resistance changes suddenly when a fault is detected. - Observe the DMM for an indication of a fault while completing the following. - Shake, wiggle, and bend the FPPWR and FPRTN circuits between the FP and the REM. Is a concern present?	(+) REM-J1 Connector, Harness Side	(-) REM-J1 Connector, Harness Side	FPPWR	FPRTN	(+) REM-J1 Connector, Harness Side	(-)	FPRTN	Ground	Yes ISOLATE the fault and REPAIR as necessary. No Unable to duplicate or identify the fault at this time. CONNECT the REM. GO to Z1.
(+) REM-J1 Connector, Harness Side	(-) REM-J1 Connector, Harness Side									
FPPWR	FPRTN									
(+) REM-J1 Connector, Harness Side	(-)									
FPRTN	Ground									
KB51	ISOLATE THE OPEN IN THE IGN START/RUN CIRCUIT - IFS connector disconnected. - Measure the resistance between:<table><tr><td>(+) IFS Connector, Component Side</td><td>(-) IFS Connector, Component Side</td></tr><tr><td>IGN START/RUN-A</td><td>IGN START/RUN-B</td></tr></table> - Measure the resistance between:<table><tr><td>(+) FPDM PWR Relay Connector, Harness Side</td><td>(-) IFS Connector, Harness Side</td></tr><tr><td>IGN START/RUN</td><td>IGN START/RUN-B</td></tr></table> Is the resistance less than 5 ohms?	(+) IFS Connector, Component Side	(-) IFS Connector, Component Side	IGN START/RUN-A	IGN START/RUN-B	(+) FPDM PWR Relay Connector, Harness Side	(-) IFS Connector, Harness Side	IGN START/RUN	IGN START/RUN-B	Yes REPAIR the open circuit. No INSTALL a new IFS.
(+) IFS Connector, Component Side	(-) IFS Connector, Component Side									
IGN START/RUN-A	IGN START/RUN-B									
(+) FPDM PWR Relay Connector, Harness Side	(-) IFS Connector, Harness Side									
IGN START/RUN	IGN START/RUN-B									

KB50-KB51

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB52	CHECK THE FPRTN CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - REM-J1 connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) REM-J1 Connector, Harness Side</td><td>(-) REM Connector, Harness Side</td></tr><tr><td>REM/FP PWR</td><td>FPRTN</td></tr></table> - Is the voltage less than 1 V?	(+) REM-J1 Connector, Harness Side	(-) REM Connector, Harness Side	REM/FP PWR	FPRTN	Yes GO to KB49. No REPAIR the short circuit to GND.
(+) REM-J1 Connector, Harness Side	(-) REM Connector, Harness Side					
REM/FP PWR	FPRTN					
KB53	CARRY OUT THE REM SELF-TEST TO VERIFY THE IFS SWITCH INPUT TO THE REM - Carry out the REM self-test. Refer to Body Control Systems (Multifunction Electronic Control Module). - Check the REM for self-test DTCs: - Is DTC B2172 present?	Yes GO to KB54. No GO to A1.				
KB54	DTC B2172: CHECK THE IFS SWITCH INPUT CIRCUIT TO THE REM - REM-J3 connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) REM-J3 Connector, Harness Side</td><td>(-)</td></tr><tr><td>IFS</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) REM-J3 Connector, Harness Side	(-)	IFS	Ground	Yes Key in OFF position. If the engine is a no start and REM DTC B2172 is received in on-demand self-test mode: INSTALL a new REM. If the engine starts or REM DTC B2172 is a continuous memory DTC: DTC is possibly intermittent. If the engine is a no start: RETURN to Symptom Charts to continue diagnosis. If the engine starts: GO to Z1. No Key in OFF position. CHECK the IFS switch for an open If OK, REPAIR the open circuit.
(+) REM-J3 Connector, Harness Side	(-)					
IFS	Ground					

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take			
KB55	DTC P1234: IS DTC P1234 PRESENT IN THE KOEO SELF-TEST?	Yes A hard fault is present. GO to KB56 . No The PCM is now receiving a signal from FPDM2. One possible cause of DTC P1234 is that the IFS switch was tripped, then reset. GO to KB66 .			
Note: The Ford GT is equipped with 2 FPDMs. DTC P1234 applies to FPDM2 which is mounted in the lower position on the bracket. - Check for KOEO DTCs: Is DTC P1234 present?					
KB56	CHECK POWER AND GROUND CIRCUITS TO THE FPDM2	Yes Key in OFF position. To check the FPM2 circuit, GO to KB62 . No GO to KB57 .			
- FPDM2 connector disconnected. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-) FPDM2 Connector, Harness Side</td></tr><tr><td>FPDM2 PWR - Pin 5</td><td>GND - Pin 3</td></tr></table> Is the voltage greater than 10.5 V?			(+) FPDM2 Connector, Harness Side	(-) FPDM2 Connector, Harness Side	FPDM2 PWR - Pin 5
(+) FPDM2 Connector, Harness Side	(-) FPDM2 Connector, Harness Side				
FPDM2 PWR - Pin 5	GND - Pin 3				
KB57	CHECK POWER TO FPDM2	Yes REPAIR the open circuit. Open FPDM2 ground circuit No Key in OFF position. No power to FPDM2 GO to KB58 .			
- Measure the voltage between: <table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPDM2 PWR - Pin 5</td><td>Ground</td></tr></table> Is the voltage greater than 10.5 V?			(+) FPDM2 Connector, Harness Side	(-)	FPDM2 PWR - Pin 5
(+) FPDM2 Connector, Harness Side	(-)				
FPDM2 PWR - Pin 5	Ground				
KB58	CHECK THE B+ VOLTAGE TO THE FPDM2 POWER SUPPLY RELAY	Yes GO to KB59 . No B+ circuit fault. CHECK the condition of the related fuse/fuse links. If OK, REPAIR the open circuit. If the fuse/fuse link is damaged, CHECK the circuit for short to ground before replacing.			
- FPDM2 PWR Relay connector disconnected. - Measure the voltage between: <table><tr><td>(+) FPDM2 PWR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>B+ - Pin 3</td><td>Ground</td></tr></table> Is the voltage greater than 10.5 V?			(+) FPDM2 PWR Relay Connector, Harness Side	(-)	B+ - Pin 3
(+) FPDM2 PWR Relay Connector, Harness Side	(-)				
B+ - Pin 3	Ground				

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB59	CHECK THE VPWR VOLTAGE TO FPDM2 POWER SUPPLY RELAY - Measure the voltage between:<table><tr><td>(+) FPDM2 PWR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 1</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) FPDM2 PWR Relay Connector, Harness Side	(-)	VPWR - Pin 1	Ground	Yes GO to KB60. No REPAIR the open circuit.
(+) FPDM2 PWR Relay Connector, Harness Side	(-)					
VPWR - Pin 1	Ground					
KB60	CHECK FOR GROUND TO THE FPDM2 POWER SUPPLY RELAY - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) FPDM2 PWR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>GND - Pin 2</td><td>Ground</td></tr></table> - Is the resistance less than 5 ohms?	(+) FPDM2 PWR Relay Connector, Harness Side	(-)	GND - Pin 2	Ground	Yes GO to KB61. No REPAIR the open circuit.
(+) FPDM2 PWR Relay Connector, Harness Side	(-)					
GND - Pin 2	Ground					
KB61	CHECK THE FPDM2 PWR CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-) FPDM2 PWR Relay Connector, Harness Side</td></tr><tr><td>FPDM2 PWR - Pin 5</td><td>FPDM2 PWR - Pin 5</td></tr></table> - Is the resistance less than 5 ohms?	(+) FPDM2 Connector, Harness Side	(-) FPDM2 PWR Relay Connector, Harness Side	FPDM2 PWR - Pin 5	FPDM2 PWR - Pin 5	Yes INSTALL a new FPDM2 PWR relay. No GO to KB66.
(+) FPDM2 Connector, Harness Side	(-) FPDM2 PWR Relay Connector, Harness Side					
FPDM2 PWR - Pin 5	FPDM2 PWR - Pin 5					
KB62	CHECK THE FPM2 CIRCUIT FOR AN OPEN IN THE HARNESS - FPDM2 connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FPM2 - Pin 1</td><td>FPM2</td></tr></table> - Is the resistance less than 5 ohms?	(+) FPDM2 Connector, Harness Side	(-) PCM Connector, Harness Side	FPM2 - Pin 1	FPM2	Yes GO to KB63. No REPAIR the open circuit.
(+) FPDM2 Connector, Harness Side	(-) PCM Connector, Harness Side					
FPM2 - Pin 1	FPM2					

KB59-KB62

Fuel Pump Driver Module**KB**

Test Step		Results / Action to Take				
KB63	CHECK THE FPM2 CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPM2 - Pin 1</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) FPDM2 Connector, Harness Side	(-)	FPM2 - Pin 1	Ground	Yes Key in OFF position. GO to KB64 . No REPAIR the short circuit.
(+) FPDM2 Connector, Harness Side	(-)					
FPM2 - Pin 1	Ground					
KB64	CHECK THE FPM2 CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPM2 - Pin 1</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) FPDM2 Connector, Harness Side	(-)	FPM2 - Pin 1	Ground	Yes GO to KB65 . No REPAIR the short circuit.
(+) FPDM2 Connector, Harness Side	(-)					
FPM2 - Pin 1	Ground					
KB65	CHECK FOR FPM2 OUTPUT FROM THE FPDM2 - FPDM2 connector connected. - Key in ON position. Note: It is OK for the voltage to cycle below this range and then return within range. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPM2</td><td>Ground</td></tr></table> - Is the voltage between 0.02 V - 1 V?	(+) PCM Connector, Harness Side	(-)	FPM2	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new FPDM2.
(+) PCM Connector, Harness Side	(-)					
FPM2	Ground					

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB66	CHECK CIRCUITS THAT MAY CAUSE AN INTERMITTENT LOSS OF POWER SUPPLY TO THE FPDM2 Note: Be aware that P1234 could be set if the IFS switch is tripped then reset. • Key in ON position. • Access the PCM and monitor the FPM2 PID. Note: With no fault detected, the FPDM2 sends a 50% duty cycle (all OK) to the PCM on the FPM2 circuit. Depending on diagnostic tools, the FPM2 PID may display 50%, or a random value that is fluctuating between 85% and 115%. • Observe the FPM2 PID for an Indication of a fault while completing the following: (look for the FPM2 PID to change from the 50% value, or to stop fluctuating). • Shake, wiggle, and bend the following circuits: — FPDM2 GND. — FPDM2 PWR circuit to FPDM2. — FPM2 circuit between the FPDM2 and the PCM. — B+ and ground circuits to the FPDM2 power supply relay. — Lightly tap on the IFS to simulate road shock. — Lightly tap on the FPDM2 to simulate road shock. — Lightly tap on the FPDM2 power supply relay to simulate road shock. • Key in OFF position. • Is a concern present?	Yes ISOLATE the fault and REPAIR as necessary. No Unable to duplicate or identify the fault at this time. GO to Z1.				
KB67	DTC P1236: IS DTC P1236 PRESENT IN THE KOEO SELF-TEST? • The Ford GT is equipped with 2 FPDMs. DTC P1236 applies to FPDM2 which is mounted in the lower position on the bracket. • Check for KOEO DTCs: • Is DTC P1236 present?	Yes A hard fault is present. GO to KB68. No GO to KB72.				
KB68	CHECK THE FP CIRCUIT FOR AN OPEN IN THE HARNESS • Key in OFF position. • FPDM2 connector disconnected. • PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) FPDM2 Connector, Harness Side</td></tr><tr><td>FP</td><td>FP - Pin 6</td></tr></table> • Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) FPDM2 Connector, Harness Side	FP	FP - Pin 6	Yes GO to KB69. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) FPDM2 Connector, Harness Side					
FP	FP - Pin 6					

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB69	CHECK THE FP CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - FPDM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-)</td></tr><tr><td>FP - Pin 6</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) FPDM2 Connector, Harness Side	(-)	FP - Pin 6	Ground	Yes Key in OFF position. GO to KB70. No REPAIR the short circuit.
(+) FPDM2 Connector, Harness Side	(-)					
FP - Pin 6	Ground					
KB70	CHECK THE FP CIRCUIT FOR A SHORT TO GROUND - Measure the resistance between:<table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-)</td></tr><tr><td>FP - Pin 6</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) FPDM2 Connector, Harness Side	(-)	FP - Pin 6	Ground	Yes GO to KB71. No REPAIR the short circuit.
(+) FPDM2 Connector, Harness Side	(-)					
FP - Pin 6	Ground					
KB71	CHECK THE FP CIRCUIT IN THE FPDM2 - FPDM2 connector connected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FP</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) PCM Connector, Harness Side	(-)	FP	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new FPDM2.
(+) PCM Connector, Harness Side	(-)					
FP	Ground					
KB72	CHECK THE FP CIRCUIT FOR AN INTERMITTENT OPEN OR SHORTS - Key in ON position. - Access the PCM and monitor the FPM2 PID. Note: With no fault detected, the FPDM2 sends a 50% duty cycle (all OK) to the PCM on the FPM2 circuit. Depending on diagnostic tools, the FPM2 PID may display 50%, or a random value that is fluctuating between 85% and 115%. - Observe the FPM2 PID for an indication of a fault while completing the following: (look for the FPM2 PID to change from the 50% value, or to stop fluctuating). - Shake, wiggle, and bend the FP circuit between FPDM2 and the PCM. - Lightly tap on the FPDM2 to simulate road shock. - Is a concern present?	Yes ISOLATE the fault and REPAIR as necessary. No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1.				

KB69-KB72

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take						
KB73	DTC P1238: IS DTC P1238 PRESENT IN THE KOEO SELF-TEST?							
	Note: The Ford GT is equipped with 2 FPDMs. DTC P1238 applies to FPDM2 which is mounted in the lower position on the bracket. • Check for KOEO DTCs: • Is DTC P1238 present?	Yes A hard fault is present. GO to KB74. No DTC P1238 is possibly intermittent. GO to KB80.						
KB74	CHECK FP2PWR, FP2RTN AND INTERNAL FUEL PUMP CIRCUIT RESISTANCE							
	• Key in OFF position. • FPDM2 connector disconnected. • Measure the resistance between: <table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-) FPDM2 Connector, Harness Side</td></tr><tr><td>FP2PWR - Pin 4</td><td>FP2RTN - Pin 2</td></tr></table> • Is the resistance less than 10 ohms?	(+) FPDM2 Connector, Harness Side	(-) FPDM2 Connector, Harness Side	FP2PWR - Pin 4	FP2RTN - Pin 2	Yes GO to KB75. No To ISOLATE the fault, GO to KB79.		
(+) FPDM2 Connector, Harness Side	(-) FPDM2 Connector, Harness Side							
FP2PWR - Pin 4	FP2RTN - Pin 2							
KB75	CHECK THE FP2PWR AND FP2RTN CIRCUIT(S) FOR A SHORT TO POWER IN THE HARNESS							
	• Key in OFF position. • FP connector disconnected. Refer to Vehicle/Diagrams for the correct connector. • Key in ON position. • Measure the voltage between: <table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-)</td></tr><tr><td>FP2PWR - Pin 4</td><td>Ground</td></tr><tr><td>FP2RTN - Pin 2</td><td>Ground</td></tr></table> • Are the voltages less than 1 V?	(+) FPDM2 Connector, Harness Side	(-)	FP2PWR - Pin 4	Ground	FP2RTN - Pin 2	Ground	Yes GO to KB76. No REPAIR the short circuit.
(+) FPDM2 Connector, Harness Side	(-)							
FP2PWR - Pin 4	Ground							
FP2RTN - Pin 2	Ground							
KB76	CHECK THE FP2PWR AND FP2RTN CIRCUIT(S) FOR A SHORT TO GROUND IN THE HARNESS							
	• Key in OFF position. • Measure the resistance between: <table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-)</td></tr><tr><td>FP2PWR - Pin 4</td><td>Ground</td></tr><tr><td>FP2RTN - Pin 2</td><td>Ground</td></tr></table> • Are the resistances greater than 10K ohms?	(+) FPDM2 Connector, Harness Side	(-)	FP2PWR - Pin 4	Ground	FP2RTN - Pin 2	Ground	Yes GO to KB77. No REPAIR the short circuit.
(+) FPDM2 Connector, Harness Side	(-)							
FP2PWR - Pin 4	Ground							
FP2RTN - Pin 2	Ground							

KB73-KB76

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take									
KB77	CHECK FOR A SHORT BETWEEN THE FP2PWR AND FP2RTN CIRCUITS	Yes GO to KB78. No REPAIR the short circuit.									
- Measure the resistance between: <table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-) FPDM2 Connector, Harness Side</td></tr><tr><td>FP2PWR - Pin 4</td><td>FP2RTN - Pin 2</td></tr></table> - Is the resistance greater than 10K ohms?			(+) FPDM2 Connector, Harness Side	(-) FPDM2 Connector, Harness Side	FP2PWR - Pin 4	FP2RTN - Pin 2					
(+) FPDM2 Connector, Harness Side	(-) FPDM2 Connector, Harness Side										
FP2PWR - Pin 4	FP2RTN - Pin 2										
KB78	CHECK FOR VOLTAGE TO FP	Yes INSTALL a new FP. No VERIFY the vehicle battery was at a proper charge during the test. VERIFY the pump ON command did not time out before the voltage check was made. If OK, INSTALL a new FPDM2.									
- FPDM2 connector connected. - Key in ON position. Note: During Output Test Mode, the fuel pump stays commanded on for only about 5 seconds. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Measure the voltage between: <table><tr><td>(+) FP Connector, Harness Side</td><td>(-) FP Connector, Harness Side</td></tr><tr><td>FP2PWR</td><td>FP2RTN</td></tr></table> - Is the voltage greater than 10 V?			(+) FP Connector, Harness Side	(-) FP Connector, Harness Side	FP2PWR	FP2RTN					
(+) FP Connector, Harness Side	(-) FP Connector, Harness Side										
FP2PWR	FP2RTN										
KB79	ISOLATE THE OPEN IN THE FP2 CIRCUIT	Yes No fault found. Unable to duplicate or identify the fault at this time. GO to Z1. No REPAIR the open circuit. If the open is internal to the pump, INSTALL a new FP									
- FP connector disconnected. Refer to Vehicle/Diagrams for the correct connector. - Measure the resistance between: <table><tr><td>(+) FP Connector, Harness Side</td><td>(-) FPDM2 Connector, Harness Side</td></tr><tr><td>FP2PWR</td><td>FP2PWR - Pin 4</td></tr><tr><td>FP2RTN</td><td>FP2RTN - Pin 2</td></tr></table> - Measure the resistance between: <table><tr><td>(+) FP Connector, Component Side</td><td>(-) FP Connector, Component Side</td></tr><tr><td>FP2PWR</td><td>FP2RTN</td></tr></table> - Is the resistance less than 10 ohms?			(+) FP Connector, Harness Side	(-) FPDM2 Connector, Harness Side	FP2PWR	FP2PWR - Pin 4	FP2RTN	FP2RTN - Pin 2	(+) FP Connector, Component Side	(-) FP Connector, Component Side	FP2PWR
(+) FP Connector, Harness Side	(-) FPDM2 Connector, Harness Side										
FP2PWR	FP2PWR - Pin 4										
FP2RTN	FP2RTN - Pin 2										
(+) FP Connector, Component Side	(-) FP Connector, Component Side										
FP2PWR	FP2RTN										

KB77-KB79

Fuel Pump Driver Module**KB**

Test Step		Results / Action to Take
KB80	CHECK THE FP2PWR AND FP2RTN CIRCUIT FOR AN INTERMITTENT OPEN OR SHORTS	
• Key in ON position. • Access the PCM and monitor the FPM2 PID. Note: With no fault detected, the FPDM2 sends a 50% duty cycle (all OK) to the PCM on the FPM2 circuit. Depending on diagnostic tools, the FPM2 PID may display 50%, or a random value that is fluctuating between 85% and 115%. • Observe the FPM2 PID for an indication of a fault while completing the following: (look for the FPM2 PID to change from the 50% value, or to stop fluctuating). — Shake, wiggle, and bend the FP2PWR and FP2RTN circuits between the FPDM2 and the FP. — Lightly tap on the FP and FPDM2 to simulate road shock. • Is a concern present?		Yes ISOLATE the fault and REPAIR as necessary. No Key in OFF position. GO to Z1.

KB80

Test KD: Electric Exhaust Gas Recirculation (EEGR) System
PINPOINT TEST KD: ELECTRIC EXHAUST GAS RECIRCULATION (EEGR) SYSTEM

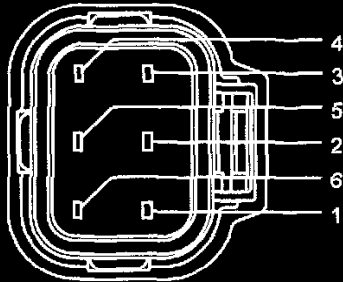
Electric Exhaust Gas Recirculation (EEGR) System

KD

This pinpoint test is intended to diagnose the following:

- EEGR System.
- EEGR stepper motor (9D475).
- Harness circuit: EEGR.
- Powertrain control module (PCM) (12A650).

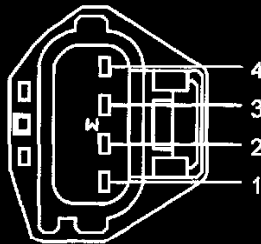
Electric Exhaust Gas Recirculation (EEGR) Assembly Connector



A0077511

Circuit	Pin
EGRMC4 (EGR Motor Control 4)	6
EGRMC3 (EGR Motor Control 3)	4
EGRMC2 (EGR Motor Control 2)	3
EGRMC1 (EGR Motor Control 1)	1
VPWR (Power Supply)	2, 5

Note And Connector

**Electric Exhaust Gas Recirculation
(EGR) System****KD****Manifold Absolute Pressure (MAP) Sensor
Connector**

A0077519

Vehicle	Connector	Circuit	Pin
Focus	A	MAP SIGRTN VREF	1 4 2
Ranger	A	MAP SIGRTN VREF	4 1 3

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Ranger	104 Pin	VPWR EGRMC4 EGRMC3 EGRMC2 EGRMC1	71 98 72 99 73
All other vehicles	150 (50-50-50) Pin	VPWR EGRMC4 EGRMC3 EGRMC2 EGRMC1	B35 E11 E10 E9 E8

Electric Exhaust Gas Recirculation (EEGR) System

KD

Test Step		Results / Action to Take									
KD1	DTC P0403: EGR CONTROL CIRCUIT - CHECK THE CONNECTION OF THE EEGR HARNESS CONNECTOR TO THE EEGR	Yes GO to KD2 . No REPAIR as necessary.									
Note: If the DTC is intermittent, wiggle the harness and connectors when taking measurements. • Check the connection of the EEGR harness connector to the EEGR. • Are the connector contacts clean and properly seated?											
KD2	CHECK FOR VPWR AT THE EEGR HARNESS CONNECTOR	Yes GO to KD3 . No REPAIR the open circuit.									
• Key in ON position. • EEGR Assembly connector disconnected. • Measure the voltage between:<table><tr><td>(+) EEGR Assembly Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VPWR - Pin 2, 5</td><td>Negative terminal</td></tr></table> • Are the voltages greater than 10.5 volts?			(+) EEGR Assembly Connector, Harness Side	(-) Vehicle Battery	VPWR - Pin 2, 5	Negative terminal					
(+) EEGR Assembly Connector, Harness Side	(-) Vehicle Battery										
VPWR - Pin 2, 5	Negative terminal										
KD3	CHECK THE EEGR CIRCUIT(S) FOR AN OPEN IN THE HARNESS	Yes GO to KD4 . No REPAIR the open circuit.									
• Key in OFF position. • PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) EEGR Assembly Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>EGRMC1 - Pin 1</td><td>EGRMC1</td></tr><tr><td>EGRMC2 - Pin 3</td><td>EGRMC2</td></tr><tr><td>EGRMC3 - Pin 4</td><td>EGRMC3</td></tr><tr><td>EGRMC4 - Pin 6</td><td>EGRMC4</td></tr></table> • Are the resistances less than 5 ohms?			(+) EEGR Assembly Connector, Harness Side	(-) PCM Connector, Harness Side	EGRMC1 - Pin 1	EGRMC1	EGRMC2 - Pin 3	EGRMC2	EGRMC3 - Pin 4	EGRMC3	EGRMC4 - Pin 6
(+) EEGR Assembly Connector, Harness Side	(-) PCM Connector, Harness Side										
EGRMC1 - Pin 1	EGRMC1										
EGRMC2 - Pin 3	EGRMC2										
EGRMC3 - Pin 4	EGRMC3										
EGRMC4 - Pin 6	EGRMC4										

KD1-KD3

Electric Exhaust Gas Recirculation (EEGR) System

KD

Test Step		Results / Action to Take														
KD4	CHECK THE EEGR CIRCUIT(S) FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) EEGR Assembly Connector, Harness Side</th><th>(-) Vehicle Battery</th></tr><tr><td>EGRMC1 - Pin 1</td><td>Negative terminal</td></tr><tr><td>EGRMC2 - Pin 3</td><td>Negative terminal</td></tr><tr><td>EGRMC3 - Pin 4</td><td>Negative terminal</td></tr><tr><td>EGRMC4 - Pin 6</td><td>Negative terminal</td></tr></table> - Are the resistances greater than 10K ohms?	(+) EEGR Assembly Connector, Harness Side	(-) Vehicle Battery	EGRMC1 - Pin 1	Negative terminal	EGRMC2 - Pin 3	Negative terminal	EGRMC3 - Pin 4	Negative terminal	EGRMC4 - Pin 6	Negative terminal	Yes GO to KD5 . No REPAIR the short circuit to GND.				
(+) EEGR Assembly Connector, Harness Side	(-) Vehicle Battery															
EGRMC1 - Pin 1	Negative terminal															
EGRMC2 - Pin 3	Negative terminal															
EGRMC3 - Pin 4	Negative terminal															
EGRMC4 - Pin 6	Negative terminal															
KD5	CHECK FOR SHORTS BETWEEN CIRCUITS IN THE EEGR HARNESS Note: REFER to the PCM connector pin numbers in the beginning of this pinpoint test. - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>EGRMC3</td><td>EGRMC1</td></tr><tr><td>EGRMC3</td><td>EGRMC2</td></tr><tr><td>EGRMC3</td><td>EGRMC4</td></tr><tr><td>EGRMC1</td><td>EGRMC2</td></tr><tr><td>EGRMC1</td><td>EGRMC4</td></tr><tr><td>EGRMC2</td><td>EGRMC4</td></tr></table> - Are the resistances greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	EGRMC3	EGRMC1	EGRMC3	EGRMC2	EGRMC3	EGRMC4	EGRMC1	EGRMC2	EGRMC1	EGRMC4	EGRMC2	EGRMC4	Yes GO to KD6 . No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side															
EGRMC3	EGRMC1															
EGRMC3	EGRMC2															
EGRMC3	EGRMC4															
EGRMC1	EGRMC2															
EGRMC1	EGRMC4															
EGRMC2	EGRMC4															
KD6	CHECK THE EEGR CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><th>(+) EEGR Assembly Connector, Harness Side</th><th>(-) Vehicle Battery</th></tr><tr><td>EGRMC1 - Pin 1</td><td>Negative terminal</td></tr><tr><td>EGRMC2 - Pin 3</td><td>Negative terminal</td></tr><tr><td>EGRMC3 - Pin 4</td><td>Negative terminal</td></tr><tr><td>EGRMC4 - Pin 6</td><td>Negative terminal</td></tr></table> - Are the voltages greater than 0.1 V?	(+) EEGR Assembly Connector, Harness Side	(-) Vehicle Battery	EGRMC1 - Pin 1	Negative terminal	EGRMC2 - Pin 3	Negative terminal	EGRMC3 - Pin 4	Negative terminal	EGRMC4 - Pin 6	Negative terminal	Yes REPAIR the short circuit. No GO to KD7 .				
(+) EEGR Assembly Connector, Harness Side	(-) Vehicle Battery															
EGRMC1 - Pin 1	Negative terminal															
EGRMC2 - Pin 3	Negative terminal															
EGRMC3 - Pin 4	Negative terminal															
EGRMC4 - Pin 6	Negative terminal															

KD4-KD6

Electric Exhaust Gas Recirculation (EEGR) System

KD

Test Step		Results / Action to Take										
KD7	CHECK THE EEGR COILS FOR AN OPEN - Key in OFF position. - Measure the resistance between:<table><tr><th>(+) EEGR Assembly Connector, Component Side</th><th>(-) EEGR Assembly Connector, Component Side</th></tr><tr><td>EGRMC1 - Pin 1</td><td>VPWR - Pin 2, 5</td></tr><tr><td>EGRMC2 - Pin 3</td><td>VPWR - Pin 2, 5</td></tr><tr><td>EGRMC3 - Pin 4</td><td>VPWR - Pin 2, 5</td></tr><tr><td>EGRMC4 - Pin 6</td><td>VPWR - Pin 2, 5</td></tr></table> - Are the resistances between 15 ohms - 24 ohms?	(+) EEGR Assembly Connector, Component Side	(-) EEGR Assembly Connector, Component Side	EGRMC1 - Pin 1	VPWR - Pin 2, 5	EGRMC2 - Pin 3	VPWR - Pin 2, 5	EGRMC3 - Pin 4	VPWR - Pin 2, 5	EGRMC4 - Pin 6	VPWR - Pin 2, 5	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No INSTALL a new EEGR assembly.
(+) EEGR Assembly Connector, Component Side	(-) EEGR Assembly Connector, Component Side											
EGRMC1 - Pin 1	VPWR - Pin 2, 5											
EGRMC2 - Pin 3	VPWR - Pin 2, 5											
EGRMC3 - Pin 4	VPWR - Pin 2, 5											
EGRMC4 - Pin 6	VPWR - Pin 2, 5											
KD8	DTCS P0400 AND P1408: CHECK FOR STUCK OR STICKY EGR VALVE OPERATION BY COMPARING ACTUAL MAP VOLTAGE TO MAP_V PID VOLTAGE Note: Repair the following DTCs first, if present: — P0102, P0103, P0107, P0108, P1100, P1101. - Key in OFF position. - MAP Sensor connector disconnected. - Connect a 5 amp fused jumper wire between the following:<table><tr><th>Point A MAP Sensor Connector, Harness Side</th><th>Point B MAP Sensor Connector, Component Side</th></tr><tr><td>VREF</td><td>VREF</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> - Key on engine running. - Measure the voltage between:<table><tr><th>(+) MAP Sensor Connector, Component Side</th><th>(-) Vehicle Battery</th></tr><tr><td>MAP</td><td>Negative terminal</td></tr></table> - Is the voltage between 1 V - 2 V?	Point A MAP Sensor Connector, Harness Side	Point B MAP Sensor Connector, Component Side	VREF	VREF	SIGRTN	SIGRTN	(+) MAP Sensor Connector, Component Side	(-) Vehicle Battery	MAP	Negative terminal	Yes RECORD the actual MAP voltage values at KOEO, idle, 1,000 and 2,000 RPM. You will use the values for comparison in the following test step. GO to KD9 . No Key in OFF position. CHECK the MAP harness for open and short circuits.
Point A MAP Sensor Connector, Harness Side	Point B MAP Sensor Connector, Component Side											
VREF	VREF											
SIGRTN	SIGRTN											
(+) MAP Sensor Connector, Component Side	(-) Vehicle Battery											
MAP	Negative terminal											
KD9	COMPARE ACTUAL MAP VOLTAGE TO MAP_V PID VOLTAGE EGR - Key in ON position. - Access the PCM and monitor the MAP_V PID. - Note the MAP_V PID voltage. - Key on engine running. - Note the MAP_V PID voltage. - Increase engine speed to 1,000 RPM. Note the MAP_V PID voltage. - Increase engine speed to 2,000 RPM. Note the MAP_V PID voltage. - Does the MAP_V PID voltage stay within 0.5 volt of the actual MAP voltage?	Yes Key in OFF position. The fault is not present at this time. Be sure the MAP is properly seated and the vacuum source is not blocked. No Key in OFF position. GO to KD10 .										

KD7-KD9

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

Test Step		Results / Action to Take
KD10	CARRY OUT THE KOER SELF-TEST	Yes INSTALL a new EEGR assembly. No REFER to Symptom Charts, Step 2: No DTCs Present Symptom Chart Index.
	Does DTC P1408 reappear?	

KD10**Test KE: Idle Air Control (IAC) Valve****PINPOINT TEST KE: IDLE AIR CONTROL (IAC) VALVE**

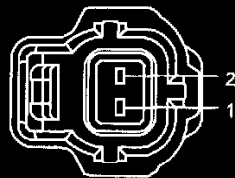
Idle Air Control (IAC) Valve

KE

This pinpoint test is intended to diagnose the following:

- Idle Air Control (IAC) Valve (9F715).
- Harness circuits: IAC, PWR and B+ (IAC-RC).
- Powertrain control module (PCM) (12A650).

Idle Air Control (IAC) Connector



A0077545

Vehicle	Connector	Circuit	Pin
Focus	A	IAC PWR	1 2
All other vehicles	A	IAC PWR	2 1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator	150 (60-32-58) Pin	IAC	E9
Escape, Mariner	150 (50-50-50) Pin	IAC	E39

(Continued)

Note And Connectors

Idle Air Control (IAC) Valve

KE

Vehicle	Connector	Circuit	Pin
Focus	150 (50-50-50) Pin	IAC-RC IAC	E38 E50
Sable, Taurus	104 Pin	IAC-RC IAC	58 83
All other vehicles	104 Pin	IAC	83

Test Step		Results / Action to Take				
KE1	DTCS P0505, P0506, P0511, P1504 OR P1507: CHECK FOR INLET AIR LEAKS. (OR STARTS ONLY AT PART THROTTLE) - With the engine running at idle (if possible), listen for vacuum leaks. - Inspect the entire air intake system from the mass air flow (MAF) sensor to the intake manifold for leaks such as: - Damaged or loose IAC air tubes. - Cracked or punctured intake air tube. - Loose intake air tube at the 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 present?	Yes Key in OFF position. REPAIR as necessary. No Key in OFF position. GO to KE2 .				
KE2	CHECK FOR VOLTAGE TO THE IAC SOLENOID Note: If EGR DTC P0402 was output during the self-test, diagnose it first before continuing with this pinpoint test. - IAC connector disconnected. - Key in ON position. - Measure the voltage between: <table border="1"><tr><td>(+) IAC Connector, Har- ness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>PWR</td><td>Negative terminal</td></tr></table> Is the voltage greater than 10.5 volts?	(+) IAC Connector, Har- ness Side	(-) Vehicle Battery	PWR	Negative terminal	Yes Key in OFF position. GO to KE3 . No Key in OFF position. REPAIR the open circuit.
(+) IAC Connector, Har- ness Side	(-) Vehicle Battery					
PWR	Negative terminal					
KE3	CHECK THE RESISTANCE OF IAC VALVE - IAC connector disconnected. - Measure the resistance between: <table border="1"><tr><td>(+) IAC Connector, Component Side</td><td>(-) IAC Connector, Component Side</td></tr><tr><td>PWR</td><td>IAC</td></tr></table> Is the resistance between 6 ohms - 15 ohms?	(+) IAC Connector, Component Side	(-) IAC Connector, Component Side	PWR	IAC	Yes GO to KE4 . No INSTALL a new IAC valve.
(+) IAC Connector, Component Side	(-) IAC Connector, Component Side					
PWR	IAC					

Chart, KE1-KE3

Idle Air Control (IAC) Valve

KE

Test Step		Results / Action to Take			
KE4	CHECK THE IAC VALVE FOR AN INTERNAL SHORT TO THE IAC CASE	Yes GO to KE5. No INSTALL a new IAC valve.			
- Measure the resistance between:<table><tr><td>(+) IAC Connector, Component Side</td><td>(-) IAC Connector, Component Side</td></tr><tr><td>IAC</td><td>IAC Case</td></tr></table> - Is the resistance greater than 10K ohms?			(+) IAC Connector, Component Side	(-) IAC Connector, Component Side	IAC
(+) IAC Connector, Component Side	(-) IAC Connector, Component Side				
IAC	IAC Case				
KE5	CHECK THE IAC CIRCUIT FOR AN OPEN IN THE HARNESS	Yes For IAC-RC applications GO to KE6. For all others GO to KE7. No REPAIR the open circuit.			
- IAC connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) IAC Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>IAC</td><td>IAC</td></tr></table> - Is the resistance less than 5 ohms?			(+) IAC Connector, Harness Side	(-) PCM Connector, Harness Side	IAC
(+) IAC Connector, Harness Side	(-) PCM Connector, Harness Side				
IAC	IAC				
KE6	CHECK IAC-RC FOR VOLTAGE	Yes GO to KE7. No REPAIR the open circuit.			
- Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>IAC-RC</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?			(+) PCM Connector, Harness Side	(-)	IAC-RC
(+) PCM Connector, Harness Side	(-)				
IAC-RC	Ground				
KE7	CHECK THE IAC CIRCUIT FOR A SHORT TO POWER IN THE HARNESS	Yes Key in OFF position. GO to KE8. No Key in OFF position. REPAIR the short circuit.			
- Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>IAC</td><td>Negative terminal</td></tr></table> - Is the voltage less than 1 V?			(+) PCM Connector, Harness Side	(-) Vehicle Battery	IAC
(+) PCM Connector, Harness Side	(-) Vehicle Battery				
IAC	Negative terminal				
KE8	CHECK THE IAC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS	Yes GO to KE9. No REPAIR the short circuit.			
- Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>IAC</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?			(+) PCM Connector, Harness Side	(-)	IAC
(+) PCM Connector, Harness Side	(-)				
IAC	Ground				

KE4-KE8

Idle Air Control (IAC) Valve

KE

Test Step		Results / Action to Take
KE9	CHECK FOR A DROP IN IDLE RPM WITH THE IAC DISCONNECTED	Yes Key in OFF position. GO to KE11 . No Key in OFF position. GO to KE10 .
	- PCM connector connected. - IAC connector connected. - Key on engine running. - Bring the engine to normal operating temperature. - Transmission in PARK or NEUTRAL. - Disconnect the IAC Valve. Does the RPM drop or the engine stall?	
KE10	CHECK FOR STUCK IAC PINTLE	Yes GO to KE11 . No INSTALL a new IAC valve.
	- Inspect the entire intake air system for debris, blockage or other damage. Remove and inspect the IAC valve and check the pintle movement. Check the air tubes (if equipped) for blockage or damage. Remove and inspect the air cleaner element for excessive dirt. Is the IAC valve OK?	
KE11	VERIFY THE DTC	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No GO to KE12 .
	Is DTC P0511 or P1504 present in continuous memory or from the KOER self-test?	
KE12	CHECK THE IAC SIGNAL FROM THE PCM	Yes Key in OFF position. GO to KE13 . No Key in OFF position. INSTALL a new IAC valve.
	- PCM connector connected. - IAC connector connected. Note: If stalling occurs, place a shim under the hard stop screw to maintain idle conditions. - Key on engine running. - Access the PCM and monitor the RPM PID. - Access the PCM and monitor the IAC PID. - With the engine at normal operating temperature, closed throttle and all accessories off, the IAC duty cycle should be between approximately 22% and 65%. Slowly increase the engine speed to 3,000 RPM and return to closed throttle. (Note: If closed throttle RPM is significantly higher than normal, ignore this step). Is the duty cycle between 22% - 65%?	

KE9-KE12

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

Test Step		Results / Action to Take
KE13	VERIFY THE DTC Is DTC P0506, P0511, P1504 or P1507 present in Continuous Memory ?	Yes GO to KE19. No Key in OFF position. INSPECT throttle body for damage. REPAIR as necessary. If OK, INSTALL a new IAC valve. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM).
KE14	DTCS P0507 OR P1506: CHECK FOR INLET AIR LEAKS - Key on engine running. - With the engine running at idle, listen for vacuum leaks. - Inspect the entire air intake system from the mass air flow (MAF) sensor to the intake manifold for leaks such as: - Damaged or loose IAC air tubes. - Cracked or punctured intake air tube. - Loose intake air tube at the 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 present?	Yes Key in OFF position. REPAIR as necessary. No Key in OFF position. GO to KE15.
KE15	CHECK FOR EVAP DTCS Note: EVAP system malfunctions can cause IAC DTCs or idle speed concerns. Are any EVAP DTCs present ?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to KE16.

KE13-KE15

Idle Air Control (IAC) Valve

KE

Test Step		Results / Action to Take				
KE16	CHECK THE IAC VALVE FOR CORRECT FUNCTION					
• Key on engine running. • Bring the engine to normal operating temperature. • Transmission in PARK or NEUTRAL. • Disconnect the IAC Valve. • Does the RPM drop or the engine stall?		Yes Key in OFF position. GO to KE17. No Key in OFF position. INSPECT throttle body for damage REPAIR as necessary. If OK, INSTALL a new IAC valve. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM).				
KE17	CHECK THE IAC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS					
Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. • Diagnostic tool connector disconnected. • PCM connector disconnected. • Measure the resistance between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>IAC</td><td>Negative terminal</td></tr></table> • Is the resistance greater than 10K ohms?		(+) PCM Connector, Harness Side	(-) Vehicle Battery	IAC	Negative terminal	Yes GO to KE18. No REPAIR the short circuit to GND.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
IAC	Negative terminal					
KE18	VERIFY THE SYMPTOM					
• Is a fast idle symptom currently present?		Yes INSTALL a new PCM. No GO to KE19.				
KE19	CHECK THE IAC SYSTEM FOR AN INTERMITTENT OPEN OR SHORT					
• PCM connector connected. • Key on engine running. • Access the PCM and monitor the IAC and RPM PIDs. • With the engine at normal operating temperature, closed throttle and all accessories off, the IAC duty cycle should be between approximately 22% and 65%. • Observe the PIDs while completing the following at idle: — Lightly tap on the and wiggle the 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 bulkhead and from the bulkhead to the PCM. • Do the IAC or RPM PIDs suddenly change in value, indicating a fault?		Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No Key in OFF position. GO to KE20.				

KE16-KE19

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

Test Step		Results / Action to Take
KE20	VERIFY THE SYMPTOM	Yes INSTALL a new IAC valve. No Concern is elsewhere. RETURN to Symptom Charts for further direction.
• Is an idle quality, starting or stalling symptom currently present?		

KE20

Test KF: Fan Control (FC) Relays
PINPOINT TEST KF: FAN CONTROL (FC) RELAYS

Fan Control (FC) Relays

KF

This pinpoint test is intended to diagnose the following:

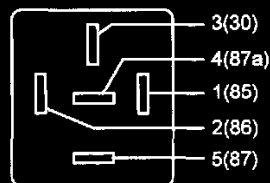
- LFC, MFC, HFC relays.
- Harness circuits: HFC, LFC, MFC, VPWR.
- Powertrain control module (PCM) (12A650).

Three Speed Fan Operation

Although the PCM output circuits are called low, medium and high fan control (FC), cooling fan operation is controlled by a combination of these outputs.

Refer to Description and Operation, PCM Outputs.

Low Fan Control (LFC) Relay Connector

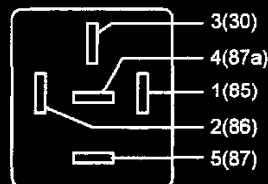


A0077582

Circuit	Pin
LFC (Low Fan Control)	2
VPWR (Power Supply)	1

NOTE: The VPWR and LFC circuits may be reversed in the harness connector. Also, the LFC circuit may be wired to 2 separate relays. Refer to Vehicle/Diagrams for additional information.

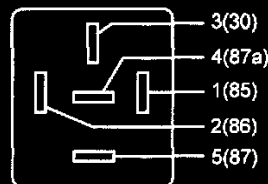
Note And Test Schematic

Fan Control (FC) Relays**KF****Medium Fan Control (MFC) Relay Connector**

A0077582

Circuit	Pin
MFC (Medium Fan Control)	2
VPWR (Power Supply)	1

NOTE: The VPWR & MFC circuits may be reversed in the harness connector. Also, the MFC circuit may be wired to 2 separate relays. Refer to Vehicle/Diagrams for additional information.

High Fan Control (HFC) Relay Connector

A0077582

Fan Control (FC) Relays**KF**

Circuit	Pin
HFC (High Fan Control)	2
VPWR (Power Supply)	1

NOTE: The VPWR & HFC circuits may be reversed in the harness connector. Also, the HFC circuit may be wired to 2 separate relays. Refer to Vehicle/Diagrams for additional information.

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Circuit	Pin
Aviator	LFC	B19
Escape 2.3L, Mariner 2.3L	HFC MFC LFC	B38 B17 B39
Focus	HFC MFC LFC	B38 B4 B39
Freestar/Monterey	HFC MFC LFC	46 19 28
Ford GT	HFC LFC	46 28
Mustang	HFC LFC	E7 E6
Ranger	LFC	45
Sable, Taurus	HFC MFC LFC	46 42 28
All other vehicles	HFC LFC	B38 B39

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF1	KOEO AND KOER DTCS P0480 OR P1474: CHECK THE VPWR VOLTAGE TO LOW SPEED FC RELAY - LFC Relay connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) LFC Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 1</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) LFC Relay Connector, Harness Side	(-)	VPWR - Pin 1	Ground	Yes Key in OFF position. GO to KF2 . No Key in OFF position. REPAIR the open circuit.
(+) LFC Relay Connector, Harness Side	(-)					
VPWR - Pin 1	Ground					
KF2	CHECK FOR LFC CIRCUIT CYCLING - Key in ON position. - Connect a non-powered test lamp between:<table><tr><td>(+) LFC Relay Connector, Harness Side</td><td>(-) LFC Relay Connector, Harness Side</td></tr><tr><td>VPWR - Pin 1</td><td>LFC - Pin 2</td></tr></table> - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the low speed fan ON. - Command the high speed fan ON. - Command the outputs OFF. - Does the test lamp illuminate on and off when either the low or high speed cooling fan output is commanded on and off?	(+) LFC Relay Connector, Harness Side	(-) LFC Relay Connector, Harness Side	VPWR - Pin 1	LFC - Pin 2	Yes Key in OFF position. INSTALL a new LFC relay. No Key in OFF position. REMOVE the test lamp. GO to KF3 .
(+) LFC Relay Connector, Harness Side	(-) LFC Relay Connector, Harness Side					
VPWR - Pin 1	LFC - Pin 2					
KF3	CHECK THE LFC CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) LFC Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>LFC - Pin 2</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) LFC Relay Connector, Harness Side	(-)	LFC - Pin 2	Ground	Yes Key in OFF position. GO to KF4 . No Key in OFF position. REPAIR the short circuit.
(+) LFC Relay Connector, Harness Side	(-)					
LFC - Pin 2	Ground					
KF4	CHECK THE LFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Diagnostic tool connector disconnected. - Measure the resistance between:<table><tr><td>(+) LFC Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>LFC - Pin 2</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) LFC Relay Connector, Harness Side	(-)	LFC - Pin 2	Ground	Yes GO to KF5 . No REPAIR the short circuit.
(+) LFC Relay Connector, Harness Side	(-)					
LFC - Pin 2	Ground					

KF1-KF4

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF5	CHECK THE LFC CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) LFC Relay Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>LFC - Pin 2</td><td>LFC</td></tr></table> - Is the resistance less than 5 ohms?	(+) LFC Relay Connector, Harness Side	(-) PCM Connector, Harness Side	LFC - Pin 2	LFC	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) LFC Relay Connector, Harness Side	(-) PCM Connector, Harness Side					
LFC - Pin 2	LFC					
KF6	KOEO AND KOER DTCS P0482 OR P1477: CHECK THE VPWR VOLTAGE TO MEDIUM SPEED FC RELAY - MFC Relay connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) MFC Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 1</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) MFC Relay Connector, Harness Side	(-)	VPWR - Pin 1	Ground	Yes GO to KF7. No Key in OFF position. REPAIR the open circuit.
(+) MFC Relay Connector, Harness Side	(-)					
VPWR - Pin 1	Ground					
KF7	CHECK FOR MFC CIRCUIT CYCLING - Key in ON position. - Connect a non-powered test lamp between:<table><tr><td>(+) MFC Relay Connector, Harness Side</td><td>(-) MFC Relay Connector, Harness Side</td></tr><tr><td>VPWR - Pin 1</td><td>MFC - Pin 2</td></tr></table> - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the low speed fan ON. - Command the high speed fan ON. - Command the outputs OFF. - Does the test lamp illuminate on and off when either the low or high speed cooling fan output is commanded on and off?	(+) MFC Relay Connector, Harness Side	(-) MFC Relay Connector, Harness Side	VPWR - Pin 1	MFC - Pin 2	Yes Key in OFF position. INSTALL a new MFC relay. No Key in OFF position. REMOVE the test lamp. GO to KF8.
(+) MFC Relay Connector, Harness Side	(-) MFC Relay Connector, Harness Side					
VPWR - Pin 1	MFC - Pin 2					
KF8	CHECK THE MFC CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) MFC Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>MFC - Pin 2</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) MFC Relay Connector, Harness Side	(-)	MFC - Pin 2	Ground	Yes Key in OFF position. GO to KF9. No REPAIR the short circuit.
(+) MFC Relay Connector, Harness Side	(-)					
MFC - Pin 2	Ground					

KF5-KF8

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF9	CHECK THE MFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Diagnostic tool connector disconnected. - Measure the resistance between:<table><tr><td>(+) MFC Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>MFC - Pin 2</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) MFC Relay Connector, Harness Side	(-)	MFC - Pin 2	Ground	Yes GO to KF10. No Key in OFF position. REPAIR the short circuit.
(+) MFC Relay Connector, Harness Side	(-)					
MFC - Pin 2	Ground					
KF10	CHECK THE MFC CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) MFC Relay Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>MFC - Pin 2</td><td>MFC</td></tr></table> - Is the resistance less than 5 ohms?	(+) MFC Relay Connector, Harness Side	(-) PCM Connector, Harness Side	MFC - Pin 2	MFC	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) MFC Relay Connector, Harness Side	(-) PCM Connector, Harness Side					
MFC - Pin 2	MFC					
KF11	KOEO AND KOER DTCS P0481 OR P1479: CHECK THE VPWR VOLTAGE TO HIGH SPEED FC RELAY - HFC Relay connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) HFC Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 1</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) HFC Relay Connector, Harness Side	(-)	VPWR - Pin 1	Ground	Yes GO to KF12. No Key in OFF position. REPAIR the open circuit.
(+) HFC Relay Connector, Harness Side	(-)					
VPWR - Pin 1	Ground					
KF12	CHECK FOR HFC CIRCUIT CYCLING - Key in ON position. - Connect a non-powered test lamp between:<table><tr><td>(+) HFC Relay Connector, Harness Side</td><td>(-) HFC Relay Connector, Harness Side</td></tr><tr><td>VPWR - Pin 1</td><td>HFC - Pin 2</td></tr></table> - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the low speed fan ON. - Command the high speed fan ON. - Command the outputs OFF. - Does the test lamp illuminate on and off when either the low or high speed cooling fan output is commanded on and off?	(+) HFC Relay Connector, Harness Side	(-) HFC Relay Connector, Harness Side	VPWR - Pin 1	HFC - Pin 2	Yes Key in OFF position. INSTALL a new HFC relay. No Key in OFF position. REMOVE the test lamp. GO to KF13.
(+) HFC Relay Connector, Harness Side	(-) HFC Relay Connector, Harness Side					
VPWR - Pin 1	HFC - Pin 2					

KF9-KF12

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF13	CHECK THE HFC CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) HFC Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>HFC - Pin 2</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) HFC Relay Connector, Harness Side	(-)	HFC - Pin 2	Ground	Yes Key in OFF position. GO to KF14. No Key in OFF position. REPAIR the short circuit.
(+) HFC Relay Connector, Harness Side	(-)					
HFC - Pin 2	Ground					
KF14	CHECK THE HFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Diagnostic tool connector disconnected. - Measure the resistance between:<table><tr><td>(+) HFC Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>HFC - Pin 2</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) HFC Relay Connector, Harness Side	(-)	HFC - Pin 2	Ground	Yes GO to KF15. No REPAIR the short circuit.
(+) HFC Relay Connector, Harness Side	(-)					
HFC - Pin 2	Ground					
KF15	CHECK THE HFC CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) HFC Relay Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>HFC - Pin 2</td><td>HFC</td></tr></table> - Is the resistance less than 5 ohms?	(+) HFC Relay Connector, Harness Side	(-) PCM Connector, Harness Side	HFC - Pin 2	HFC	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) HFC Relay Connector, Harness Side	(-) PCM Connector, Harness Side					
HFC - Pin 2	HFC					
KF16	KOEO AND KOER DTCS P0480 OR P1474: CHECK THE VPWR VOLTAGE TO LFC1 RLY Note: This application has 2 relays wired to the LFC circuit. This procedure may call out LFC1 and LFC2 relays. Either of the relays may be used as the number 1, with the other relay being number 2. - LFC1 Relay connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) LFC1 Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) LFC1 Relay Connector, Harness Side	(-)	VPWR	Ground	Yes Key in OFF position. GO to KF17. No Key in OFF position. REPAIR the open circuit.
(+) LFC1 Relay Connector, Harness Side	(-)					
VPWR	Ground					

KF13-KF16

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF17	CHECK FOR LFC CIRCUIT CYCLING - Connect a non-powered test lamp between: <table border="1"> <tr> <td>(+) LFC1 Relay Connector, Harness Side</td> <td>(-) LFC1 Relay Connector, Harness Side</td> </tr> <tr> <td>VPWR</td> <td>LFC</td> </tr> </table> - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the low speed fan ON. - Command the high speed fan ON. - Command the outputs OFF. Does the test lamp illuminate on and off when either the low or high speed cooling fan output is commanded on and off?	(+) LFC1 Relay Connector, Harness Side	(-) LFC1 Relay Connector, Harness Side	VPWR	LFC	Yes INSTALL a new LFC1 RLY. LEAVE RLY disconnected. GO to KF22 . No Leave the test lamp connected GO to KF18 .
(+) LFC1 Relay Connector, Harness Side	(-) LFC1 Relay Connector, Harness Side					
VPWR	LFC					
KF18	CHECK FOR LFC CIRCUIT CYCLING WITH THE LFC2 RLY DISCONNECTED - Connect a non-powered test lamp between: <table border="1"> <tr> <td>(+) LFC1 Relay Connector, Harness Side</td> <td>(-) LFC1 Relay Connector, Harness Side</td> </tr> <tr> <td>VPWR</td> <td>LFC</td> </tr> </table> - LFC2 Relay connector disconnected. - Command the low speed fan ON. - Command the high speed fan ON. - Command the outputs OFF. Does the test lamp illuminate on and off when either the low or high speed cooling fan output is commanded on and off?	(+) LFC1 Relay Connector, Harness Side	(-) LFC1 Relay Connector, Harness Side	VPWR	LFC	Yes INSTALL a new LFC2 relay. No GO to KF19 .
(+) LFC1 Relay Connector, Harness Side	(-) LFC1 Relay Connector, Harness Side					
VPWR	LFC					
KF19	CHECK THE LFC CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - PCM connector disconnected. - Key in ON position. - Measure the voltage between: <table border="1"> <tr> <td>(+) LFC1 Relay Connector, Harness Side</td> <td>(-)</td> </tr> <tr> <td>LFC</td> <td>Ground</td> </tr> </table> Is the voltage less than 1 V?	(+) LFC1 Relay Connector, Harness Side	(-)	LFC	Ground	Yes Key in OFF position. GO to KF20 . No Key in OFF position. REPAIR the short circuit.
(+) LFC1 Relay Connector, Harness Side	(-)					
LFC	Ground					
KF20	CHECK THE LFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Diagnostic tool connector disconnected. - Measure the resistance between: <table border="1"> <tr> <td>(+) LFC1 Relay Connector, Harness Side</td> <td>(-)</td> </tr> <tr> <td>LFC</td> <td>Ground</td> </tr> </table> Is the resistance greater than 10K ohms?	(+) LFC1 Relay Connector, Harness Side	(-)	LFC	Ground	Yes GO to KF21 . No REPAIR the short circuit.
(+) LFC1 Relay Connector, Harness Side	(-)					
LFC	Ground					

KF17-KF20

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF21	CHECK THE LFC CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) LFC1 Relay Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>LFC</td><td>LFC</td></tr></table> - Is the resistance less than 5 ohms?	(+) LFC1 Relay Connector, Harness Side	(-) PCM Connector, Harness Side	LFC	LFC	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) LFC1 Relay Connector, Harness Side	(-) PCM Connector, Harness Side					
LFC	LFC					
KF22	VERIFY THERE IS NOT AN OPEN IN THE CIRCUIT SPECIFIC TO THE LFC2 RELAY - Access the PCM and monitor the LFCF PID. - Command the high speed fan ON. - Command the outputs OFF. - Command the low speed fan ON. - Command the outputs OFF. - Does the PID indicate a fault (yes) when either the high or low speed cooling fan output is commanded on and off?	Yes GO to KF23. No INSTALL a new LFC1 relay.				
KF23	CHECK THE VPWR VOLTAGE TO LFC2 RLY - LFC2 Relay connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) LFC2 Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) LFC2 Relay Connector, Harness Side	(-)	VPWR	Ground	Yes Key in OFF position. GO to KF24. No Key in OFF position. REPAIR the open circuit.
(+) LFC2 Relay Connector, Harness Side	(-)					
VPWR	Ground					
KF24	CHECK THE LFC CIRCUIT BETWEEN THE LOW SPEED FC RELAY(S) - Measure the resistance between:<table><tr><td>(+) LFC1 Relay Connector, Harness Side</td><td>(-) LFC2 Relay Connector, Harness Side</td></tr><tr><td>LFC</td><td>LFC</td></tr></table> - Is the resistance less than 5 ohms?	(+) LFC1 Relay Connector, Harness Side	(-) LFC2 Relay Connector, Harness Side	LFC	LFC	Yes INSTALL a new LFC relay. (INSTALL new LFC relays). No REPAIR the open circuit.
(+) LFC1 Relay Connector, Harness Side	(-) LFC2 Relay Connector, Harness Side					
LFC	LFC					

KF21-KF24

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF25	KOEO AND KOER DTCS P0482 OR P1477: CHECK THE VPWR VOLTAGE TO MFC1 RLY Note: This application has 2 relays wired to the MFC circuit. This procedure may call out MFC1 and MFC2 relays. Either of the relays may be used as the number 1, with the other relay being number 2. - MFC1 Relay connector disconnected. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) MFC1 Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) MFC1 Relay Connector, Harness Side	(-)	VPWR	Ground	Yes Key in OFF position. GO to KF26. No Key in OFF position. REPAIR the open circuit.
(+) MFC1 Relay Connector, Harness Side	(-)					
VPWR	Ground					
KF26	CHECK FOR MFC CIRCUIT CYCLING - Connect a non-powered test lamp between: <table><tr><td>(+) MFC1 Relay Connector, Harness Side</td><td>(-) MFC1 Relay Connector, Harness Side</td></tr><tr><td>VPWR</td><td>MFC</td></tr></table> - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the low speed fan ON. - Command the high speed fan ON. - Command the outputs OFF. - Does the test lamp illuminate on and off when either the low or high speed cooling fan output is commanded on and off?	(+) MFC1 Relay Connector, Harness Side	(-) MFC1 Relay Connector, Harness Side	VPWR	MFC	Yes INSTALL a new MFC1 RLY at end of diagnostics. Leave RLY disconnected GO to KF31. No Leave the test lamp connected GO to KF27.
(+) MFC1 Relay Connector, Harness Side	(-) MFC1 Relay Connector, Harness Side					
VPWR	MFC					
KF27	CHECK FOR MFC CIRCUIT CYCLING WITH THE MFC2 RLY DISCONNECTED - Connect a non-powered test lamp between: <table><tr><td>(+) MFC1 Relay Connector, Harness Side</td><td>(-) MFC1 Relay Connector, Harness Side</td></tr><tr><td>VPWR</td><td>MFC</td></tr></table> - MFC2 Relay connector disconnected. - Command the low speed fan ON. - Command the high speed fan ON. - Command the outputs OFF. - Does the test lamp illuminate on and off when either the low or high speed cooling fan output is commanded on and off?	(+) MFC1 Relay Connector, Harness Side	(-) MFC1 Relay Connector, Harness Side	VPWR	MFC	Yes INSTALL a new MFC2 relay. No GO to KF28.
(+) MFC1 Relay Connector, Harness Side	(-) MFC1 Relay Connector, Harness Side					
VPWR	MFC					

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF28	CHECK THE MFC CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) MFC1 Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>MFC</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) MFC1 Relay Connector, Harness Side	(-)	MFC	Ground	Yes Key in OFF position. GO to KF29. No Key in OFF position. REPAIR the short circuit.
(+) MFC1 Relay Connector, Harness Side	(-)					
MFC	Ground					
KF29	CHECK THE MFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Diagnostic tool connector disconnected. - Measure the resistance between:<table><tr><td>(+) MFC1 Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>MFC</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) MFC1 Relay Connector, Harness Side	(-)	MFC	Ground	Yes GO to KF30. No REPAIR the short circuit.
(+) MFC1 Relay Connector, Harness Side	(-)					
MFC	Ground					
KF30	CHECK THE MFC CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) MFC1 Relay Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>MFC</td><td>MFC</td></tr></table> - Is the resistance less than 5 ohms?	(+) MFC1 Relay Connector, Harness Side	(-) PCM Connector, Harness Side	MFC	MFC	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) MFC1 Relay Connector, Harness Side	(-) PCM Connector, Harness Side					
MFC	MFC					
KF31	VERIFY THERE IS NOT AN OPEN IN THE CIRCUIT SPECIFIC TO THE MFC2 RELAY - Access the PCM and monitor the MFCF PID. - Command the high speed fan ON. - Command the outputs OFF. - Command the low speed fan ON. - Command the outputs OFF. - Does the PID Indicate a fault (yes) when either the high or low speed Cooling fan output is commanded on and off?	Yes GO to KF32. No INSTALL a new MFC relay.				
KF32	CHECK THE VPWR VOLTAGE TO MFC2 RLY - MFC2 Relay connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) MFC2 Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) MFC2 Relay Connector, Harness Side	(-)	VPWR	Ground	Yes Key in OFF position. GO to KF33. No Key in OFF position. REPAIR the open circuit.
(+) MFC2 Relay Connector, Harness Side	(-)					
VPWR	Ground					

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF33	CHECK THE MFC CIRCUIT BETWEEN THE MEDIUM SPEED FC RELAY(S) • Measure the resistance between: <table><tr><td>(+) MFC1 Relay Con- nector, Harness Side</td><td>(-) MFC2 Relay Con- nector, Harness Side</td></tr><tr><td>MFC</td><td>MFC</td></tr></table> • Is the resistance less than 5 ohms?	(+) MFC1 Relay Con- nector, Harness Side	(-) MFC2 Relay Con- nector, Harness Side	MFC	MFC	Yes INSTALL a new HFC relay(s). No REPAIR the open circuit.
(+) MFC1 Relay Con- nector, Harness Side	(-) MFC2 Relay Con- nector, Harness Side					
MFC	MFC					
KF34	KOEO AND KOER DTCS P0481 OR P1479: CHECK THE VPWR VOLTAGE TO HFC1 RLY Note: This application has 2 relays wired to the HFC circuit. This procedure may call out HFC1 and HFC2 relays. Either of the relays may be used as the number 1, with the other relay being number 2. • HFC1 Relay connector disconnected. • Key in ON position. • Measure the voltage between: <table><tr><td>(+) HFC1 Relay Con- nector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> • Is the voltage greater than 10.5 V?	(+) HFC1 Relay Con- nector, Harness Side	(-)	VPWR	Ground	Yes Key in OFF position. GO to KF35 . No Key in OFF position. REPAIR the open circuit.
(+) HFC1 Relay Con- nector, Harness Side	(-)					
VPWR	Ground					
KF35	CHECK FOR HFC CIRCUIT CYCLING • Connect a non-powered test lamp between: <table><tr><td>(+) HFC1 Relay Con- nector, Harness Side</td><td>(-) HFC1 Relay Con- nector, Harness Side</td></tr><tr><td>VPWR</td><td>HFC</td></tr></table> • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the low speed fan ON. • Command the high speed fan ON. • Command the outputs OFF. • Does the test lamp illuminate on and off when either the low or high speed cooling fan output is commanded on and off?	(+) HFC1 Relay Con- nector, Harness Side	(-) HFC1 Relay Con- nector, Harness Side	VPWR	HFC	Yes INSTALL a new HFC1 RLY at end of diagnostics. Leave RLY disconnected, GO to KF40 . No Leave the test lamp connected, GO to KF36 .
(+) HFC1 Relay Con- nector, Harness Side	(-) HFC1 Relay Con- nector, Harness Side					
VPWR	HFC					

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF36	CHECK FOR HFC CIRCUIT CYCLING WITH THE HFC2 RLY DISCONNECTED - Connect a non-powered test lamp between:<table><tr><td>(+) HFC1 Relay Con- nector, Harness Side</td><td>(-) HFC1 Relay Con- nector, Harness Side</td></tr><tr><td>VPWR</td><td>HFC</td></tr></table> - HFC2 Relay connector disconnected. - Command the low speed fan ON. - Command the high speed fan ON. - Command the outputs OFF. - Does the test lamp illuminate on and off when either the low or high speed cooling fan output is commanded on and off?	(+) HFC1 Relay Con- nector, Harness Side	(-) HFC1 Relay Con- nector, Harness Side	VPWR	HFC	Yes INSTALL a new HFC2 relay. No GO to KF37.
(+) HFC1 Relay Con- nector, Harness Side	(-) HFC1 Relay Con- nector, Harness Side					
VPWR	HFC					
KF37	CHECK THE HFC CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) HFC1 Relay Con- nector, Harness Side</td><td>(-)</td></tr><tr><td>HFC</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) HFC1 Relay Con- nector, Harness Side	(-)	HFC	Ground	Yes Key in OFF position. GO to KF38. No Key in OFF position. REPAIR the short circuit.
(+) HFC1 Relay Con- nector, Harness Side	(-)					
HFC	Ground					
KF38	CHECK THE HFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Diagnostic tool connector disconnected. - Measure the resistance between:<table><tr><td>(+) HFC1 Relay Con- nector, Harness Side</td><td>(-)</td></tr><tr><td>HFC</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) HFC1 Relay Con- nector, Harness Side	(-)	HFC	Ground	Yes GO to KF39. No REPAIR the short circuit.
(+) HFC1 Relay Con- nector, Harness Side	(-)					
HFC	Ground					
KF39	CHECK THE HFC CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) HFC1 Relay Con- nector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>HFC</td><td>HFC</td></tr></table> - Is the resistance less than 5 ohms?	(+) HFC1 Relay Con- nector, Harness Side	(-) PCM Connector, Harness Side	HFC	HFC	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) HFC1 Relay Con- nector, Harness Side	(-) PCM Connector, Harness Side					
HFC	HFC					

Fan Control (FC) Relays**KF**

Test Step		Results / Action to Take			
KF40	VERIFY THERE IS NOT AN OPEN IN THE CIRCUIT SPECIFIC TO THE HFC2 RELAY	Yes GO to KF41 . No INSTALL a new HFC1 relay.			
	- Access the PCM and monitor the HFCF PID. - Command the high speed fan ON. - Command the outputs OFF. - Command the low speed fan ON. - Command the outputs OFF. Does the PID indicate a fault (yes) when either the high or low speed cooling fan output is commanded on and off?				
KF41	CHECK THE VPWR VOLTAGE TO HFC2 RLY	Yes Key in OFF position. GO to KF42 . No Key in OFF position. REPAIR the open circuit.			
	- HFC2 Relay connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) HFC2 Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> Is the voltage greater than 10.5 V?		(+) HFC2 Relay Connector, Harness Side	(-)	VPWR
(+) HFC2 Relay Connector, Harness Side	(-)				
VPWR	Ground				
KF42	CHECK THE HFC CIRCUIT BETWEEN THE HIGH SPEED FC RELAY(S)	Yes INSTALL a new HFC relay(s). No REPAIR the open circuit.			
	- Measure the resistance between:<table><tr><td>(+) HFC1 Relay Connector, Harness Side</td><td>(-) HFC2 Relay Connector, Harness Side</td></tr><tr><td>HFC</td><td>HFC</td></tr></table> Is the resistance less than 5 ohms?		(+) HFC1 Relay Connector, Harness Side	(-) HFC2 Relay Connector, Harness Side	HFC
(+) HFC1 Relay Connector, Harness Side	(-) HFC2 Relay Connector, Harness Side				
HFC	HFC				

KF40-KF42

Fan Control (FC) Relays**KF**

Test Step		Results / Action to Take				
KF43	CONTINUOUS MEMORY DTCS P0480 OR P1474: CHECK THE LFC CIRCUIT FOR AN INTERMITTENT OPEN OR SHORT TO POWER • A/C and defrost off. • L Fan Motor connector disconnected. • R Fan Motor connector disconnected. • LFC Relay connector disconnected. • Connect a non-powered test lamp between:<table><tr><td>(+) LFC Relay Connector, Harness Side</td><td>(-) LFC Relay Connector, Harness Side</td></tr><tr><td>VPWR - Pin 1</td><td>LFC - Pin 2</td></tr></table> • Key in ON position. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the low speed fan ON. Note: If the test lamp does not turn on, Command the high speed fan ON. • Observe the test lamp for an indication of a fault while completing the following. Note that the lamp turns Off when a fault is detected. — Shake, wiggle, and bend the LFC circuit(s). — Shake, wiggle, and bend the VPWR circuit to the LFC relay. — Inspect the LFC RLY component for signs of damage. • Is a fault indicated?	(+) LFC Relay Connector, Harness Side	(-) LFC Relay Connector, Harness Side	VPWR - Pin 1	LFC - Pin 2	Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No GO to KF44 .
(+) LFC Relay Connector, Harness Side	(-) LFC Relay Connector, Harness Side					
VPWR - Pin 1	LFC - Pin 2					
KF44	CHECK THE LFC CIRCUIT FOR AN INTERMITTENT SHORT TO GROUND • Key in ON position. • Command the outputs OFF. • Observe the test lamp for an indication of a fault while completing the following. Note that the lamp turns on when a fault is detected. — Shake, wiggle, and bend the LFC circuit(s). — Lightly tap on the LFC RLY to simulate road shock. • Is a fault indicated?	Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1 .				

Fan Control (FC) Relays**KF**

Test Step		Results / Action to Take				
KF45	CONTINUOUS MEMORY DTCS P0481 OR P1479: CHECK THE HFC CIRCUIT FOR AN INTERMITTENT OPEN OR SHORT TO POWER					
• A/C and defrost off. • L Fan Motor connector disconnected. • R Fan Motor connector disconnected. • HFC Relay connector disconnected. • Connect a non-powered test lamp between:<table><tr><td>(+) HFC Relay Connector, Harness Side</td><td>(-) HFC Relay Connector, Harness Side</td></tr><tr><td>VPWR - Pin 1</td><td>HFC - Pin 2</td></tr></table> • Key in ON position. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the high speed fan ON. Note: If the test lamp does not turn on, Command the low speed fan ON. • Observe the test lamp for an indication of a fault while completing the following. Note that the lamp turns Off when a fault is detected. — Shake, wiggle, and bend the HFC circuit(s). — Shake, wiggle, and bend the VPWR circuit to the HFC relay. — Lightly tap on the HFC RLY to simulate road shock. • Is a fault indicated?		(+) HFC Relay Connector, Harness Side	(-) HFC Relay Connector, Harness Side	VPWR - Pin 1	HFC - Pin 2	Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No GO to KF46 .
(+) HFC Relay Connector, Harness Side	(-) HFC Relay Connector, Harness Side					
VPWR - Pin 1	HFC - Pin 2					
KF46	CHECK THE HFC CIRCUIT FOR AN INTERMITTENT SHORT TO GROUND					
• Key in ON position. • Command the outputs OFF. • Observe the test lamp for an indication of a fault while completing the following. Note that the lamp illuminates when a fault is detected. — Shake, wiggle, and bend the HFC circuit(s). • Is a fault indicated?		Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1 .				

KF45-KF46

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF47	CONTINUOUS MEMORY DTCS P0482 OR P1477: CHECK THE MFC CIRCUIT FOR AN INTERMITTENT OPEN OR SHORT TO POWER • A/C and defrost off. • L Fan Motor connector disconnected. • R Fan Motor connector disconnected. • MFC Relay connector disconnected. • Connect a non-powered test lamp between: <table><tr><td>(+) MFC Relay Connector, Harness Side</td><td>(-) MFC Relay Connector, Harness Side</td></tr><tr><td>VPWR - Pin 1</td><td>MFC - Pin 2</td></tr></table> • Key in ON position. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the low speed fan ON. Note: If the test lamp does not turn on, Command the high speed fan ON. • Observe the test lamp for an indication of a fault while completing the following. Note that the lamp turns Off when a fault is detected. — Shake, wiggle, and bend the MFC circuit(s). — Shake, wiggle, and bend the VPWR circuit to the MFC relay. — Inspect the MFC RLY component for signs of damage. • Is a fault indicated?	(+) MFC Relay Connector, Harness Side	(-) MFC Relay Connector, Harness Side	VPWR - Pin 1	MFC - Pin 2	
(+) MFC Relay Connector, Harness Side	(-) MFC Relay Connector, Harness Side					
VPWR - Pin 1	MFC - Pin 2					

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF49	CONTINUOUS MEMORY DTCS P0480 OR P1474: CHECK THE LFC CIRCUIT FOR AN INTERMITTENT OPEN OR SHORT TO POWER Note: This application has 2 relays wired to the LFC circuit. This procedure may call out LFC1 and LFC2 relays. Either of the relays may be used as the number 1, with the other relay being number 2. • AC and defroster OFF. • L Fan Motor connector disconnected. • R Fan Motor connector disconnected. • LFC1 Relay connector disconnected. • Connect a non-powered test lamp between: <table><tr><td>(+) LFC1 Relay Connector, Harness Side</td><td>(-) LFC1 Relay Connector, Harness Side</td></tr><tr><td>VPWR</td><td>LFC</td></tr></table> • Key in ON position. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the low speed fan ON. Note: If the test lamp does not turn on, Command the high speed fan ON. • Observe the test lamp for an indication of a fault while completing the following. Note that the lamp turns OFF when a fault is detected. — Shake, wiggle, and bend the LFC circuit between the PCM and both low speed FC relays. — Shake, wiggle, and bend the VPWR circuit to both low speed FC relays. — Lightly tap on the Low Speed FC relay that is still connected to simulate road shock. • Is a fault indicated?	(+) LFC1 Relay Connector, Harness Side	(-) LFC1 Relay Connector, Harness Side	VPWR	LFC	Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No GO to KF50.
(+) LFC1 Relay Connector, Harness Side	(-) LFC1 Relay Connector, Harness Side					
VPWR	LFC					
KF50	CHECK THE LFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS • Key in ON position. • Command the outputs OFF. • Exit output test mode. • Observe the test lamp for an indication of a fault while completing the following. Note that the lamp turns ON when a fault is detected. — Shake, wiggle, and bend the LFC circuit between the PCM and both low speed FC relays. • Inspect Low Speed FC Relay that is disconnected for intermittent concerns. • Is a fault indicated?	Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No Key in OFF position. GO to Z1.				

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF51	CONTINUOUS MEMORY DTCS P0482 OR P1477: CHECK THE MFC CIRCUIT FOR AN INTERMITTENT OPEN OR SHORT TO POWER Note: This application has 2 relays wired to the MFC circuit. This procedure may call out MFC1 and MFC2 relays. Either of the relays may be used as the number 1, with the other relay being number 2. • AC and defroster OFF. • L Fan Motor connector disconnected. • R Fan Motor connector disconnected. • MFC1 Relay connector disconnected. • Connect a non-powered test lamp between:<table><tr><td>(+) MFC1 Relay Connector, Harness Side</td><td>(-) MFC1 Relay Connector, Harness Side</td></tr><tr><td>VPWR</td><td>MFC</td></tr></table> • Key in ON position. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the low speed fan ON. Note: If the test lamp does not turn on, Command the high speed fan ON. • Observe the test lamp for an indication of a fault while completing the following. Note that the lamp turns OFF when a fault is detected. — Shake, wiggle, and bend the MFC circuit between the PCM and both medium speed FC relays. — Shake, wiggle, and bend the VPWR circuit to both medium speed FC relays. — Lightly tap on the Medium Speed FC relay that is still connected to simulate road shock. • Is a fault indicated?	(+) MFC1 Relay Connector, Harness Side	(-) MFC1 Relay Connector, Harness Side	VPWR	MFC	Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No GO to KF52 .
(+) MFC1 Relay Connector, Harness Side	(-) MFC1 Relay Connector, Harness Side					
VPWR	MFC					
KF52	CHECK THE MFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS • Key in ON position. • Command the outputs OFF. • Exit output test mode. • Observe the test lamp for an indication of a fault while completing the following. Note that the lamp turns ON when a fault is detected. — Shake, wiggle, and bend the MFC circuit between the PCM and both medium speed FC relays. • Inspect Medium Speed FC relay that is disconnected for intermittent concerns. • Is a fault indicated?	Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No Key in OFF position. GO to Z1 .				

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF53	CONTINUOUS MEMORY DTCS P0481 OR P1479: CHECK THE HFC CIRCUIT FOR AN INTERMITTENT OPEN OR SHORT TO POWER Note: This application has 2 relays wired to the HFC circuit. This procedure may call out HFC1 and HFC2 relays. Either of the relays may be used as the number 1, with the other relay being number 2. • AC and defroster OFF. • L Fan Motor connector disconnected. • R Fan Motor connector disconnected. • HFC1 Relay connector disconnected. • Connect a non-powered test lamp between: <table border="1"><tr><td>(+) HFC1 Relay Con- nector, Harness Side</td><td>(-) HFC1 Relay Con- nector, Harness Side</td></tr><tr><td>VPWR</td><td>HFC</td></tr></table> • Key in ON position. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the low speed fan ON. Note: If the test lamp does not turn on, Command the high speed fan ON. • Observe the test lamp for an indication of a fault while completing the following. Note that the lamp turns OFF when a fault is detected. — Shake, wiggle, and bend the HFC circuit between the PCM and both High Speed FC relays. — Shake, wiggle, and bend the VPWR circuit to both high speed FC relays. — Lightly tap on the High Speed FC relay that is still connected to simulate road shock. • Is a fault indicated?	(+) HFC1 Relay Con- nector, Harness Side	(-) HFC1 Relay Con- nector, Harness Side	VPWR	HFC	Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No GO to KF54 .
(+) HFC1 Relay Con- nector, Harness Side	(-) HFC1 Relay Con- nector, Harness Side					
VPWR	HFC					
KF54	CHECK THE HFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS • Key in ON position. • Command the outputs OFF. • Exit output test mode. • Observe the test lamp for an indication of a fault while completing the following. Note that the lamp turns ON when a fault is detected. — 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 Key in OFF position. ISOLATE the fault and REPAIR as necessary. No Key in OFF position. GO to Z1 .				

Fan Control (FC) Relays**KF**

Test Step		Results / Action to Take
KF55	COOLING FAN ALWAYS RUNS (NO DTCS): VERIFY THE FAN IS NOT ON BECAUSE OF A/C HIGH PRESSURE SWITCH INPUT TO THE PCM	
	• Key on engine running. • Access the PCM and monitor the ACP PID. • Is the PID state CLOSED?	Yes Key in OFF position. The PCM will turn the fan on when the medium pressure, normally open contacts of the ACHP switch are closed. GO to KF66. No Input OK GO to KF56.
KF56	COOLING FAN CONCERN (NO DTCS): CHECK THE FAN CONTROL PRIMARY CIRCUITS	
	• Verify that AC is OFF. • Verify engine temperature is below the temperature where the Cooling fan would come on. • Key in ON position. Note: Chose the PIDs below as appropriate, according to which circuits the vehicle has. • Access the PCM and monitor the LFCF, MFCF and HFCF PIDs. • Does either PID indicate a fault?	Yes Primary circuit(s) Fault found. GO to KF57. No For all except Ranger: PCM Primary circuit(s) is OK. To check for secondary wiring, REFER to Cooling System for cooling system diagnostics. For Ranger: GO to KF59.
KF57	DID THE LFCF PID INDICATE A FAULT?	
	• Did the LFCF PID indicate a fault?	Yes Low Fan Control (LFC) Primary Circuit Failure For Freestar/Monterey, GO to KF16. For all others, GO to KF1. No GO to KF58.

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF58	DID THE MFCF PID INDICATE A FAULT? Did the MFCF PID Indicate a fault?	Yes Medium Fan Control (MFC) Primary Circuit Failure For Focus, and Freestar/Monterey, GO to KF25 . For all others, GO to KF6 . No High Fan Control (HFC) Primary Circuit Failure For Taurus, Sable, Escape 3.0L, Mariner 3.0L, and Ford GT, GO to KF34 . For all others, GO to KF11 .				
KF59	IS THE SYMPTOM: COOLING FAN ALWAYS RUNS? Is the symptom: cooling fan always runs?	Yes GO to KF65 . No GO to KF60 .				
KF60	ELECTRIC COOLING FAN CONCERN (WITH NO DTCS): ELECTRIC COOLING FAN FUNCTIONAL CHECK - Key in ON position. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the low speed fan ON. - Does the fan operate?	Yes Key in OFF position. All Cooling fan circuit checks are OK. RETURN to Symptom Charts to continue diagnosis. No GO to KF61 .				
KF61	FAN INOPERATIVE: COMMAND THE LOW SPEED FAN ON AND CHECK FOR VOLTAGE TO THE CF - Key in OFF position. - CF Motor connector disconnected. - Key in ON position. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the low speed fan ON. - Measure the voltage between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>FAN PWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) CF Motor Connector, Harness Side	(-)	FAN PWR	Ground	Yes Key in OFF position. GO to KF62 . No Key in OFF position. GO to KF63 .
(+) CF Motor Connector, Harness Side	(-)					
FAN PWR	Ground					

KF58-KF61

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF62	CHECK THE GROUND CIRCUIT TO COOLING FAN - Measure the resistance between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>GND</td><td>Ground</td></tr></table> - Is the resistance less than 5 ohms?	(+) CF Motor Connector, Harness Side	(-)	GND	Ground	Yes INSTALL a new CF motor. No REPAIR the open circuit.
(+) CF Motor Connector, Harness Side	(-)					
GND	Ground					
KF63	CHECK THE B+ VOLTAGE TO FC RLY - FC Relay connector disconnected. - Measure the voltage between:<table><tr><td>(+) FC Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>B+</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) FC Relay Connector, Harness Side	(-)	B+	Ground	Yes GO to KF64 . No REPAIR the open circuit. B+ circuit fault. CHECK the condition of the related fuse/fuse links. If OK, REPAIR the open circuit. If the fuse/fuse link is damaged, CHECK the circuit for short to ground before replacing.
(+) FC Relay Connector, Harness Side	(-)					
B+	Ground					
KF64	CHECK THE FAN PWR CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) FC Relay Connector, Harness Side</td><td>(-) CF Motor Connector, Harness Side</td></tr><tr><td>FAN PWR</td><td>FAN PWR</td></tr></table> - Is the resistance less than 5 ohms?	(+) FC Relay Connector, Harness Side	(-) CF Motor Connector, Harness Side	FAN PWR	FAN PWR	Yes INSTALL a new FC relay. No REPAIR the open circuit.
(+) FC Relay Connector, Harness Side	(-) CF Motor Connector, Harness Side					
FAN PWR	FAN PWR					
KF65	CHECK FOR FC RLY CONTACTS ALWAYS CLOSED Note: Verify the A/C and defrost are off. - FC Relay connector disconnected. - Key in ON position. - Does the fan run with the key in the ON position?	Yes Key in OFF position. REPAIR the short circuit to PWR. No Key in OFF position. INSTALL a new FC relay.				

KF62-KF65

Fan Control (FC) Relays**KF**

Test Step		Results / Action to Take				
KF66	CHECK THE A/CHPSW (MEDIUM PRESSURE, NORMALLY OPEN CONTACTS) • A/CHPSW connector disconnected. • Key in ON position. • Access the PCM and monitor the ACP PID. • Is the PID state CLOSED?	Yes Key in OFF position. GO to KF67 . No Key in OFF position. CONNECT the A/CHPSW. REFER to Heating and Air Conditioning to diagnose the A/C system pressure. If OK, INSTALL a new A/CHPSW.				
KF67	CHECK THE A/CPSW CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS • PCM connector disconnected. • Measure the resistance between:<table border="1"><tr><td>(+) A/CHPSW Connector, Harness Side</td><td>(-)</td></tr><tr><td>A/CPSW</td><td>Ground</td></tr></table> • Is the resistance greater than 10K ohms?	(+) A/CHPSW Connector, Harness Side	(-)	A/CPSW	Ground	Yes Verify the results of the previous test steps. RETURN to Symptom Charts to continue diagnosis. If OK, INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory. No REPAIR the short circuit to GND.
(+) A/CHPSW Connector, Harness Side	(-)					
A/CPSW	Ground					

KF66-KF67

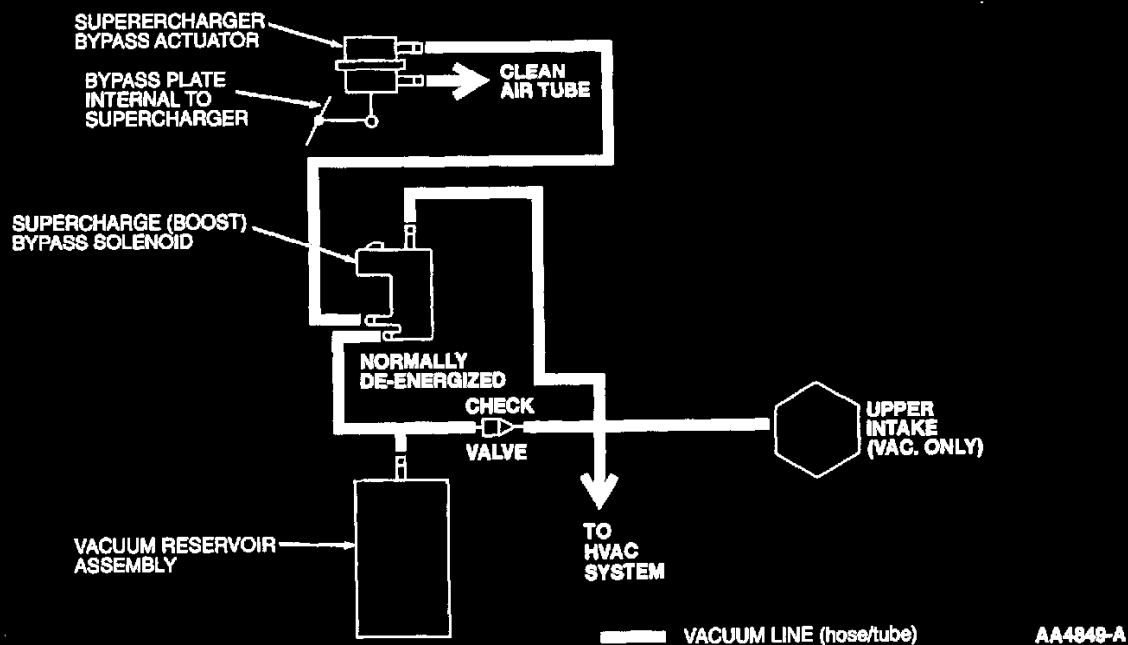
Test KJ: Supercharger Bypass Control
PINPOINT TEST KJ: SUPERCHARGER BYPASS CONTROL

Supercharger Bypass Control

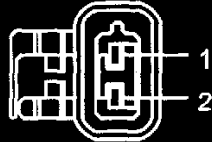
KJ

This pinpoint test is intended to diagnose the following:

- Supercharger bypass solenoid (9H465) (part name is: thermactor air control solenoid/vacuum valve assembly).
- Supercharger assembly (including the supercharger bypass actuator) (6F076).
- Vacuum reservoir assembly (9J442).
- Vacuum Hoses.
- Harness circuits: SCBC, VPWR and PWRGND.
- Powertrain control module (PCM) (12A650).



Note And Schematic

Supercharger Bypass Control**KJ****Supercharger Bypass Control (SCBC) Solenoid Connector**

A0077543

Circuit	Pin
SCBC (Supercharger Bypass Control)	1
VPWR (Power Supply)	2

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Connector	Circuit	Pin
104 Pin	PWRGND SCBC VPWR	103 45 71

Supercharger Bypass Control

KJ

Test Step		Results / Action to Take			
KJ1	DTC P0234: CHECK FOR ANY OTHER DTCS	Yes Key in OFF position. DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to KJ2 .			
	Note: DTC P0234 is for informational purposes only and is usually accompanied by other DTCs. The other accompanying DTCs should be diagnosed first. • Drive the vehicle for 10 to 15 minutes with the engine exceeding 2,000 RPM. Make sure the engine temperature stabilizes. • Return to the repair area and check that the upper radiator hose(s) are hot and pressurized. • Are any other DTCs present?				
KJ2	CHECK THE IAT2 PID	Yes Key in OFF position. CHECK for low fluid level in the CAC system. CHECK for cracked intercooler lines. REPAIR as necessary. No Key in OFF position. CHECK for indications of engine knock while driving the vehicle. REPAIR as necessary. If OK, indicate to the vehicle owner that driving conditions may have caused the DTC.			
	 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. • Key on engine running. • Access the PCM and monitor the IAT2 PID. • Is the temperature greater than 110°C (230°F)?				
KJ3	DTC P0243: CHECK THE SUPERCHARGER BYPASS SOLENOID OUTPUT	Yes Key in OFF position. GO to KJ4 . No Key in OFF position. GO to KJ5 .			
	• Key in OFF position. • SCBC Solenoid connector disconnected. • Connect a non-powered test lamp between:<table><tr><td>(+) SCBC Solenoid Connector, Harness Side</td><td>(-) SCBC Solenoid Connector, Harness Side</td></tr><tr><td>VPWR - Pin 2</td><td>SCBC - Pin 1</td></tr></table> • Key in ON position. • Observe the test lamp. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the outputs ON. • Observe the test lamp. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the outputs OFF. • Does the test lamp illuminate on and off when the output(s) is commanded on and off?		(+) SCBC Solenoid Connector, Harness Side	(-) SCBC Solenoid Connector, Harness Side	VPWR - Pin 2
(+) SCBC Solenoid Connector, Harness Side	(-) SCBC Solenoid Connector, Harness Side				
VPWR - Pin 2	SCBC - Pin 1				

KJ1-KJ3

Supercharger Bypass Control

KJ

Test Step		Results / Action to Take				
KJ4	CHECK THE SCBC SOLENOID RESISTANCE - Measure the resistance between:<table><tr><td>(+) SCBC Solenoid Connector, Component Side</td><td>(-) SCBC Solenoid Connector, Component Side</td></tr><tr><td>SCBC - Pin 1</td><td>VPWR - Pin 2</td></tr></table> - Is the resistance between 68 ohms - 78 ohms?	(+) SCBC Solenoid Connector, Component Side	(-) SCBC Solenoid Connector, Component Side	SCBC - Pin 1	VPWR - Pin 2	Yes CHECK for damaged vacuum hoses between the engine intake manifold and the SCBC solenoid. CHECK for vacuum reservoir assembly leaks. REPAIR or INSTALL new as necessary. If OK DIAGNOSE as an intermittent concern. No INSTALL a new SCBC solenoid.
(+) SCBC Solenoid Connector, Component Side	(-) SCBC Solenoid Connector, Component Side					
SCBC - Pin 1	VPWR - Pin 2					
KJ5	CONFIRM THE TEST LAMP STATUS Is the test lamp always off?	Yes Key in OFF position. GO to KJ6. No Key in OFF position. GO to KJ9.				
KJ6	CHECK FOR AN OPEN VPWR CIRCUIT BETWEEN THE SCBC SOLENOID AND THE POWER RELAY - Measure the voltage between:<table><tr><td>(+) SCBC Solenoid Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VPWR - Pin 2</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 10.5 V?	(+) SCBC Solenoid Connector, Harness Side	(-) Vehicle Battery	VPWR - Pin 2	Negative terminal	Yes Key in OFF position. GO to KJ8. No Key in OFF position. GO to KJ7.
(+) SCBC Solenoid Connector, Harness Side	(-) Vehicle Battery					
VPWR - Pin 2	Negative terminal					
KJ7	CHECK THE VPWR CIRCUIT FOR AN OPEN IN THE HARNESS Note: Refer to the PCM connector pin numbers in the beginning of this pinpoint test. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) SCBC Solenoid Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VPWR - Pin 2</td><td>VPWR - Pin 71</td></tr></table> - Is the resistance less than 5 ohms?	(+) SCBC Solenoid Connector, Harness Side	(-) PCM Connector, Harness Side	VPWR - Pin 2	VPWR - Pin 71	Yes GO to KJ8. No REPAIR the open circuit.
(+) SCBC Solenoid Connector, Harness Side	(-) PCM Connector, Harness Side					
VPWR - Pin 2	VPWR - Pin 71					

KJ4-KJ7

Supercharger Bypass Control

KJ

Test Step		Results / Action to Take				
KJ8	CHECK THE SCBC CIRCUIT FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) SCBC Solenoid Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>SCBC - Pin 1</td><td>SCBC - Pin 45</td></tr></table> - Is the resistance less than 5 ohms?	(+) SCBC Solenoid Connector, Harness Side	(-) PCM Connector, Harness Side	SCBC - Pin 1	SCBC - Pin 45	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) SCBC Solenoid Connector, Harness Side	(-) PCM Connector, Harness Side					
SCBC - Pin 1	SCBC - Pin 45					
KJ9	CHECK THE SCBC CIRCUIT FOR A SHORT TO PWRGND IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) SCBC Solenoid Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>SCBC - Pin 1</td><td>PWRGND - Pin 103</td></tr></table> - Is the resistance greater than 10K ohms?	(+) SCBC Solenoid Connector, Harness Side	(-) PCM Connector, Harness Side	SCBC - Pin 1	PWRGND - Pin 103	Yes GO to KJ10. No REPAIR the short circuit.
(+) SCBC Solenoid Connector, Harness Side	(-) PCM Connector, Harness Side					
SCBC - Pin 1	PWRGND - Pin 103					
KJ10	CHECK THE SCBC CIRCUIT FOR A SHORT TO POWER OR TO CHASSIS GROUND IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Component Side</td><td>(-)</td></tr><tr><td>SCBC - Pin 45</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) PCM Connector, Component Side	(-)	SCBC - Pin 45	Ground	Yes Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No Key in OFF position. REPAIR the short circuit.
(+) PCM Connector, Component Side	(-)					
SCBC - Pin 45	Ground					
KJ11	LACK OF POWER (LOW BOOST) - CHECK THE 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, cracks, bends or kinks in the vacuum line between the supercharger bypass actuator and the supercharger bypass solenoid. - Check for holes, cracks, bends or kinks in the vacuum line between the supercharger bypass solenoid and the vacuum reservoir assembly. - Check for any disconnected hoses at the supercharger bypass actuator, bypass solenoid or vacuum reservoir assembly. - Are any concerns present?	Yes REPAIR or INSTALL new vacuum lines as required. No Concern is elsewhere. RETURN to Symptom Charts for further direction.				

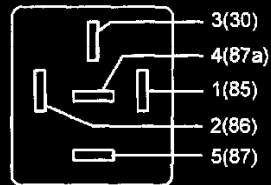
KJ8-KJ11

Test KM: Air Conditioning Clutch Relay (A/CCR) Circuit
PINPOINT TEST KM: AIR CONDITIONING CLUTCH RELAY (A/CCR) CIRCUIT

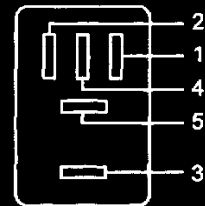
**Air Conditioning Clutch Relay (A/CCR)
Circuit****KM**

This pinpoint test is intended to diagnose the following:

- A/CC RELAY.
- Harness Circuits: VPWR, A/CCR, A/CCS.
- Powertrain control module (PCM) (12A650).

Air Conditioning Clutch (A/CC) Relay Connector**A**

A0077582

B

A0077584

Vehicle	Connector	Circuit	Pin
Excursion, Expedition, F-150, Navigator	A	A/CCR VPWR	1 2
All other vehicles	B	A/CCR VPWR	1 2

The VPWR and A/CCR circuits may be reversed in the harness connector. Refer to Vehicle/Diagrams for additional information.

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Note And Connectors

Air Conditioning Clutch Relay (A/CCR) Circuit

KM

Vehicle	Connector	Circuit	Pin
Aviator, LS, Thunderbird	150 (60-32-58) Pin	A/CCR	B9
E-Series, F-Super Duty, Mustang	170 Pin	A/CCR	E3
Excursion, Explorer SportTrac, Freestar/Monterey, Ford GT, Ranger, Sable, Taurus	104 Pin	A/CCR	69
Expedition, F-150, Navigator	190 Pin	A/CCR	B18
All other vehicles	150 (50-50-50) Pin	A/CCR	B25

Test Step		Results / Action to Take				
KM1	KOEO AND KOER DTCS P1460 OR P0645: VERIFY THAT A/CCS PID IS OFF					
	Note: Verify the AC and the defrost are off during KOEO/KOER Self-Tests. If the vehicle is not equipped with AC, the WAC circuit is not used and DTC P1460/P0645 can be ignored. • Key on engine running. • AC and defroster OFF. • Access the PCM and monitor the ACCS PID. • Is the PID state OFF?	Yes Key in OFF position. GO to KM2. No Key in OFF position. A/CCS input to PCM is requesting A/C. REFER to Heating and Air Conditioning to diagnose the A/C system.				
KM2	CHECK THE VPWR VOLTAGE TO A/CC RELAY					
	• A/CC Relay connector disconnected. • Key in ON position. • Measure the voltage between: <table border="1"><tr><td>(+) A/CC Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> • Is the voltage greater than 10.5 V?	(+) A/CC Relay Connector, Harness Side	(-)	VPWR	Ground	Yes Key in OFF position. GO to KM3. No Key in OFF position. REPAIR the open circuit. START engine. TURN on A/C Switch. WAIT for 15 seconds. TURN off A/C Switch. REPEAT the self-test.
(+) A/CC Relay Connector, Harness Side	(-)					
VPWR	Ground					

Chart, KM1-KM2

**Air Conditioning Clutch Relay (A/CCR)
Circuit****KM**

Test Step		Results / Action to Take				
KM3	CHECK THE A/CC RELAY - REFER to the pin numbers molded on A/CC RELAY. Measure the resistance between either pin 1 or pin 85 and all the 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 the resistance checks OK?	Yes GO to KM4. No INSTALL a new A/CC relay. START engine. TURN on A/C Switch. WAIT for 15 seconds. TURN off A/C Switch. REPEAT the self-test.				
KM4	CHECK THE A/CCR (WAC) CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) A/CC Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>A/CCR</td><td>Ground</td></tr></table> Is the voltage less than 1 V?	(+) A/CC Relay Connector, Harness Side	(-)	A/CCR	Ground	Yes Key in OFF position. GO to KM5. No REPAIR the short circuit. START engine. TURN on A/C Switch. WAIT for 15 seconds. TURN off A/C Switch. REPEAT the self-test.
(+) A/CC Relay Connector, Harness Side	(-)					
A/CCR	Ground					
KM5	CHECK THE A/CCR (WAC) CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) A/CC Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>A/CCR</td><td>Ground</td></tr></table> Is the resistance greater than 10K ohms?	(+) A/CC Relay Connector, Harness Side	(-)	A/CCR	Ground	Yes GO to KM6. No REPAIR the short circuit. START engine. TURN on A/C Switch. WAIT for 15 seconds. TURN off A/C Switch. REPEAT the self-test.
(+) A/CC Relay Connector, Harness Side	(-)					
A/CCR	Ground					

KM3-KM5

Air Conditioning Clutch Relay (A/CCR) Circuit

KM

Test Step		Results / Action to Take				
KM6	CHECK THE A/CCR (WAC) CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) A/CC Relay Con- nector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>A/CCR</td><td>A/CCR</td></tr></table> - Is the resistance less than 5 ohms?	(+) A/CC Relay Con- nector, Harness Side	(-) PCM Connector, Harness Side	A/CCR	A/CCR	Yes INSTALL a new PCM. REFER to Diagnostic Methods,Flash Electrically Erasable Programmable Read Only Memory (EEPROM). START engine. TURN on AC Switch. WAIT for 15 seconds. TURN off AC Switch. REPEAT the self-test. No REPAIR the open circuit. START engine. TURN on A/C Switch. WAIT for 15 seconds. TURN off A/C Switch. REPEAT the self-test.
(+) A/CC Relay Con- nector, Harness Side	(-) PCM Connector, Harness Side					
A/CCR	A/CCR					
KM7	KOEO AND KOER DTC P1464: VERIFY THE A/C AND DEFROST WERE OFF DURING THE SELF-TEST - Verify the A/C and defrost were off during the self-test. - Is A/C and defrost off during Self-Test?	Yes GO to KM8. No A/C and defrost off. REPEAT the self-test where DTC P1464 was retrieved.				
KM8	CHECK THE A/CCS PID - Key in ON position. - A/C and defroster OFF. - Access the PCM and monitor the ACCS PID. - Is the PID state ON?	Yes Key in OFF position. The A/CCS PID indicates that the PCM is being requested to turn on the A/C. REFER to Heating and Air Conditioning to diagnose the symptom. No The A/CCS PID indicates that the A/CCS input to the PCM is low. VERIFY test step results A/C and defroster OFF. REPEAT the self-test.				

KM6-KM8

Air Conditioning Clutch Relay (A/CCR) Circuit

KM

Test Step		Results / Action to Take
KM9	CONTINUOUS MEMORY DTCS P1460 OR P0645: CHECK THE A/CCR (WAC) CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS	
	Note: If the vehicle is not equipped with A/C, the A/CCR circuit is not used and the P1460/P0645 can be ignored. • Key in ON position. • CHECK the A/CCR (WAC) circuit for a short to ground while performing the following: (the A/C clutch clicks on when a fault is detected). — Wiggle, shake, and bend small sections of the wiring harness while working from the component to the module. — Lightly tap on the A/CC RLY to simulate road shock. • Is a fault indicated?	Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. CLEAR the DTCs. START engine. TURN on A/C Switch. WAIT for 15 seconds. TURN off A/C Switch. REPEAT the self-test. No GO to KM10.
KM10	CHECK THE A/CCR (WAC) FOR AN OPEN OR SHORT CIRCUIT TO POWER	
	• Key in ON position. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the outputs ON. • CHECK A/CCR (WAC) circuit for open or short to power while completing the following (the A/C clutch will click off if a fault is detected): — Wiggle, shake, and bend small sections of the wiring harness while working from the component to the module. — Lightly tap on the A/CC RLY to simulate road shock. • Is a fault indicated?	Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. CLEAR the DTCs. START engine. Turn On A/C Switch WAIT for 15 seconds. TURN off A/C Switch. REPEAT the self-test. No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1.
KM11	KOEO AND KOER DTCS P0534 OR P1469: CHECK FOR CAUSES OF FAST A/CCS CYCLING	
	• Refer to Heating and Air Conditioning to check the A/C system pressure, to test the A/CCS cycle times, and to check for causes of fast A/CCS cycling time. • Is a fault indicated?	Yes ISOLATE the fault and REPAIR as necessary. REFER to Heating and Air Conditioning to continue diagnosis for the fast A/C cycling. No GO to KM12.

**Air Conditioning Clutch Relay (A/CCR)
Circuit****KM**

Test Step		Results / Action to Take
KM12	CHECK FOR INTERMITTENT OPEN IN A/CCS CIRCUIT	
• Key in ON position. • Access the PCM and monitor the ACCS PID. • Turn on the A/C Switch. • CHECK A/CCR (WAC) circuit for open or short to power while completing the following (the A/CCS PID will turn off and on quickly when a fault is detected, indicating an intermittent open). — Wiggle, shake, and bend small sections of the wiring harness while working from the component to the module. — Lightly tap on the PS (to simulate road shock). • Inspect the AC_CYC connector. • Is a fault indicated?		Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. CLEAR the DTCs. START engine. TURN on A/C Switch. WAIT for 15 seconds. TURN off A/C Switch. REPEAT the self-test. No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1 .

KM12

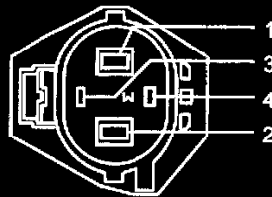
Test KN: Variable Speed Electric Cooling Fan

PINPOINT TEST KN: VARIABLE SPEED ELECTRIC COOLING FAN

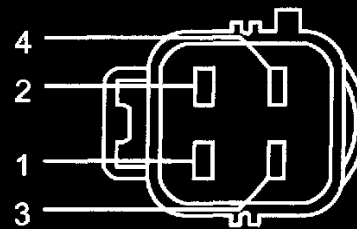
Variable Speed Electric Cooling Fan**KN**

This pinpoint test is intended to diagnose the following:

- Variable Speed Electric Cooling Fan (8T00).
- Harness Circuits: FCV, B+, VPWR, GND.
- Powertrain control module (PCM) (12A650).

Cooling Fan (CF) Motor Connector**A**

A0077538

B

A0077515

Vehicle	Connector	Circuit	Pin
Five Hundred, Freestyle, Montego	A	FCV GND B+	4 2 1
LS, Thunderbird	A	VPWR FCV GND B+	4 3 2 1
All other vehicles	B	FCV GND B+	3 2 1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Note And Connectors

Variable Speed Electric Cooling Fan

KN

Vehicle	Connector	Circuit	Pin
LS, Thunderbird	150 (60-32-58) Pin	FCV	B47
All other vehicles	150 (50-50-50) Pin	FCV	E14

Test Step		Results / Action to Take				
KN1	KOEO DTC P0480: CHECK THE B+ AND GND CIRCUIT FOR AN OPEN IN THE HARNESS • Key in OFF position. • CF Motor connector disconnected. • Rotate the fan by hand. The fan should rotate freely, with no abnormal binding. If binding is present, remove any foreign materials or install a new fan assembly as required. • Measure the voltage between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-) CF Motor Connector, Harness Side</td></tr><tr><td>B+</td><td>GND</td></tr></table> • Is the voltage greater than 10.5 V?	(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side	B+	GND	Yes GO to KN3. No GO to KN2.
(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side					
B+	GND					
KN2	CHECK VOLTAGE TO FAN MOTOR USING CHASSIS GROUND AS A REFERENCE • Measure the voltage between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>B+</td><td>Ground</td></tr></table> • Is the voltage greater than 10.5 V?	(+) CF Motor Connector, Harness Side	(-)	B+	Ground	Yes REPAIR the open circuit. Open GND harness circuit No B+ circuit fault. CHECK the condition of the related fuse/fuse links. If OK, REPAIR the open circuit. If the fuse/fuse link is damaged, CHECK the circuit for short to ground before replacing.
(+) CF Motor Connector, Harness Side	(-)					
B+	Ground					
KN3	CHECK THE FCV CIRCUIT(S) • Connect the 1.6K ohms resistor between the FCV and B+ circuits at the CF harness connector (this simulates cooling fan circuitry). • Key in ON position. • Check for KOEO DTCs: • Is DTC P0480 present?	Yes Key in OFF position. GO to KN4. No Key in OFF position. INSTALL a new cooling fan motor.				

Chart, KN1-KN3

Variable Speed Electric Cooling Fan

KN

Test Step		Results / Action to Take				
KN4	CHECK THE FCV CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>FCV</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) CF Motor Connector, Harness Side	(-)	FCV	Ground	Yes Key in OFF position. GO to KN5. No Key in OFF position. REPAIR the short circuit.
(+) CF Motor Connector, Harness Side	(-)					
FCV	Ground					
KN5	CHECK THE FCV CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>FCV</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) CF Motor Connector, Harness Side	(-)	FCV	Ground	Yes GO to KN6. No REPAIR the short circuit.
(+) CF Motor Connector, Harness Side	(-)					
FCV	Ground					
KN6	CHECK FOR AN OPEN CIRCUIT BETWEEN PCM & FCV - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) CF Motor Connector, Harness Side</td></tr><tr><td>FCV</td><td>FCV</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) CF Motor Connector, Harness Side	FCV	FCV	Yes INSTALL a new PCM. REFER to Diagnostic Methods,Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) CF Motor Connector, Harness Side					
FCV	FCV					
KN7	CONTINUOUS MEMORY DTC P0480: CHECK THE B+ & GND CIRCUIT FOR AN INTERMITTENT CONCERN - Key in OFF position. - CF Motor connector disconnected. - Rotate the fan by hand. The fan should rotate freely, with no abnormal binding. If binding is present, remove any foreign materials or install a new fan assembly as required. - Connect a non-powered test lamp between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-) CF Motor Connector, Harness Side</td></tr><tr><td>B+</td><td>GND</td></tr></table> - Observe the test lamp for an indication of a fault while completing the following. Note that the lamp turns Off when a fault is detected. - Shake, wiggle, and bend the B+ and GND circuits to the CF. - Shake, wiggle, and bend the associated fuse. - Is a fault indicated?	(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side	B+	GND	Yes ISOLATE the fault and REPAIR as necessary. No GO to KN8.
(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side					
B+	GND					

KN4-KN7

Variable Speed Electric Cooling Fan

KN

Test Step		Results / Action to Take				
KN8	CHECK THE FCV CIRCUIT(S) FOR INTERMITTENT CONCERNS - Connect the 1.6 K ohms resistor between the FCV and B+ circuits at the CF harness connector (this simulates cooling fan circuitry). - Measure the voltage between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>FCV</td><td>Ground</td></tr></table> - Key in ON position. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the low speed fan ON. - Observe the DMM for an indication of a fault while completing the following. Note that voltage changes suddenly when a fault is detected. - Shake, wiggle, and bend the FCV circuit between the CF motor and the PCM. - Is a fault indicated?	(+) CF Motor Connector, Harness Side	(-)	FCV	Ground	Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No Key in OFF position. GO to Z1.
(+) CF Motor Connector, Harness Side	(-)					
FCV	Ground					
KN9	COOLING FAN MOTOR DOES NOT OPERATE (WITH NO DTCS): COMMAND THE FAN ON TO CHECK OPERATION - Carry out the KOEO self-test. - Listen to the fan. - Does the fan operate sometime during the KOEO self-test?	Yes Key in OFF position. Concern is elsewhere. RETURN to Symptom Charts for further direction. No Key in OFF position. GO to KN10.				
KN10	CHECK THE B+ AND GND TO COOLING FAN MOTOR B+ & GND - CF Motor connector disconnected. - Rotate the fan by hand. The fan should rotate freely, with no abnormal binding. If binding is present, remove any foreign materials or install a new fan assembly as required. - Measure the voltage between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-) CF Motor Connector, Harness Side</td></tr><tr><td>B+</td><td>GND</td></tr></table> - Is the voltage greater than 10.5 V?	(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side	B+	GND	Yes INSTALL a new cooling fan motor. No GO to KN11.
(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side					
B+	GND					

Variable Speed Electric Cooling Fan

KN

Test Step		Results / Action to Take				
KN11	CHECK VOLTAGE TO COOLING FAN USING CHASSIS GROUND AS A REFERENCE - Measure the voltage between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>B+</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) CF Motor Connector, Harness Side	(-)	B+	Ground	Yes REPAIR the open circuit. No B+ circuit fault. CHECK the condition of the related fuse/fuse links. If OK, REPAIR the open circuit. If the fuse/fuse link is damaged, CHECK the circuit for short to ground before replacing.
(+) CF Motor Connector, Harness Side	(-)					
B+	Ground					
KN12	KOEO DTC P0480: CHECK THE B+ AND GND TO COOLING FAN MOTOR - Key in OFF position. - CF Motor connector disconnected. - Rotate the fan by hand. The fan should rotate freely, with no abnormal binding. If binding is present, remove any foreign materials or install a new fan assembly as required. - Measure the voltage between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-) CF Motor Connector, Harness Side</td></tr><tr><td>B+</td><td>GND</td></tr></table> - Is the voltage greater than 10.5 V?	(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side	B+	GND	Yes GO to KN14. No GO to KN13.
(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side					
B+	GND					
KN13	CHECK VOLTAGE TO FAN MOTOR USING CHASSIS GROUND AS A REFERENCE - Measure the voltage between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>B+</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) CF Motor Connector, Harness Side	(-)	B+	Ground	Yes REPAIR the open circuit. Open GND harness circuit No B+ circuit fault. CHECK the condition of the related fuse/fuse links. If OK, REPAIR the open circuit. If the fuse/fuse link is damaged, CHECK the circuit for short to ground before replacing.
(+) CF Motor Connector, Harness Side	(-)					
B+	Ground					
KN14	CHECK THE VPWR VOLTAGE TO CF - CF Motor connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) CF Motor Connector, Harness Side	(-)	VPWR	Ground	Yes Key in OFF position. GO to KN15. No Key in OFF position. REPAIR the open circuit.
(+) CF Motor Connector, Harness Side	(-)					
VPWR	Ground					

KN11-KN14

Variable Speed Electric Cooling Fan

KN

Test Step		Results / Action to Take				
KN15	CHECK THE FCV CIRCUIT(S) TO THE FAN • Connect the 1.6 K ohms resistor between the FCV and B+ circuits at the CF harness connector (this simulates cooling fan circuitry). • Key in ON position. • Carry out the KOEO self-test. • Is DTC P0480 present?	Yes GO to KN16 . No Key in OFF position. INSTALL a new cooling fan motor.				
KN16	CHECK THE FCV CIRCUIT FOR A SHORT TO POWER IN THE HARNESS • PCM connector disconnected. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>FCV</td><td>Ground</td></tr></table> • Is the voltage less than 1 V?	(+) CF Motor Connector, Harness Side	(-)	FCV	Ground	Yes Key in OFF position. GO to KN17 . No Key in OFF position. REPAIR the short circuit.
(+) CF Motor Connector, Harness Side	(-)					
FCV	Ground					
KN17	CHECK THE FCV CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS • Measure the resistance between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>FCV</td><td>Ground</td></tr></table> • Is the resistance greater than 10K ohms?	(+) CF Motor Connector, Harness Side	(-)	FCV	Ground	Yes GO to KN18 . No REPAIR the short circuit.
(+) CF Motor Connector, Harness Side	(-)					
FCV	Ground					
KN18	CHECK THE FCV CIRCUIT FOR AN OPEN IN THE HARNESS • Measure the resistance between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FCV</td><td>FCV</td></tr></table> • Is the resistance less than 5 ohms?	(+) CF Motor Connector, Harness Side	(-) PCM Connector, Harness Side	FCV	FCV	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the open circuit.
(+) CF Motor Connector, Harness Side	(-) PCM Connector, Harness Side					
FCV	FCV					

KN15-KN18

Variable Speed Electric Cooling Fan

KN

Test Step		Results / Action to Take				
KN19	CONTINUOUS MEMORY DTC P0480: CHECK THE B+ & GND FOR AN INTERMITTENT CONCERN • Key in OFF position. • CF Motor connector disconnected. • Rotate the fan by hand. The fan should rotate freely, with no abnormal binding. If binding is present, remove any foreign materials or install a new fan assembly as required. • Connect a non-powered test lamp between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-) CF Motor Connector, Harness Side</td></tr><tr><td>B+</td><td>GND</td></tr></table> • Observe the test lamp for an indication of a fault while completing the following. Note that the lamp turns Off when a fault is detected. — Shake, wiggle, and bend the B+ and GND circuits to the CFM. — Lightly tap on the associated FUSE to simulate road shock. • Is a fault indicated?	(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side	B+	GND	Yes ISOLATE the fault and REPAIR as necessary. No GO to KN20 .
(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side					
B+	GND					
KN20	CHECK THE VPWR CIRCUIT(S) FOR INTERMITTENT CONCERNS • Key in OFF position. • CF Motor connector disconnected. • Connect a non-powered test lamp between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> • Key in ON position. • Observe the test lamp for an indication of a fault while completing the following. Note that the lamp turns off when a fault is detected. • Shake, wiggle, and bend the VPWR circuit(s). • Is a fault indicated?	(+) CF Motor Connector, Harness Side	(-)	VPWR	Ground	Yes ISOLATE the fault and REPAIR as necessary. No GO to KN21 .
(+) CF Motor Connector, Harness Side	(-)					
VPWR	Ground					

Variable Speed Electric Cooling Fan**KN**

Test Step		Results / Action to Take				
KN21	CHECK THE FCV CIRCUIT(S) FOR INTERMITTENT CONCERNS • Connect the 1.6 K ohms resistor between the FCV and B+ circuits at the CF harness connector (this simulates cooling fan circuitry). • Measure the voltage between:<table border="1"><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>FCV</td><td>Ground</td></tr></table> • Key in ON position. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the low speed fan ON. • Check DMM for an indication of a fault while completing the following. The voltage changes suddenly when a fault is detected. • Shake, wiggle, and bend the FCV circuit between the CF motor and the PCM. • Is a fault indicated?	(+) CF Motor Connector, Harness Side	(-)	FCV	Ground	Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No Key in OFF position. GO to Z1.
(+) CF Motor Connector, Harness Side	(-)					
FCV	Ground					

KN21

Test KP: Charge Air Cooler (CAC) Pump
PINPOINT TEST KP: CHARGE AIR COOLER (CAC) PUMP

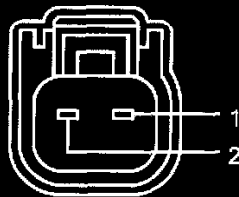
Charge Air Cooler (CAC) Pump

KP

This pinpoint test is intended to diagnose the following:

- Charge Air Cooler Pump Relay (14B192).
- Charge Air Cooler Pump Motor (8501).
- Harness circuits: CAC, VPWR and GND.
- Powertrain control module (PCM) (12A650).

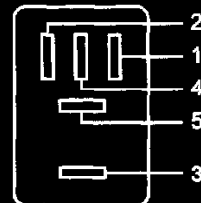
Charge Air Cooler (CAC) Motor Connector



A0077552

Circuit	Pin
GND (Ground)	2
PUMPPWR (Pump Power)	1

Note And Connector

Charge Air Cooler (CAC) Pump**KP****Charge Air Cooler (CAC) Relay Connector**

A0077584

Circuit	Pin
PUMPPWR (Pump Power)	5
B+ (Battery Positive Voltage)	3
CAC (Charge Air Cooler)	2
VPWR (Power Supply)	1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Connector	Circuit	Pin
104 Pin	CAC	82

Charge Air Cooler (CAC) Pump

KP

Test Step		Results / Action to Take				
KP1	DTC P1229: CHECK THE POWER FEED TO THE CAC PUMP RELAY COIL	Yes Key in OFF position. GO to KP2. No Key in OFF position. REPAIR the open circuit.				
- Key in OFF position. - CAC Relay connector disconnected. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) CAC Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 1</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?			(+) CAC Relay Connector, Harness Side	(-)	VPWR - Pin 1	Ground
(+) CAC Relay Connector, Harness Side	(-)					
VPWR - Pin 1	Ground					
KP2	CHECK THE CAC PUMP RELAY					
- REMOVE the relay from the power distribution box. - Measure the resistance between: <table><tr><td>(+) CAC Relay Connector, Component Side</td><td>(-) CAC Relay Connector, Component Side</td></tr><tr><td>CAC - Pin 2</td><td>VPWR - Pin 1</td></tr></table> - Is the resistance between 65 ohms - 100 ohms?		(+) CAC Relay Connector, Component Side	(-) CAC Relay Connector, Component Side	CAC - Pin 2	VPWR - Pin 1	Yes GO to KP3. No INSTALL a new CAC relay.
(+) CAC Relay Connector, Component Side	(-) CAC Relay Connector, Component Side					
CAC - Pin 2	VPWR - Pin 1					
KP3	CHECK THE CAC PUMP RELAY					
- CHECK the resistance between pin 1 or 2 and all other pins on the CAC relay. - Are all the resistances greater than 10K ohms?		Yes GO to KP4. No INSTALL a new CAC relay.				
KP4	CHECK FOR AN OPEN CIRCUIT BETWEEN THE PCM AND THE CAC RELAY					
- Key in OFF position. - PCM connector disconnected. - Measure the resistance between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) CAC Relay Connector, Harness Side</td></tr><tr><td>CAC - Pin 82</td><td>CAC - Pin 2</td></tr></table> - Is the resistance less than 5 ohms?		(+) PCM Connector, Harness Side	(-) CAC Relay Connector, Harness Side	CAC - Pin 82	CAC - Pin 2	Yes GO to KP5. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) CAC Relay Connector, Harness Side					
CAC - Pin 82	CAC - Pin 2					
KP5	CHECK FOR A SHORT TO POWER BETWEEN THE PCM AND THE CAC RELAY					
- Key in ON position. - Measure the voltage between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>CAC - Pin 82</td><td>Negative terminal</td></tr></table> - Is the voltage less than 0.5 V?		(+) PCM Connector, Harness Side	(-) Vehicle Battery	CAC - Pin 82	Negative terminal	Yes Key in OFF position. GO to KP6. No REPAIR the short circuit to PWR.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
CAC - Pin 82	Negative terminal					

KP1-KP5

Charge Air Cooler (CAC) Pump**KP**

Test Step		Results / Action to Take				
KP6	CHECK BETWEEN THE PCM AND THE CAC RELAY FOR A SHORT TO GROUND - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>CAC - Pin 82</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	CAC - Pin 82	Negative terminal	Yes GO to KP7. No REPAIR the short circuit to GND.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
CAC - Pin 82	Negative terminal					
KP7	CHECK THE SCICP PID - PCM connector connected. - Access the PCM and monitor the SCICP PID. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Is the SCICP PID on?	Yes If the CAC reservoir is full, there is no air flow blockage at the CAC radiator, the IAT2 and connecting circuits are not high resistance or open, intercooler hoses are not reversed and DTC P1229 is present in KOEO and KOER, INSTALL a new PCM. REFER to Diagnostic Methods,Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No Key in OFF position. Unable to duplicate or identify the fault at this time. GO to Z1.				
KP8	CHECK THE CAC FOR MECHANICAL OPERATION - Key in ON position. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Observe the CAC pump. - Command the outputs OFF. - Did the CAC pump run?	Yes Key in OFF position. CHECK for low fluid level in the intercooler system. CHECK for cracked or incorrectly routed intercooler lines or airflow blockage at the CAC radiator. REPAIR as necessary. If the symptom still exists, RETURN to Symptom Charts. No GO to KP9.				

KP6-KP8

Charge Air Cooler (CAC) Pump

KP

Test Step		Results / Action to Take				
KP9	CHECK THE POWER AND GROUND CIRCUITS AT THE CAC PUMP MOTOR - CAC Motor connector disconnected. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Measure the voltage between:<table><tr><td>(+) CAC Motor Connector, Harness Side</td><td>(-) CAC Motor Connector, Harness Side</td></tr><tr><td>PUMPPWR - Pin 1</td><td>GND - Pin 2</td></tr></table> - Is the voltage greater than 10 V?	(+) CAC Motor Connector, Harness Side	(-) CAC Motor Connector, Harness Side	PUMPPWR - Pin 1	GND - Pin 2	Yes Key in OFF position. INSTALL a new CAC motor. No Key in OFF position. GO to KP10 .
(+) CAC Motor Connector, Harness Side	(-) CAC Motor Connector, Harness Side					
PUMPPWR - Pin 1	GND - Pin 2					
KP10	CHECK CAC POWER CIRCUIT TO GND - Measure the voltage between:<table><tr><td>(+) CAC Motor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>PUMPPWR - Pin 1</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 10 V?	(+) CAC Motor Connector, Harness Side	(-) Vehicle Battery	PUMPPWR - Pin 1	Negative terminal	Yes GO to KP11 . No REPAIR the open circuit.
(+) CAC Motor Connector, Harness Side	(-) Vehicle Battery					
PUMPPWR - Pin 1	Negative terminal					
KP11	CHECK THE INTEGRITY OF THE CAC PUMP MOTOR GROUND CONNECTION - CAC Motor connector disconnected. - Measure the resistance between:<table><tr><td>(+) CAC Motor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>GND - Pin 2</td><td>Negative terminal</td></tr></table> - Is the resistance less than 5 ohms?	(+) CAC Motor Connector, Harness Side	(-) Vehicle Battery	GND - Pin 2	Negative terminal	Yes GO to KP12 . No REPAIR the open circuit.
(+) CAC Motor Connector, Harness Side	(-) Vehicle Battery					
GND - Pin 2	Negative terminal					
KP12	CHECK THE VOLTAGE TO THE CAC PUMP RELAY - CAC Relay connector disconnected. - Measure the voltage between:<table><tr><td>(+) CAC Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>B+ - Pin 3</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) CAC Relay Connector, Harness Side	(-)	B+ - Pin 3	Ground	Yes GO to KP13 . No Key in OFF position. REPAIR the open circuit. Check fuses.
(+) CAC Relay Connector, Harness Side	(-)					
B+ - Pin 3	Ground					
KP13	CHECK FOR AN OPEN CAC PUMP MOTOR CIRCUIT - Measure the resistance between:<table><tr><td>(+) CAC Relay Connector, Harness Side</td><td>(-) CAC Motor Connector, Harness Side</td></tr><tr><td>PUMPPWR - Pin 5</td><td>PUMPPWR - Pin 1</td></tr></table> - Is the resistance less than 5 ohms?	(+) CAC Relay Connector, Harness Side	(-) CAC Motor Connector, Harness Side	PUMPPWR - Pin 5	PUMPPWR - Pin 1	Yes Key in OFF position. INSTALL a new CAC pump relay. No Key in OFF position. REPAIR the open circuit.
(+) CAC Relay Connector, Harness Side	(-) CAC Motor Connector, Harness Side					
PUMPPWR - Pin 5	PUMPPWR - Pin 1					

KP9-KP13

Test NB: Malfunction Indicator Lamp

PINPOINT TEST NB: MALFUNCTION INDICATOR LAMP

Malfunction Indicator Lamp

NB

This pinpoint test is intended to diagnose the following:

- Harness circuits: MIL circuit.
- Powertrain control module (PCM) (12A650).

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Explorer SportTrac, Ranger	104 Pin	MIL	2
All other vehicles	150 (50-50-50) Pin	MIL	T22

Test Step		Results / Action to Take				
NB1	MALFUNCTION INDICATOR LAMP ALWAYS ON (NO DTCS PRESENT) Does the vehicle start?	Yes GO to NB2. No Concern is elsewhere. RETURN to Symptom Charts for further direction.				
NB2	CHECK THE MIL CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>MIL</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	MIL	Negative terminal	Yes INSTALL a new PCM. REFER to Diagnostic Methods,Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit to GND.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
MIL	Negative terminal					
NB3	MALFUNCTION INDICATOR LAMP (MIL) NEVER ON Does the vehicle start?	Yes GO to NB4. No Concern is elsewhere. RETURN to Symptom Charts for further direction.				

Note, Connector And NB1-NB3

Malfunction Indicator Lamp**NB**

Test Step		Results / Action to Take				
NB4	MIL HARNESS CHECK • Key in OFF position. • PCM connector disconnected. • Key in ON position. • Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A PCM Connector, Harness Side</td><td>Point B</td></tr><tr><td>MIL</td><td>Ground</td></tr></table> • Remove the jumper wire(s) • Does the MIL illuminate when grounded?	Point A PCM Connector, Harness Side	Point B	MIL	Ground	Yes INSTALL a new PCM. REFER to Diagnostic Methods,Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No GO to NB5.
Point A PCM Connector, Harness Side	Point B					
MIL	Ground					
NB5	CHECK FOR AN OPEN MIL CIRCUIT BETWEEN THE PCM AND INSTRUMENT CLUSTER • Key in OFF position. • Disconnect the instrument cluster. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) IC Connector, Harness Side</td></tr><tr><td>MIL</td><td>MIL</td></tr></table> • Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) IC Connector, Harness Side	MIL	MIL	Yes REFER to Instrument Panel, Gauges and Warning Indicators to diagnose the MIL and its circuitry. No REPAIR the open circuit. VERIFY the repair by turning the key to the ON position.
(+) PCM Connector, Harness Side	(-) IC Connector, Harness Side					
MIL	MIL					

NB4-NB5

Test NC: Ignition Engine Speed Input Circuit**PINPOINT TEST NC: IGNITION ENGINE SPEED INPUT CIRCUIT**

Ignition Engine Speed Input Circuit**NC**

This pinpoint test is intended to diagnose the powertrain control module (PCM) (12A650).

Test Step		Results / Action to Take
NC1	CONTINUOUS MEMORY DTC P0320: ERRATIC IGNITION	Yes REPAIR as necessary. No Key in OFF position. GO to NC2 .
	• Verify all 2-way radio installations. Carefully follow the manufacturer's installation instructions regarding the routing of the antenna and power leads. • Is a concern present?	
NC2	NO START CONCERN	Yes GO to A1 . No GO to NC3 .
	• Is the customer complaint no start?	
NC3	INTERMITTENT FAULTS	Yes GO to Z1 . No GO to JD1 .
	• Is this an intermittent condition?	

Note And NC1-NC3

Test ND: Engine RPM/Vehicle Speed Limiter Reached
PINPOINT TEST ND: ENGINE RPM/VEHICLE SPEED LIMITER REACHED

**Engine RPM\Vehicle Speed Limiter
Reached****ND**

Note: Enter this pinpoint test only when directed here.

Test Step		Results / Action to Take
ND1	DTCS P0219, P0297 OR P1270: EXCESSIVE ENGINE RPM OR VEHICLE SPEED	
	• P0219 (engine over speed), P0297 (vehicle over speed) or P1270 Diagnostic Trouble Codes indicate the vehicle was operated in a manner which caused the engine or vehicle speed to exceed a calibrated limit. — Excessive engine RPM in NEUTRAL or operated in the wrong transmission gear. — Excessive wheel slippage (water, ice, mud or snow). — Vehicle driven at a high rate of speed. • Was the vehicle operating in any of the above conditions?	Yes The OBD system is OK. RETURN the vehicle to customer with information about the DTC No REFER to Symptom Charts, Step 2: No DTC(s) Present Symptom Chart Index. If there are no other symptoms, RETURN the vehicle to the customer with information about the DTC.

Note And ND1

Test QA: Unable to Activate Self-Test/Network Communication Error

PINPOINT TEST QA: UNABLE TO ACTIVATE SELF-TEST/NETWORK COMMUNICATION ERROR

Unable to Activate Self-Test/Network Communication Error

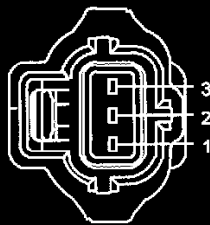
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Note: PCM diagnostic tool protocol is dependant upon vehicle application and configuration. Refer to Vehicle/Diagrams for module and connector locations. Refer to Information Bus (Module Communications Network) for description and operation information.

PCM Communication Protocol and VREF Information Table

Application	Engine	PCM Protocol	Measure the PCM VREF at:
Aviator	All	SCP	TPS
E-150/E-250 4.6L	All	CAN	FRP
Excursion	All	SCP	TPS
Explorer Sport Trac	All	SCP	TPS
Explorer/Mountaineer 4.6L	All	CAN	FRP
F-150	All	CAN	FRP
Ford GT	All	SCP	TPS
Freestar/Monterey	All	SCP	TPS
Lincoln LS/Thunderbird	All	CAN	FRP
Ranger	All	SCP	TPS
Taurus/Sable	All	CAN	TPS
All others	All	CAN	FRPT

Throttle Position (TP) Sensor Connector

A

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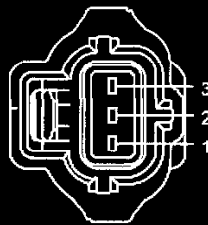
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Note, Table And Connector

**Unable to Activate Self-Test/Network
Communication Error****QA**

Vehicle	Connector	Circuit	Pin
Escape 2.3L, Focus, Mariner 2.3L, Ranger 2.3L	A	SIGRTN VREF	1 3
All other vehicles	B	SIGRTN VREF	3 1

Fuel Rail Pressure (FRP) Sensor Connector

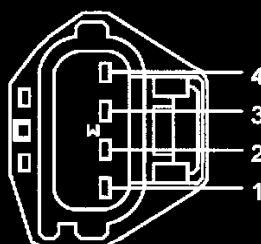
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Circuit	Pin
SIGRTN (Signal return)	2
VREF (Reference Voltage)	1

Unable to Activate Self-Test/Network Communication Error

QA

Fuel Rail Pressure/Temperature (FRPT) Sensor Connector



A0077567

Circuit	Pin
SIGRTN (Signal return)	4
VREF (Reference Voltage)	2

Powertrain Control Module (PCM) Connector

Vehicle	Connector	Circuit	Pin
Aviator, LS, Thunderbird	150 (60-32-58) Pin	PWRGND VPWR	B24, B25, B26, B27 B32, B33
E-Series 4.6L, E-Series 5.4L 4R75E, Mustang	170 Pin	PWRGND VPWR	B47, B48, B49, B50 B35, B36
E-Series 6.8L, E-Series 5.4L 5R100, F-Super Duty	170 Pin	PWRGND VPWR	B47, B48, B49, B50 B35, B36, T39
Escape, Explorer, Focus, Mariner, Mountaineer	150 (50-50-50) Pin	PWRGND VPWR	B47, B48, B49 B35, B36
Excursion 5.4L	104 Pin	PWRGND VPWR	3, 24, 51, 76, 77, 103 71, 97

(Continued)

Unable to Activate Self-Test/Network Communication Error

QA

Vehicle	Connector	Circuit	Pin
Excursion 6.8L	104 Pin	PWRGND VPWR	3, 23, 24, 51, 76, 77, 103 71, 97
Expedition, F-150, Navigator	190 Pin	PWRGND VPWR	B67, B68, B69, B70 B51, B52, B53
Explorer SportTrac, Ranger, Sable, Taurus	104 Pin	PWRGND VPWR	103, 24, 51, 76, 77 71, 97
Freestar/Monterey	104 Pin	PWRGND VPWR	103, 24, 51, 76 71, 97
Ford GT	104 Pin	PWRGND VPWR	103, 3, 51, 76 71, 97
All other vehicles	150 (50-50-50) Pin	PWRGND VPWR	B47, B48, B49, B50 B35, B36

Test Step		Results / Action to Take
QA1	CARRY OUT A VEHICLE INSPECTION AND VERIFY THE SELF-TEST PROCEDURE	
Note: If the self-test or communication concern occurred after a failed or an aborted reprogram, the module may be blank. Attempt to reprogram the module again before continuing with this pinpoint. • This pinpoint test addresses the following concerns: — unable to communicate with PCM. — unable to activate the PCM self-test. • Possible causes: — incorrect self-test procedure. — communication circuit open from PCM to the DLC. — PCM power or ground circuits PCM. — VREF circuit short to ground (Excursion, Explorer Sport Trac, Ford GT, Freestar/Monterey, or Ranger). • Visually inspect the following for obvious signs of electrical damage: — harness wiring. — electrical connections. • Verify the correct procedure was used to activate the self-test for the diagnostic tool. REFER to Diagnostic Methods, Scan Tool Set-up and Functionality. • Was the correct self-test procedure used?		Yes GO to QA2. No REFER to Diagnostic Methods, Scan Tool Set-up and Functionality.

Yes
GO to **QA2**.

No
REFER to Diagnostic Methods,
Scan Tool Set-up and Functionality.

Chart, QA1

Unable to Activate Self-Test/Network Communication Error

QA

Test Step		Results / Action to Take				
QA2	CARRY OUT THE DATA LINK DIAGNOSTICS TEST • Connect the diagnostic tool. • Key in ON position. • Carry out the data link diagnostics test. • Is system passed obtained?	Yes GO to Quick Test QT1 . No For all electronic control units no response/not equipped, GO to QA3 . For PCM no response/not equipped, GO to QA3 . For no response from the diagnostic tool, REFER to Information Bus (Module Communications Network) to diagnose no response from the diagnostic tool.				
QA3	CHECK FOR VREF VOLTAGE AT A SENSOR Note: PCM power and ground can be determined by measuring VREF voltage at a sensor. Refer to the PCM Communication Protocol and VREF Information table at the beginning of this pinpoint test for the vehicle application and the applicable sensor to test. • Key in OFF position. • Disconnect the applicable sensor. • Key in ON position. • Measure the voltage between the applicable sensor VREF circuit, harness side and the applicable sensor SIGRTN circuit, harness side. • Is the voltage between 4.5 volts - 5.5 volts?	Yes For Excursion, Explorer Sport Trac, Ford GT, Freestar/Monterey, or Ranger, GO to QA6 . For all others, REFER to Information Bus (Module Communications Network) to diagnose no communication with the PCM. No GO to QA4 .				
QA4	CHECK THE PCM VPWR CIRCUITS FOR VOLTAGE • Key in OFF position. • Disconnect the PCM. • Key in ON position. • Measure the voltage between: <table border="1"><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> • Are the voltages greater than 10.5 volts?	(+) PCM Connector, Harness Side	(-)	VPWR	Ground	Yes GO to QA5 . No GO to B1 .
(+) PCM Connector, Harness Side	(-)					
VPWR	Ground					
QA5	CHECK THE PCM GROUND CIRCUITS FOR AN OPEN • Key in OFF position. • Measure the resistance between: <table border="1"><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>PWRGND</td><td>Ground</td></tr></table> • Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-)	PWRGND	Ground	Yes For Excursion, Explorer Sport Trac, Ford GT, Freestar/Monterey, or Ranger, GO to C1 . For all others, GO to QA7 . No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-)					
PWRGND	Ground					

QA2-QA5

**Unable to Activate Self-Test/Network
Communication Error****QA**

Test Step		Results / Action to Take
QA6	CHECK COMMUNICATION WITH THE SUSPECT SENSOR DISCONNECTED	
	• Key in ON position. • Carry out the data link diagnostics test. • Key in OFF position. • Reconnect the suspect sensor. • Carry out the data link diagnostics test. • Is PCM communication present only when the sensor is disconnected?	Yes INSTALL a new suspect sensor. No REFER to Information Bus (Module Communications Network) to diagnose no communication with the PCM.
QA7	CHECK FOR CORRECT PCM OPERATION	
	• Disconnect all the PCM connectors. Visually inspect for: — corrosion. — pushed out pins. • Connect all the PCM connectors and make sure they seat correctly. • Carry out the data link diagnostic test and verify the concern is still present. • Is the concern still present?	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector.

QA6-QA7

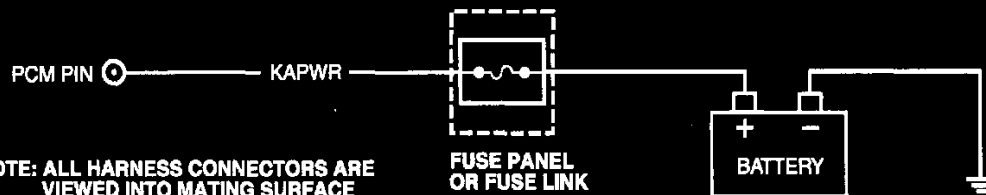
Test QB: DTCs P0603 or P1633: Keep Alive Power
PINPOINT TEST QB: DTCs P0603 OR P1633: KEEP ALIVE POWER

DTCs P0603 or P1633: Keep Alive Power

QB

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).



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Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator, LS, Thunderbird	150 (60-32-58) Pin	KAPWR	B44
E-Series, F-Super Duty, Mustang	170 Pin	KAPWR	B45
Excursion, Explorer SportTrac, Freestar/Monterey, Ford GT, Ranger, Sable, Taurus	104 Pin	KAPWR	55
Expedition, F-150, Navigator	190 Pin	KAPWR	B54
All other vehicles	150 (50-50-50) Pin	KAPWR	B45

Note, Schematics And Connector

DTCs P0603 or P1633: Keep Alive Power

QB

Test Step		Results / Action to Take			
QB1	CHECK THE 12-VOLT BATTERY TERMINALS	Yes GO to QB2 . No REPAIR as necessary.			
Note: If KAPWR is interrupted to the PCM when a breakout box is installed or the battery is disconnected, DTC P0603/P1633 can be generated on the first power-up. - Inspect the 12-volt battery cables for loose connections and for corrosion. Are the 12-volt battery terminal connections in good condition?					
QB2	INSPECT THE ENGINE COMPARTMENT FOR PROPER WIRE ROUTING	Yes REPAIR as necessary. No GO to QB3 .			
- Inspect the electronic engine control (EEC) system wiring for proper wire routing. - Check the wiring routing to establish if any of the electrical connectors are being stressed due to poorly routed wiring. If necessary re-route and secure the wiring. - Visually inspect wiring and connectors. Is a concern present?					
QB3	CHECK KEEP ALIVE POWER (KAPWR) TO THE PCM	Yes GO to QB4 . No ISOLATE the fault and REPAIR as necessary.			
- Key in OFF position. - PCM connector disconnected. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) 12 Volt Vehicle Battery</td></tr><tr><td>KAPWR</td><td>Negative terminal</td></tr></table> - While observing the multimeter, grasp the EEC harness and wiggle, shake or bend a small section while working from the battery to the PCM. Is the voltage greater than 10.5 V?			(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery	KAPWR
(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery				
KAPWR	Negative terminal				
QB4	CHECK FOR A REPEAT OF THE DTC	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No Unable to duplicate or identify the fault at this time. GO to Z1 .			
- PCM connector connected. - Clear all DTCs that may have been caused by the PCM disconnect. - Test drive the vehicle and allow the engine to reach normal operating temperature. - Carry out the PCM self-test. Is DTC P0603 or P1633 present?					

QB1-QB4

Test QC: DTC P1000: On-Board Diagnostic (OBD) Systems Readiness Test Not Complete
PINPOINT TEST QC: DTC P1000: ON-BOARD DIAGNOSTIC (OBD) SYSTEMS READINESS TEST NOT COMPLETE

DTC P1000: On-Board Diagnostic (OBD) Systems Readiness Test Not Complete

QC

Note: Diagnostic Trouble Code (DTC) P1000 indicates that all the OBD 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 OBD system. This additional driving must occur before the vehicle is tested at the inspection/maintenance station. The amount of driving required varies with the individual driving patterns. To complete this requirement in the shortest amount of time, refer to Diagnostic Methods, Drive Cycles.

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.

The only way DTC P1000 can be removed from memory is when all the OBD monitors are successfully completed.

DTC P1000 is set by the PCM under 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 diagnostic 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 power take off (PTO) and the circuit is shorted to VPWR or B+ or the PTO is on during the testing.

Test Step		Results / Action to Take
QC1	CONTINUOUS MEMORY DTC P1000: CHECK FOR ANY OTHER DTCS	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to QC2 .
	Note: Enter this pinpoint test only if DTC P1000 was retrieved from Continuous Memory. Ignore DTC P1000 in KOEO or KOER memory. • DTC P1000 indicates all of the OBD monitors have not yet been successfully tested. • Were any other DTCs received with P1000?	
QC2	CHECK FOR PTO	Yes GO to QC3 . No GO to QC4 .
	• Is the vehicle equipped with PTO?	

Note And QC1-QC2

DTC P1000: On-Board Diagnostic (OBD) Systems Readiness Test Not Complete**QC**

Test Step		Results / Action to Take
QC3	CHECK THE PTO PID	
	• Key on engine running. • Access the PCM and monitor the PTO PID. • Cycle the PTO switch/actuator ON and OFF. (Follow the PTO aftermarket instructions). • Does the PTO PID cycle ON and OFF?	Yes GO to QC4 . No GO to FB1 .
QC4	REQUEST TO CLEAR DTC P1000	
	Note: An entire OBD drive cycle has not yet been completed to clear DTC P1000 from the PCM. • Has the customer requested DTC P1000 be cleared from the PCM memory?	Yes CARRY OUT an OBD drive cycle. On Board Diagnostic (OBD) Drive Cycle No Key in OFF position. INFORM the customer that if the law in your area requires additional driving in order to clear DTC P1000 from the PCM memory, it must be completed before an inspection/maintenance test.

QC3-QC4

Test QD: DTC P1260: Passive Anti Theft System**PINPOINT TEST QD: DTC P1260: PASSIVE ANTI THEFT SYSTEM**

DTC P1260: Passive Anti-Theft System**QD**

Note: 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. DTC P1260 will be stored any time the PCM disables the vehicle because of the PATS.

Test Step		Results / Action to Take
QD1	CHECK FOR PATS DTCS	Yes GO to QD2 . No REFER to Antitheft and Alarm Systems to diagnose the PATS DTCS.
	- Repair all PATS DTCS before P1260. Refer to Antitheft and Alarm Systems for System Description, Operation and Self-Test. Are all PATS DTCS diagnosed?	
QD2	CHECK FOR ANY OTHER POWERTRAIN DTCS	Yes GO to QD3 . No Disregard DTC P1260. Repair all other powertrain DTCS. REFER to Diagnostic Trouble Code (DTC) Charts and Descriptions.
	- Repair all powertrain DTCS other than P1260. Are all other powertrain DTCS diagnosed?	

Note And QD1-QD2

DTC P1260: Passive Anti-Theft System**QD**

Test Step		Results / Action to Take
QD3	ATTEMPT TO START THE ENGINE	
• Carry out a keep alive memory reset to clear DTC P1260. Refer to Diagnostic Methods Resetting The Keep Alive Memory (KAM). • Attempt to start the engine. • Does the engine start?		Yes No system faults exist at the present time. For intermittent no start or start stalls, CHECK for intermittent PATS faults. (PATS cannot stall the engine after 1 second of operation). For intermittent stalls while driving, VERIFY diagnostic tool-to-PCM communication during the concern. If a PCM communication error occurs, the possible causes are: Loss of PWR or GND to the PCM. Damaged PCM PWR relay. Damaged EEC PWR diode. VREF circuit short to ground (Excursion, Explorer Sport Trac, Ford GT, Freestar/Monterey, or Ranger) REPAIR as necessary. No DTC P1260 is not the cause of the No Start. REFER to Symptom Charts, Step 2: No DTCs Present Symptom Chart Index.

QD3

Test QE: Electronic Throttle Control (ETC) System
PINPOINT TEST QE: ELECTRONIC THROTTLE CONTROL (ETC) SYSTEM

Electronic Throttle Control (ETC) System

QE

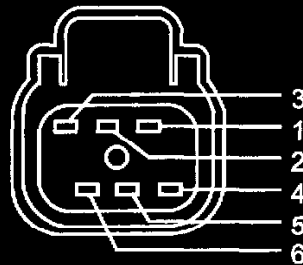
This pinpoint test is intended to diagnose the following:

- Informational PCM DTCs.

The informational DTCs are the result of limited operating strategy (LOS) or failure mode effects management (FME) operating strategy that maintains limited vehicle function in the event of a PCM, harness, or component failure.

Circuit DTCs can be accompanied by the informational DTCs, and should be diagnosed first. Informational DTCs without circuit DTCs may or may not indicate the actual concern and should be diagnosed as a symptom.

EGR System Module (ESM) Connector



A0077577

Circuit	Pin
SIGRTN (Signal return)	6
VREF (Reference Voltage)	2

Test Step		Results / Action to Take
QE1	DTCS P2104, P2105, P2106 OR P2110: CHECK FOR THE PRESENCE OF ANY DTCS OTHER THAN THE INFORMATIONAL DTCS	Yes GO to QE2. No GO to QE4.
	• Are any DTCS present other than the following: P2104, P2105, P2106, or P2110?	

Note, Connector And QE1

**Electronic Throttle Control (ETC)
System****QE**

Test Step		Results / Action to Take
QE2	CHECK FOR THE PRESENCE OF PROCESSOR PERFORMANCE DTCS	
	• Check for self-test DTCS. • Are DTCS P0600, P0606, P060A, P060B, P060C, P061B, P061C, P061D, P061F, P1674, or U0300 present?	Yes For DTCS P061B and P2106, GO to QE9. For all others, DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to QE3.
QE3	CHECK FOR THE PRESENCE OF ANY ETB CONCERNS	
	• Check for self-test DTCS. • Are DTCS P2072 or P2100 present?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No ADDRESS the remaining DTCS in the following order: KOEO, KOER, and Continuous. DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions.
QE4	CHECK FOR DTCS IN OTHER VEHICLE MODULES	
	• Check for self-test DTCS in all of the vehicle modules. • Are any DTCS present?	Yes REFER to the applicable ALLDATA System/Component to diagnose the DTC. No GO to QE5.

QE2-QE4

**Electronic Throttle Control (ETC)
System****QE**

Test Step		Results / Action to Take
QE5	CHECK FOR THE PRESENCE OF ANY MODULE COMMUNICATION CONCERNS • Check for self-test DTCs in all of the vehicle modules. • Are any communication concerns or communication DTCs present?	Yes For communication concerns in the PCM: DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. For communication concerns in other modules: REFER to the applicable ALLDATA System/Component to diagnose the communication DTC. No For DTC P2104, GO to QE6 . For DTC P2105, GO to QE7 . For DTC P2106, GO to QE9 . For DTC P2110, GO to QE11 .
QE6	DTC P2104: CHECK FOR THE PRESENCE OF PCM DTCs Note: P2104 will be set in combination with other DTCs. • Clear the PCM DTCs. • Check for self-test DTCs. • Are any DTCs present other than the following: P2104?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
QE7	DTC P2105: CHECK FOR THE PRESENCE OF PCM DTCs Note: P2105 will be set in combination with other DTCs. • Clear the PCM DTCs. • Check for self-test DTCs. • Are any DTCs present other than the following: P2105?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to QE8 .

QE5-QE7

**Electronic Throttle Control (ETC)
System****QE**

Test Step		Results / Action to Take
QE8	CARRY OUT A VISUAL INSPECTION • Key in OFF position. • Visually inspect the following for obvious signs of damage: — ETB. — PCM. • Is a concern present?	Yes ISOLATE the fault and REPAIR as necessary. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).
QE9	DTCS P061B OR P2106: CHECK FOR THE PRESENCE OF PCM DTCS • Clear the PCM DTCS. • Check for self-test DTCS. • Are any DTCS present other than the following: P061B or P2106?	

QE8-QE9

Electronic Throttle Control (ETC) System

QE

Test Step		Results / Action to Take				
QE10	CHECK THE MAP SENSOR FOR AN OFFSET SIGNAL • Key in OFF position. • Allow the vehicle to cool down. • ESM connector disconnected. • Measure the resistance between:<table><tr><td>(+) ESM Connector, Component Side</td><td>(-) ESM Connector, Component Side</td></tr><tr><td>VREF - Pin 2</td><td>SIGRTN - Pin 6</td></tr></table> • Is the resistance greater than 2K ohms?	(+) ESM Connector, Component Side	(-) ESM Connector, Component Side	VREF - Pin 2	SIGRTN - Pin 6	Yes For Crown Victoria, Grand Marquis, Explorer, Mountaineer, F-150 4.6L, LS 3.9L, Thunderbird, and Town Car, GO to QE12 . For all others, CHECK for an intermittent concern with an ETC related harness or sensor. GO to Pinpoint Test Z. No INSTALL a new ESM.
(+) ESM Connector, Component Side	(-) ESM Connector, Component Side					
VREF - Pin 2	SIGRTN - Pin 6					
QE11	DTC P2110: CHECK FOR THE PRESENCE OF PCM DTCs Note: P2110 will be set in combination with other DTCs. • Clear the PCM DTCs. • Check for self-test DTCs. • Are any DTCs present other than the following: P2110?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to Diagnostic Trouble Code (DTC) Charts and Descriptions. No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrical Erasable Programmable Read Only Memory (EEPROM).				
QE12	CHECK FOR ABS AND WHEEL SPEED SENSOR CONCERNS Note: Refer to Reference Values for the typical diagnostic reference values. • ESM connector connected. • Key on engine running. • Access the PCM and monitor the OSS, TSS/ISS and VSS PIDs. • Access the ABS and monitor the LF_WSPD, LR_WSPD, RF_WSPD and RR_WSPD PIDs. • Road test the vehicle under various load conditions while comparing the PIDs. Check for signals that are intermittent or do not correspond. • Do the PID values correspond with the vehicle operating conditions?	Yes CHECK for an intermittent concern with an ETC related harness or sensor. GO to Pinpoint Test Z. No REFER to Antilock Brakes / Traction Control Systems to diagnose any ABS concerns.				

QE10-QE12

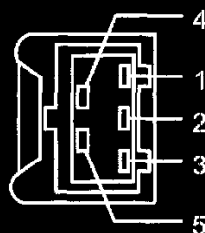
Test TA: Clutch Pedal Position (CPP) Switch

PINPOINT TEST TA: CLUTCH PEDAL POSITION (CPP) SWITCH

Clutch Pedal Position (CPP) Switch**TA**

This pinpoint test is intended to diagnose the following:

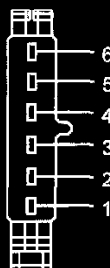
- CPP (11A152/7C534).
- Harness circuits: CPP / CPP BT and SIGRTN.
- Powertrain control module (PCM) (12A650).

Clutch Pedal Position (CPP) Connector**A**

A0077532

B

A0077523

C

A0077530

Vehicle	Connector	Circuit	Pin
Focus	A	CPP SIGRTN	4 5
Escape 2.3L	B	CPP SIGRTN	1 2

(Continued)

Note And Connector

Clutch Pedal Position (CPP) Switch

TA

Vehicle	Connector	Circuit	Pin
F-150	C	CPP-BT SIGRTN	6 5
F-Super Duty	C	CPP-BT SIGRTN	5 6
All other vehicles	C	CPP SIGRTN	1 2

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
F-150	190 Pin	CPP-BT SIGRTN	B39 B58, E58, T43
F-Super Duty	170 Pin	CPP-BT SIGRTN	B34 B41, E58, T41
Focus	150 (50-50-50) Pin	CPP SIGRTN	T16 B41, E41, T41
Mustang	170 Pin	CPP SIGRTN	T30 B43, E33, T41
Ranger	104 Pin	CPP SIGRTN	64 91
All other vehicles	150 (50-50-50) Pin	CPP SIGRTN	T27 B41, E41, T41

Test Step		Results / Action to Take
TA1	DTC P0704, P0830: CHECK THE CPP SWITCH	
 CAUTION: Apply vehicle park brake. Make sure that the vehicle is secured with wheel chocks. - Note: During self-test, the clutch pedal must be down and gearshift lever in NEUTRAL. — For code P0704 use CPP/ code P0830 use CPP BT. - Key in OFF position. - Connect the diagnostic tool. - Key in ON position. - Select the CPP, CPP BT PID and monitor for an ON/OFF PID state while performing the following: Press and release the clutch pedal several times. - Does the reading cycle when the CPP switch is activated?		

Connector And TA1

Clutch Pedal Position (CPP) Switch

TA

Test Step		Results / Action to Take						
TA2	CHECK THE SWITCH CIRCUIT RESISTANCE - Switch location(s): The CPP switch is located near the clutch pedal. - INSPECT the switches and brackets for damage. Repair as necessary. - CPP connector disconnected. - Measure the resistance between:<table><tr><td>(+) CPP Connector, Component Side</td><td>(-) CPP Connector, Component Side</td></tr><tr><td>CPP / CPP-BT</td><td>SIGRTN</td></tr></table> - Measure the CPP switch resistance with the clutch pedal down. - Is the resistance less than 5 ohms?	(+) CPP Connector, Component Side	(-) CPP Connector, Component Side	CPP / CPP-BT	SIGRTN	Yes GO to TA3. No INSTALL a new CPP.		
(+) CPP Connector, Component Side	(-) CPP Connector, Component Side							
CPP / CPP-BT	SIGRTN							
TA3	CHECK THE CPP FOR INTERNAL SHORTS - Measure the resistance between:<table><tr><td>(+) CPP Connector, Component Side</td><td>(-) CPP Connector, Component Side</td></tr><tr><td>CPP / CPP-BT</td><td>SIGRTN</td></tr></table> - Measure the CPP switch resistance with the clutch pedal UP. - Is the resistance greater than 10K ohms?	(+) CPP Connector, Component Side	(-) CPP Connector, Component Side	CPP / CPP-BT	SIGRTN	Yes GO to TA4. No INSTALL a new CPP.		
(+) CPP Connector, Component Side	(-) CPP Connector, Component Side							
CPP / CPP-BT	SIGRTN							
TA4	CHECK THE CPP / CPP BT AND SIGRTN CIRCUIT(S) FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) CPP Connector, Harness Side</td></tr><tr><td>CPP / CPP-BT</td><td>CPP / CPP-BT</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) CPP Connector, Harness Side	CPP / CPP-BT	CPP / CPP-BT	SIGRTN	SIGRTN	Yes GO to TA5. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) CPP Connector, Harness Side							
CPP / CPP-BT	CPP / CPP-BT							
SIGRTN	SIGRTN							
TA5	CHECK THE CPP / CPP BT CIRCUIT FOR A SHORT TO POWER - Key in ON position. - Measure the voltage between:<table><tr><td>(+) CPP Connector, Harness Side</td><td>(-)</td></tr><tr><td>CPP / CPP-BT</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) CPP Connector, Harness Side	(-)	CPP / CPP-BT	Ground	Yes Key in OFF position. GO to TA6. No REPAIR the short circuit to PWR.		
(+) CPP Connector, Harness Side	(-)							
CPP / CPP-BT	Ground							

TA2-TA5

Clutch Pedal Position (CPP) Switch**TA**

Test Step			Results / Action to Take				
TA6	CHECK THE CPP / CPP BT CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS		Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.				
Measure the resistance between:							
<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>CPP / CPP-BT</td><td>Ground</td></tr></table>		(+) PCM Connector, Harness Side		(-)	CPP / CPP-BT	Ground	
(+) PCM Connector, Harness Side	(-)						
CPP / CPP-BT	Ground						
Is the resistance greater than 10K ohms?							

TA6

Test TB: Transmission Control Switch (TCS)/Transmission Control Indicator Lamp (TCIL)
PINPOINT TEST TB: TRANSMISSION CONTROL SWITCH (TCS)/TRANSMISSION CONTROL INDICATOR LAMP (TCIL)

Transmission Control Switch (TCS)/ Transmission Control Indicator Lamp (TCIL)

TB

This pinpoint test is intended to diagnose the following:

- TCS.
- TCIL.
- Harness circuits: TCS and TCIL.
- Powertrain control module (PCM) (12A650).

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
Aviator, LS, Thunderbird	150 (60-32-58) Pin	TCS	B41
Crown Victoria, Grand Marquis	150 (50-50-50) Pin	TCIL TCS	T31 B27
E-Series	170 Pin	TCIL TCS	B43 B27
Excursion	104 Pin	TCIL TCS	12 29
Expedition, F-150	190 Pin	TCS	B45
Explorer SportTrac, Ranger	104 Pin	TCIL TCS	79 29
F-Super Duty	170 Pin	TCS	B27
Mustang	170 Pin	TCS	T18
All other vehicles	150 (50-50-50) Pin	TCS	B27

Test Step		Results / Action to Take
TB1	DTC P1780: CHECK THE TCS FUNCTION	
Note: Verify the TCS was cycled during self-test. • Key in ON position. • Access the TCS PID. • Apply and release the TCS and then hold it applied for 3 seconds. Release the switch. • Does the TCS PID change from ON to OFF and does the PID indicate ON when the switch was applied?		Yes Key in OFF position. REPEAT the KOER self-test and cycle the TCS during the test. No Key in OFF position. GO to TB2.

Note, Connector And TB1

Transmission Control Switch (TCS)/ Transmission Control Indicator Lamp (TCIL)

TB

Test Step		Results / Action to Take				
TB2	CHECK THE TCS VOLTAGE - PCM connector disconnected. - Key in ON position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>TCS</td><td>Ground</td></tr></table> - Monitor the voltage while applying and releasing the TCS several times. - Does the voltage change states?	(+) PCM Connector, Harness Side	(-)	TCS	Ground	Yes Key in OFF position. INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No Key in OFF position. GO to TB3.
(+) PCM Connector, Harness Side	(-)					
TCS	Ground					
TB3	CHECK THE TCS CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - TCS connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>TCS</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-)	TCS	Ground	Yes GO to TB4. No REPAIR the short circuit.
(+) PCM Connector, Harness Side	(-)					
TCS	Ground					
TB4	CHECK FOR VOLTAGE TO THE TCS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) TCS Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10.5 V?	(+) TCS Connector, Harness Side	(-)	VPWR	Ground	Yes Key in OFF position. GO to TB5. No REPAIR the open circuit.
(+) TCS Connector, Harness Side	(-)					
VPWR	Ground					
TB5	CHECK THE TCS CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) TCS Connector, Harness Side</td></tr><tr><td>TCS</td><td>TCS</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) TCS Connector, Harness Side	TCS	TCS	Yes GO to TB6. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) TCS Connector, Harness Side					
TCS	TCS					
TB6	CHECK THE TCS CIRCUIT FOR A SHORT TO POWER IN THE HARNESS - Key in ON position. - Measure the voltage between:<table><tr><td>(+) TCS Connector, Harness Side</td><td>(-)</td></tr><tr><td>TCS</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) TCS Connector, Harness Side	(-)	TCS	Ground	Yes INSTALL a new TCS. No REPAIR the short circuit.
(+) TCS Connector, Harness Side	(-)					
TCS	Ground					

TB2-TB6

Transmission Control Switch (TCS)/ Transmission Control Indicator Lamp (TCIL)

TB

Test Step		Results / Action to Take				
TB7	TCIL ALWAYS ON: CHECK THE TCIL FUNCTION • Key in ON position. • Apply and release the TCS. • Did the TCIL change state?	Yes Key in OFF position. CARRY OUT intermittent fault testing. GO to Z1 . No GO to TB8 .				
TB8	CHECK THE TCIL CIRCUIT(S) FOR A SHORT TO GROUND IN THE HARNESS • Key in OFF position. • PCM connector disconnected. • Key in ON position. Note: The TCIL turns off when the PCM is disconnected. • Did the TCIL change state?	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REPAIR the short circuit.				
TB9	TCIL NEVER ON: CHECK FOR KOER P1780 • Check the PCM for KOER DTCs: • Is DTC P1780 present?	Yes REPAIR the DTC. GO to TB1 . No GO to TB10 .				
TB10	CHECK FOR VOLTAGE TO THE TCIL • Key in OFF position. • PCM connector disconnected. • Key in ON position. • Connect a 5 amp fused jumper wire between the following: <table border="1"><tr><td>Point A PCM Connector, Harness Side</td><td>Point B Vehicle Battery</td></tr><tr><td>TCIL</td><td>Negative terminal</td></tr></table> • Did the TCIL illuminate?	Point A PCM Connector, Harness Side	Point B Vehicle Battery	TCIL	Negative terminal	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No CHECK the indicator bulb and the fuse. If OK, the open is in the wiring between the ignition switch and the TCIL pin at the harness connector. REPAIR as necessary.
Point A PCM Connector, Harness Side	Point B Vehicle Battery					
TCIL	Negative terminal					

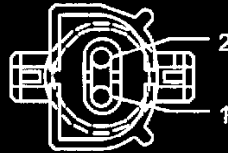
TB7-TB10

Test TG: 4X4 Low Switch (4X4LSW) and Four Wheel Drive (4WD) Switch
PINPOINT TEST TG: 4X4 LOW SWITCH (4X4LSW) AND FOUR WHEEL DRIVE (4WD) SWITCH

**4x4 Low Switch (4X4LSW) And Four
Wheel Drive (4WD) Switch****TG**

This pinpoint test is intended to diagnose the following:

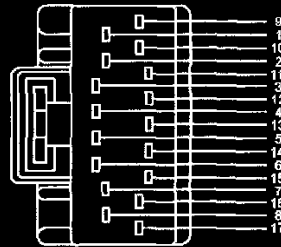
- Harness circuits between the PCM and the 4WD control module.
- Harness circuit for mechanical 4x4L.
- Powertrain control module (PCM) (12A650).

4x4 Low Switch (4X4LSW) Connector

A0077535

Circuit	Pin
4x4LLMP (4x4 Lamp)	1
4x4L (4x4 Low)	2

Note And Connector

**4x4 Low Switch (4X4LSW) And Four
Wheel Drive (4WD) Switch****TG****Four-Wheel Drive (4WD) Module Connector**

A0077576

Circuit	Pin
4x4L (4x4 Low)	9

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
E-Series	170 Pin	VPWR PWRGND 4x4L	B35 B47 B33
F-150	190 Pin	VPWR PWRGND 4x4L	B51 B67 T8
All other vehicles	104 Pin	VPWR PWRGND 4x4L	71 103 14

4x4 Low Switch (4X4LSW) And Four Wheel Drive (4WD) Switch

TG

Test Step		Results / Action to Take
TG1	DTCS P1729 AND P1781: VERIFY THE SELECTOR IS IN 4X2 OR 4X4H	Yes GO to TG2 . No VERIFY the transmission gear selector is in NEUTRAL. SELECT 2WD or 4x4H. REPEAT the Quick Test
	Note: The transmission range (TR) sensor must indicate the NEUTRAL position before 4x4L shift. - Verify the vehicle is equipped with 4x4. - Verify the selector is in 4x2 or 4x4H. - Is the selector in 2WD or 4x4H mode during the Quick Test?	
TG2	VERIFY THE 4X4L SWITCH CYCLES ON/OFF	Yes GO to TG3 . No GO to TG4 .
	- Key in ON position. - Cycle the 4wd selector switch allowing 10 to 15 seconds in each position. - Does the 4X4 lamp indicate the range selected?	
TG3	CHECK THE 4X4L CIRCUIT FOR AN INTERMITTENT FAULT	Yes Key in OFF position. ISOLATE the fault and REPAIR as necessary. No Key in OFF position. GO to TG4 .
	- Key in ON position. - Access the PCM and monitor the 4X4L PID. - Cycle the 4WD 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. - Does the 4x4L PID reading go ON/OFF during harness and connector movement?	
TG4	CHECK THE 4X4L SIGNAL VOLTAGE TO THE PCM	Yes Key in OFF position. For P1729: Unable to verify the concern. GO to Z1 . For P1781: INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM) No Key in OFF position. GO to TG5 .
	- Disconnect the PCM. - Key in ON position. - Measure the voltage between the 4x4L circuit at PCM harness connector and battery negative post while cycling the switch. - Does the voltage cycle?	

TG1-TG4

4x4 Low Switch (4X4LSW) And Four Wheel Drive (4WD) Switch

TG

Test Step		Results / Action to Take								
TG5	CHECK THE 4X4L CIRCUIT FOR AN OPEN IN THE HARNESS Note: Only one of the following resistance checks is used, depending on the system that is being diagnosed. • Disconnect the 4x4L switch on mechanical shift on the fly system. • Disconnect the 4WD control module on the electronic shift on the fly system. • Measure the resistance between:<table><tr><td>(+) 4X4LSW Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>4x4L - Pin 2</td><td>4x4L</td></tr></table> • Measure the resistance between:<table><tr><td>(+) 4WD Module Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>4x4L - Pin 9</td><td>4x4L</td></tr></table> • Is the resistance less than 5 ohms?	(+) 4X4LSW Connector, Harness Side	(-) PCM Connector, Harness Side	4x4L - Pin 2	4x4L	(+) 4WD Module Connector, Harness Side	(-) PCM Connector, Harness Side	4x4L - Pin 9	4x4L	Yes GO to TG6. No REPAIR the open circuit.
(+) 4X4LSW Connector, Harness Side	(-) PCM Connector, Harness Side									
4x4L - Pin 2	4x4L									
(+) 4WD Module Connector, Harness Side	(-) PCM Connector, Harness Side									
4x4L - Pin 9	4x4L									
TG6	CHECK THE 4X4L FOR A SHORT TO POWER IN THE HARNESS • 4X4LSW connector disconnected. • 4WD Module connector disconnected. • Key in ON position. • Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>4x4L</td><td>Negative terminal</td></tr></table> • Is the voltage less than 1 V?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	4x4L	Negative terminal	Yes GO to TG7. No REPAIR the short circuit.				
(+) PCM Connector, Harness Side	(-) Vehicle Battery									
4x4L	Negative terminal									
TG7	CHECK THE 4X4L CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS • Connect the 4WD switch on the mechanical shift on the fly system. • Connect the 4WD control module on the electronic shift on the fly system. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>4x4L</td><td>PWRGND</td></tr></table> • Is the resistance greater than 10,000 ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	4x4L	PWRGND	Yes REFER to Transmission and Drivetrain to diagnose the four wheel drive systems No REPAIR the short circuit.				
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
4x4L	PWRGND									

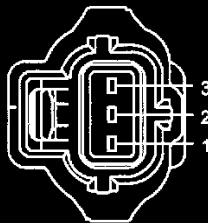
TG5-TG7

Test TJ: Output Shaft Speed (OSS) Sensor
PINPOINT TEST TJ: OUTPUT SHAFT SPEED (OSS) SENSOR

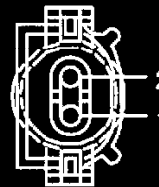
Output Shaft Speed (OSS) Sensor**TJ**

This pinpoint test is intended to diagnose the following:

- OSS Sensor (7H103/7M101).
- Harness circuits: OSS and SIGRTN.
- Powertrain control module (PCM) (12A650).

Output Shaft Speed (OSS) Sensor Connector**A**

A0077554

B

A0077536

Vehicle	Connector	Circuit	Pin
Focus	A	OSS PWRGND VPWR	2 1 3
Ford GT, Mustang	B	SIGRTN OSS	2 1
All other vehicles	B	SIGRTN OSS	1 2

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Note And Connectors

Output Shaft Speed (OSS) Sensor

TJ

Vehicle	Connector	Circuit	Pin
F-150	190 Pin	PWRGND SIGRTN OSS	B67 E58 T14
Ford GT, Ranger	104 Pin	PWRGND SIGRTN OSS	103 91 84
Mustang	170 Pin	PWRGND SIGRTN OSS	B47 E33 T3
All other vehicles	150 (50-50-50) Pin	PWRGND SIGRTN OSS	B47 E41 T3

Test Step		Results / Action to Take			
TJ1	DTCS P0720, P0721, P0722, P0723 AND P1900: VERIFY DRIVE CYCLE	Yes OSS operated as expected. GO to TJ2. No Key in OFF position. GO to TJ3.			
	- Access the PCM and monitor the OSS PID. - Drive the vehicle. - Monitor the PID in all transmission gear ranges while increasing and decreasing the speed. - Does the PID reading increase and decrease with engine and vehicle speed?				
TJ2	VISUAL INSPECTION	Yes REPAIR as necessary No GO to Z1.			
	- Output Shaft Speed (OSS) Sensor connector disconnected. - Inspect the OSS harness for damage. Inspect the OSS vehicle harness connector for damage and proper seating. - If possible, carry out a wiggle test. - Is a concern present?				
TJ3	VERIFY THE TYPE OF OSS SENSOR	Yes GO to TJ4. No GO to TJ6.			
	Note: VR (variable reluctance) sensors have 2-wire connectors, Hall-effect sensors have 3-wire connectors. - Inspect for a Hall-effect or a VR-type OSS sensor. - Is this a Hall-effect type OSS sensor?				
TJ4	CHECK THE VPWR TO THE OSS SENSOR	Yes Key in OFF position. GO to TJ5. No Key in OFF position. REPAIR the open circuit.			
	- Output Shaft Speed (OSS) Sensor connector disconnected. - Key in ON position. - Measure the voltage between: <table><tr><td>(+) Output Shaft Speed (OSS) Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VPWR</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 10.5 V?		(+) Output Shaft Speed (OSS) Sensor Connector, Harness Side	(-) Vehicle Battery	VPWR
(+) Output Shaft Speed (OSS) Sensor Connector, Harness Side	(-) Vehicle Battery				
VPWR	Negative terminal				

Chart, TJ1-TJ4

Output Shaft Speed (OSS) Sensor

TJ

Test Step		Results / Action to Take						
TJ5	CHECK THE VPWR GROUND TO THE OSS SENSOR - Measure the resistance between:<table><tr><td>(+) Output Shaft Speed (OSS) Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>PWRGND</td><td>Negative terminal</td></tr></table> - Is the resistance less than 5 ohms?	(+) Output Shaft Speed (OSS) Sensor Connector, Harness Side	(-) Vehicle Battery	PWRGND	Negative terminal	Yes GO to TJ6. No REPAIR the open circuit.		
(+) Output Shaft Speed (OSS) Sensor Connector, Harness Side	(-) Vehicle Battery							
PWRGND	Negative terminal							
TJ6	CHECK THE OSS CIRCUIT FOR A SHORT TO VREF AND VPWR IN THE HARNESS - Key in ON position. - Output Shaft Speed (OSS) Sensor connector disconnected. - Measure the voltage between:<table><tr><td>(+) Output Shaft Speed (OSS) Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>OSS</td><td>Negative terminal</td></tr></table> - Is the voltage less than 1 V?	(+) Output Shaft Speed (OSS) Sensor Connector, Harness Side	(-) Vehicle Battery	OSS	Negative terminal	Yes Key in OFF position. GO to TJ7. No Key in OFF position. REPAIR the short circuit.		
(+) Output Shaft Speed (OSS) Sensor Connector, Harness Side	(-) Vehicle Battery							
OSS	Negative terminal							
TJ7	CHECK THE OSS CIRCUIT(S) FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Output Shaft Speed (OSS) Sensor connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Output Shaft Speed (OSS) Sensor Connector, Harness Side</td></tr><tr><td>OSS</td><td>OSS</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> - NOTE: Hall-effect sensors are not equipped with a SIGRTN circuit. Disregard SIGRTN measurement. - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) Output Shaft Speed (OSS) Sensor Connector, Harness Side	OSS	OSS	SIGRTN	SIGRTN	Yes GO to TJ8. No REPAIR the open circuit.
(+) PCM Connector, Harness Side	(-) Output Shaft Speed (OSS) Sensor Connector, Harness Side							
OSS	OSS							
SIGRTN	SIGRTN							

TJ5-TJ7

Output Shaft Speed (OSS) Sensor

TJ

Test Step		Results / Action to Take										
TJ8	CHECK THE OSS CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) Output Shaft Speed (OSS) Sensor Connector, Harness Side</td><td>(-) Output Shaft Speed (OSS) Sensor Connector, Harness Side</td></tr><tr><td>OSS</td><td>PWRGND</td></tr><tr><td>OSS</td><td>SIGRTN</td></tr></table> - Note: For Hall-effect sensor applications. Disregard the SIGRTN measurement. - Measure the resistance between:<table><tr><td>(+) Output Shaft Speed (OSS) Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>OSS</td><td>Ground</td></tr></table> - Are the resistances greater than 10,000 Ohms?	(+) Output Shaft Speed (OSS) Sensor Connector, Harness Side	(-) Output Shaft Speed (OSS) Sensor Connector, Harness Side	OSS	PWRGND	OSS	SIGRTN	(+) Output Shaft Speed (OSS) Sensor Connector, Harness Side	(-)	OSS	Ground	Yes For Hall Effect GO to TJ9. For VR (Variable Reluctance) GO to TJ10. No REPAIR the short circuit.
(+) Output Shaft Speed (OSS) Sensor Connector, Harness Side	(-) Output Shaft Speed (OSS) Sensor Connector, Harness Side											
OSS	PWRGND											
OSS	SIGRTN											
(+) Output Shaft Speed (OSS) Sensor Connector, Harness Side	(-)											
OSS	Ground											
TJ9	CHECK THE OSS SIGNAL OUTPUT TO THE PCM, HALL-EFFECT TYPE SENSOR - PCM connector disconnected. - Raise the vehicle to allow rotation of the front drive wheels. - Key in ON position. - Transmission in NEUTRAL. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>OSS</td><td>PWRGND</td></tr></table> - Note: The opposite wheel must be held stationary. - The voltage should rise above 5 volts and fall below 1 volt in a regular cycle. Observe several cycles. - Does the OSS output voltage rise and fall as specified?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	OSS	PWRGND	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REMOVE the OSS sensor and inspect the target wheel. REPAIR as necessary. If OK, INSTALL a new OSS sensor.						
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side											
OSS	PWRGND											
TJ10	CHECK THE RESISTANCE OF THE OSS SENSOR - Measure the resistance between:<table><tr><td>(+) Output Shaft Speed (OSS) Sensor Connector, Component Side</td><td>(-) Output Shaft Speed (OSS) Sensor Connector, Component Side</td></tr><tr><td>OSS</td><td>SIGRTN</td></tr></table> - Is the resistance between 400 ohms - 1.25K ohms?	(+) Output Shaft Speed (OSS) Sensor Connector, Component Side	(-) Output Shaft Speed (OSS) Sensor Connector, Component Side	OSS	SIGRTN	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No REMOVE the OSS sensor and inspect the target wheel. REPAIR as necessary. If OK, INSTALL a new OSS sensor.						
(+) Output Shaft Speed (OSS) Sensor Connector, Component Side	(-) Output Shaft Speed (OSS) Sensor Connector, Component Side											
OSS	SIGRTN											

TJ8-TJ10

Test Z: Intermittent
PINPOINT TEST Z: INTERMITTENT

Intermittent**Z**

This pinpoint test is intended to diagnose and isolate intermittent concerns for the following:

- All electronic engine control (EEC) subsystems.

This chart is used to determine which test to run for the suspect circuit. PIDs corresponding to each circuit are listed. Some circuits do not have an associated PID or the PID may not be available and will have to be measured with a digital multimeter (DMM). More specific information on the PID can be found in Reference Values. If the vehicle has a coil pack system with a no start condition, carry out the ignition test.

PCM PIDS/SIGNALS

PCM/TCM PIDS/SIGNALS	Associated Circuit	Test Type
4X4	4X4	input
ACCS	A/CCS	input
ACCR (WAC)	ACCR	output
ACET	ACET	input
ACP, ACP V	ACPSW	input
APP1	APPS	input
APP2	APPS	input
APP3	APPS	input
BPS/BOO	BPS	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
CHT, CHT V	CHT	input
CKP	CKP	input
CMP	CMP	input
CPP	CPP	input
CTO	CTO	output
DPFEGR	DPFE	input
ECT, ECT V	ECT	input
EGRMC1	EGRMC1	output
EGRMC2	EGRMC2	output
EGRMC3	EGRMC3	output
EGRMC4	EGRMC4	output
EGRMDS	EGRMC	output
EGRVR	EGRVR	output
EOT, EOT V	EOT	input
EPC, EPC V	EPC	output
EVAPC V	CV	output

(Continued)

Note And Chart

Intermittent**Z****PCM PIDS/SIGNALS**

PCM/TCM PIDS/SIGNALS	Associated Circuit	Test Type
EVAPPDC	VMV	output
EVAPPF	VMV	output
EVAPPF	VMV	output
FLI, FLI V	FLI	input
FP	FP	output
FPM	FPM	input
FP M	FPM	input
FRP, FRP V	FRP	input
FRT	FRT	input
FTP, FTP V	FTP	input
GEN RC	GENRC	output
GENLI	GENLI	input
HFC	HFC	output
HOS11	HEGO	input
HOS12	HEGO	input
HOS13	HEGO	input
HTR11	HEGO	output
HTR12	HEGO	output
HTR13	HEGO	output
IAC	IAC	output
IAT, IAT V	IAT	input
IAT2, IAT2 V	IAT 2	input
IMRC	IMRC	output
IMRCM	IMRCM	input
IMTV1	IMTV1	output
IMTV2	IMTV2	output
KS1	KS1	input
KS2	KS2	input
LFC	LFC	output
MAF, MAF V	MAF	input
MAP V	MAP/TMAP	input
OSS	OSS	input
PSP, PSPV	PSP	input
PSPT	PSP	input
PTO	PTO	input
SAIR	SAIR	output
SAIRM	SAIRM	input
SS1	SS1	output
SS2	SS2	output

(Continued)

Chart

Intermittent**Z****PCM PIDS/SIGNALS**

PCM/TCM PIDS/SIGNALS	Associated Circuit	Test Type
SS3	SS3	output
SS4	SS4	output
TACM (+)	TACM (+)	output
TACM (-)	TACM (-)	output
TP1	TP1	input
TP2	TP2	input
TCC	TCC	output
TCIL	TCIL	output
TCS	TCS	input
TFT, TFT V	TFT	input
TP, TPV	TP	input
TSS/ISS	TSS	input
VCT1	VCT1	output
VCT2	VCT2	output
VPWR	VPWR	input
Use Digital Multimeter	VREF	output
Use Digital Multimeter	VSO	output
VSS	VSS+	input
WAC	WAC	output

Test Step		Results / Action to Take
Z1	DIRECTION FOR INTERMITTENT DIAGNOSTIC PATH	
Note: Proceed with this step only if the powertrain control module (PCM) was not previously cleared. Record freeze frame data prior to clearing the PCM DTCs. Clearing the DTCs will clear any freeze frame data and eliminate FMEM. This will help to recreate the original conditions that set the DTCs or caused the symptom. • Connect a diagnostic tool to the data link connector (DLC). • Key in ON position. • Clear the PCM DTCs. • Are the PCM DTCs cleared?		Yes GO to Z2. No RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM).

Chart And Z1

Intermittent**Z**

Test Step		Results / Action to Take
Z2	SELECT THE PIDS AND/OR SIGNALS RELATED TO THE SYSTEM	Yes GO to Z3. No REPEAT the test step. GO to Z2.
- A list of related PIDs and/or signals are needed for use with the diagnostic tool to monitor the suspect areas. Obtain the customer symptom description. Use the Reference Value Symptom chart and proceed to the Reference Value PID/Signal Measurement chart located at the beginning of Reference Values. - Highlight each available PID/signal recommended by the charts under the PID/signal selection menu on the diagnostic tool. - Have all available PIDs/signals related to the symptom been selected?		
Z3	DECISION TO VERIFY THE SYMPTOM	Yes GO to Z10. No GO to Z4.
Note: The path to symptom verification is optional, but is recommended for several reasons. For example: the vehicle is back for a repeat repair, or there is no DTC present. Has a fault symptom been detected?		
Z4	COLLECT ANY SYMPTOM RELATED DATA TO AID IN VERIFICATION	Yes GO to Z5. No GATHER as much data as possible to aid in isolating the intermittent fault area. REPEAT the test step. GO to Z4.
Note: Only MIL codes trigger freeze frame data. Refer to the diagnostic tool instruction manual to retrieve the freeze frame information. - Prepare the freeze frame data for use with information from the Symptom Charts. - Check for continuous memory DTCs that should have been recorded from an earlier pinpoint test. - Access the information from the customer information worksheet and the customer if available. Access any other symptom related data available, such as TSBs and OASIS reports. - Has all available data been recorded?		
Z5	RECREATE THE SYMPTOM USING ALL AVAILABLE DATA	Yes GO to Z10. No GO to Z6.
Note: To recreate the original conditions that set the DTC or caused the symptom, the vehicle may require driving. - With the diagnostic tool, select and monitor the same PIDs as displayed in freeze frame along with any previously selected PIDs/signals from step Z2. Using the 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 data from the customer, TSBs, and other sources to aid in producing the correct conditions for recreating the symptom. - When the symptom occurs, press the trigger to begin recording. Refer to the diagnostic tool instruction manual for information on the recorder function. - Could the symptom be recreated?		

Intermittent**Z**

Test Step		Results / Action to Take
Z6	RECREATE THE SYMPTOM USING THE KOEO AND ROAD TEST PROCEDURE	
	- The road test is the last attempt to locate the area of concern before physically disturbing vehicle circuits. Note: PIDs for output in the Reference Value Charts represent command values only. Circuit measurements with a digital multimeter indicate the 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/TCM circuits with a mismatch in the digital multimeter measurement indicate a possible PCM/TCM concern. - The Intermittent Road Test Procedure is a set of instructions for monitoring PIDs/signals with a diagnostic tool and circuit measurements with a digital multimeter. This is done under 4 different conditions - key on/engine off, hot idle, 48 km/h (30 mph) and 88 km/h (55 mph). Use the typical diagnostic reference values from Reference Values to compare with the actual vehicle. - Locate the correct Reference Value Chart. - Set the vehicle up to measure the circuits with a digital multimeter and a diagnostic tool. - Connect a diagnostic tool to the DLC. - Key in ON position. - With the diagnostic tool, select and monitor PIDs and measure circuits shown in the Reference Value Chart in Reference Values. - Compare the diagnostic tool PIDs and digital multimeter values to the Reference Value Charts. Are any values out of range?	Yes GO to Z10. No GO to Z7.
Z7	RECREATE THE SYMPTOM USING THE HOT IDLE ROAD TEST PROCEDURE	
	- The engine temperature should be at least 87°C (195°F). - Key on engine running. - Continue to monitor the PIDs and circuits as in the previous step. Are any values out of range?	Yes GO to Z10. No GO to Z8.
Z8	RECREATE THE SYMPTOM USING THE 48 KM/H (30 MPH) SLOW CRUISE ROAD TEST PROCEDURE	
	- Drive the vehicle on a preplanned route. - Continue to monitor the PIDs and circuits as in the previous step. Are any values out of range?	Yes GO to Z10. No GO to Z9.

Intermittent**Z**

Test Step		Results / Action to Take
Z9	RECREATE THE SYMPTOM USING 88 KM/H (55 MPH) HIGH CRUISE ROAD TEST PROCEDURE	Yes GO to Z10 . No It is now necessary to physically disturb the selected vehicle circuits in an attempt to recreate the intermittent concern. GO to Z10 .
	- Continue to drive the vehicle on the preplanned route. - Continue to monitor the PIDs and circuits as in the previous step. Are any values out of range?	
Z10	SELECT THE CIRCUITS FROM THE INTERMITTENT TEST CHART	Yes For Input Test: GO to Z11 . For Output Test: GO to Z15 . No To diagnose other driveability symptoms, REFER to Symptom Charts.
	- Remain in the PID/Signal selection menu with the diagnostic tool. - If the intermittent road test was used to verify the symptom, highlight the PIDs/signals that were displayed as a mismatch to the Reference Values. Otherwise, highlight only the PIDs/signals from step Z2. - Proceed to the Intermittent Test chart located at the beginning of this test. - Match the selected PIDs/signals to the corresponding circuit in the chart. There may be more than one circuit to test. If a PID/signal recording was made with the diagnostic tool, it may be helpful to replay it at this time. Refer to the diagnostic tool instruction manual for recorder function information. Note: From the same chart, be sure to select and proceed with the appropriate test type. - Input Test - used on sensing inputs such as temperature, position or oxygen. - Output Test - used on output devices such as relays, coils or solenoids. Has a test been chosen?	

Intermittent**Z**

Test Step		Results / Action to Take
Z11	KOEO INPUT TEST PROCEDURE FOR THE PCM/TCM SENSORS	
 WARNING: When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. • Using the circuits chosen from the Intermittent Test Chart, select only the recommended PIDs/signals to monitor with the diagnostic tool. If a PID is not available for the circuit, use a digital multimeter to check the value. • Proceed to the area of the suspect wiring or component fault. • Key in ON position. • If the input is a switch type-component, turn it on manually. • Monitor the PID or digital multimeter while tapping on the component. • Monitor while wiggling the sensor harness wire from the component to the PCM/TCM. • Look for abrupt changes in the values. Compare these actual values to the Typical Diagnostic Reference Values in Reference Values. • Are there abrupt changes in the PID values that do not compare with the Reference Values?		Yes REPAIR as necessary. VERIFY the repair. No GO to Z12.
Z12	KOER INPUT TEST PROCEDURE FOR THE PCM/TCM SENSORS	
 WARNING: When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. • Key on engine running. • Continue to monitor the PIDs and circuits as in the previous step. • Proceed to the area of the suspect wiring or component fault. • If the input is a switch type-component, turn it on manually. • Monitor the PID or digital multimeter while tapping on the component. • Monitor while wiggling the sensor harness wire from the component to the PCM/TCM. • Look for abrupt changes in the values. Compare these actual values to the Typical Diagnostic Reference Values in Reference Values. • Are any values fluctuating in and out of range?		Yes REPAIR as necessary. VERIFY the repair. No GO to Z13.

Intermittent**Z**

Test Step		Results / Action to Take
Z13	KOEO WATER SOAK TEST PROCEDURE FOR THE PCM/TCM SENSORS, EXCLUDING HIGH VOLTAGE CIRCUITS	Yes REPAIR as necessary. VERIFY the repair. No GO to Z14.
 WARNING: When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. • Key in ON position. • Continue to monitor the PIDs and circuits as in the previous step. • Proceed to the area of the suspect wiring or component fault. • If the input is a switch type-component, turn it on manually. • Monitor the PID or digital multimeter values while lightly spraying a water mist on the component. • Monitor while spraying the sensor harness wire from the component to the PCM/TCM. • Look for abrupt changes in the values. Compare these actual values to the Typical Diagnostic Reference Values in Reference Values. • Are any values fluctuating in and out of range?		
Z14	KOER WATER SOAK TEST PROCEDURE FOR THE PCM/TCM SENSORS, EXCLUDING HIGH VOLTAGE CIRCUITS	Yes REPAIR as necessary. VERIFY the repair. No GO to Z15.
 WARNING: When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. • Key on engine running. • Continue to monitor the PIDs and circuits as in the previous step. • Proceed to the area of the suspect wiring or component fault. • If the input is a switch type-component, turn it on manually. • Monitor the PID or digital multimeter values while lightly spraying a water mist on the component. • Monitor while spraying the sensor harness wire from the component to the PCM/TCM. • Look for abrupt changes in the values. Compare these actual values to the Typical Diagnostic Reference Values in Reference Values. • Are any values fluctuating in and out of range?		

Yes
REPAIR as necessary. VERIFY the repair.

No
GO to Z14.

Yes
REPAIR as necessary. VERIFY the repair.

No
GO to Z15.

Intermittent**Z**

Test Step		Results / Action to Take
Z15	KOER WATER SOAK TEST PROCEDURE FOR THE PCM SENSORS	
 WARNING: When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. - Using the circuits chosen from the Intermittent Test Chart, select only the recommended PIDs/signals to monitor with the diagnostic tool. If a PID is not available for the circuit, use a digital multimeter to check the value. Note: Remember that PIDs selected from the Intermittent Test Chart display commanded values only. A digital multimeter measurement is needed to display the actual values. Be sure to compare them. Look for fluctuations to occur during any part of the following test. The Output State Test may not control some outputs, such as injectors and ignition coils and may not be available for all actuators.  CAUTION: The cooling fans or the fuel pump may turn on during the next steps. - Key in ON position. - With the diagnostic tool, turn on selected outputs using Output State Control. Refer to the diagnostic tool instruction manual. - Proceed to the area of the suspect wiring or component fault. - Monitor the PID or digital multimeter while tapping on the component. - Monitor while wiggling the sensor harness wire from the component to the PCM/TCM. - Look for abrupt changes in the values. Compare these actual values to the Typical Diagnostic Reference Values in Reference Values. - Is there a mismatch between command and actual or are any values fluctuating in and out of range when compared to the Reference Value Charts in Reference Values?		Yes REPAIR as necessary. VERIFY the repair. No GO to Z16.

Intermittent**Z**

Test Step		Results / Action to Take
Z16	KOER OUTPUT TEST PROCEDURE FOR THE PCM/TCM ACTUATORS	
 WARNING: When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. Note: Remember that PIDs selected from the Intermittent Test Chart display commanded values only. A digital multimeter measurement is needed to display the actual values. Be sure to compare them. Look for fluctuations to occur during any part of the following test. The Output State Test may not control some outputs, such as injectors and ignition coils and may not be available for all actuators. • To test these output types, GO to Z18. • Key on engine running. • Proceed to the area of the suspect wiring or component fault. • Monitor the PIDs with the diagnostic tool and note the values. Compare the diagnostic tool values with values from a digital multimeter with the engine at idle. While tapping on the suspect component look for fluctuations in the values. • If a coil for a coil on plug application is suspect, turn off the key. Gain access to the coil and measure continuity from the spark plug terminal to the signal terminal while tapping the coil. A large fluctuation in resistance indicates an intermittent open or short. • Monitor while wiggling the sensor harness wire from the component to the PCM/TCM. • Look for abrupt changes in the values. Compare these actual values to the Typical Diagnostic Reference Values in Reference Values. • Is there a diagnostic tool to digital multimeter value mismatch or an idle fluctuation?		Yes REPAIR as necessary. VERIFY the repair. No GO to Z17.

Intermittent**Z**

Test Step		Results / Action to Take
Z17	KOEO WATER SOAK TEST PROCEDURE FOR THE PCM/TCM ACTUATORS, EXCLUDING HIGH VOLTAGE CIRCUITS	
 WARNING: When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. Note: Remember that PIDs selected from the Intermittent Test Chart display commanded values only. A digital multimeter measurement is needed to display the actual values. Be sure to compare them. Look for fluctuations to occur during any part of the following test. The Output State Test may not control some outputs, such as injectors and ignition coils and may not be available for all actuators. • To test these output types, GO to Z18. • Key in ON position. • With the diagnostic tool, turn on selected outputs using Output State Control. Refer to the diagnostic tool instruction manual. • Proceed to the area of the suspect wiring or component fault. • Monitor the PID or digital multimeter values while lightly spraying a water mist on the component. • Look for abrupt changes in the values. Compare these actual values to the Typical Diagnostic Reference Values in Reference Values. • Is there a mismatch between command and actual or are any values fluctuating in and out of range when compared to the Reference Value Charts in Reference Values?		Yes REPAIR as necessary. VERIFY the repair. No GO to Z18.

Intermittent**Z**

Test Step		Results / Action to Take
Z18	KOER WATER SOAK TEST PROCEDURE FOR THE PCM/TCM ACTUATORS	
 WARNING: When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. • Key on engine running. • Using the circuits chosen from the Intermittent Test Chart, select only the recommended PIDs/signals to monitor with the diagnostic tool. If a PID is not available for the circuit, use a digital multimeter to check the value. • Proceed to the area of the suspect wiring or component fault. • Monitor the PID or digital multimeter values while lightly spraying a water mist on the component. • Monitor while spraying the sensor harness wire from the component to the PCM/TCM. • Look for abrupt changes in the values. Compare these actual values to the Typical Diagnostic Reference Values in Reference Values. • Is there a mismatch between command and actual or are any values fluctuating in and out of range when compared to the Reference Value Charts in Reference Values?		Yes REPAIR as necessary. VERIFY the repair. No GO to Z19.
Z19	INSPECT FOR INTERMITTENT MECHANICAL CONCERNS	
Note: It is possible for an intermittent mechanical concern to cause a good PCM/TCM system to react abnormally. • An inspection of DTC related mechanical systems should have been carried out in an earlier section. If not, visually inspect at this time. • Look for possible vacuum lines, wires, cables, linkage or hoses that may become kinked, shorted or restricted during normal engine operation. • This may include engine/transmission gear changes, acceleration and deceleration, rough roads and various engine RPM and torque related conditions. • Is a mechanical concern detected?		Yes REPAIR as necessary. VERIFY the repair. No It is necessary to seek additional help. REFER to the Professional Technician Society (PTS) web site, the OASIS system or the Technical Hotline. A vehicle data recorder (VDR) or similar recorder may also be useful.