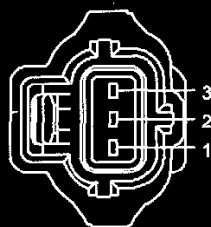


Computers and Control Systems: Pinpoint Tests**Test A: No Start****PINPOINT TEST A: NO START****No Start****A**

 **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.
Failure to follow these instructions may result in personal injury.

This pinpoint test is intended to diagnose the following:

- spark (as related to electronic engine control)
- powertrain control module (PCM) (12A650)

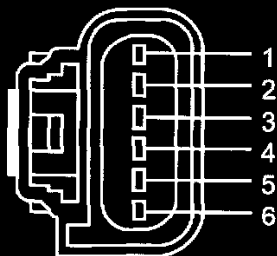
Throttle Position (TP) Sensor Connector**A**

A0077554

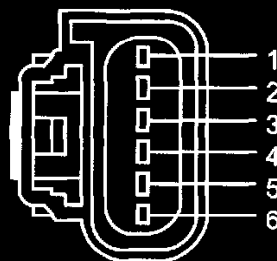
B

A0077555

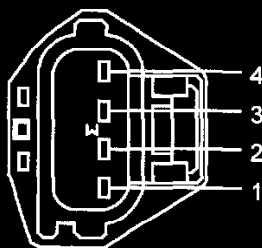
Vehicle	Connector	Pin	Circuit
Escape/Mariner 2.3L, Ranger 2.3L	A	1 3	SIGRTN VREF
All other vehicles	B	3 1	SIGRTN VREF

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

A0077520

B

A0094772

C

A0077519

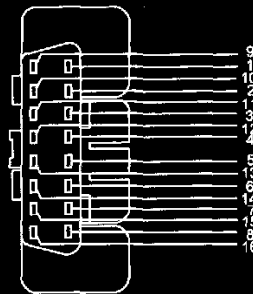
Vehicle	Connector	Pin	Circuit
E-Series 4.6L, Edge, F-150 4.2L, F-150 4.6L, Focus, MKX, MKZ, Sable, Taurus, Taurus X	A	2 3	ETCRTN ETCREF
Fusion 2.3L, Milan 2.3L	B	3 5	ETCRTN ETCREF

(Continued)

Electronic Throttle Body Throttle Position Sensor (ETBTPS) Connector

No Start**A**

Vehicle	Connector	Pin	Circuit
Fusion 3.0L, Milan 3.0L	B	4	ETCRTN
		5	ETCREF
All other vehicles	C	3	ETCRTN
		2	ETCREF

Data Link Connector (DLC)

A0077513

Pin	Circuit
13	FEPS (Flash EEPROM Programming Signal)

Test Step		Results / Action to Take
A1	ATTEMPT TO CRANK THE ENGINE 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?	Yes GO to A2 . No REFER to Starting System and diagnose the engine does not crank symptom.
A2	IDENTIFY THE TYPE OF NO START 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?	Yes The vehicle has an intermittent no start. GO to Pinpoint Test Z. No GO to A3 .

No Start**A**

Test Step		Results / Action to Take				
A3	DETERMINE THE THROTTLE TYPE					
Is the vehicle equipped with electronic throttle control?		Yes GO to A5. No GO to A4.				
A4	CHECK THE VREF VOLTAGE TO TP SENSOR					
- Key in OFF position. - TP Sensor connector disconnected. - Key ON, engine OFF. - 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 - 5.5 V?		(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side	VREF	SIGRTN	Yes GO to A6. No GO to Pinpoint Test C.
(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side					
VREF	SIGRTN					
A5	CHECK VREF VOLTAGE TO ETBTPS SENSOR					
- Key in OFF position. - ETBTPS connector disconnected. - Key ON, engine OFF. - Measure the voltage between: <table><tr><td>(+) ETBTPS Connector, Harness Side</td><td>(-) ETBTPS Connector, Harness Side</td></tr><tr><td>ETCREF</td><td>ETCRTN</td></tr></table> - Is the voltage between 4.5 - 5.5 V?		(+) ETBTPS Connector, Harness Side	(-) ETBTPS Connector, Harness Side	ETCREF	ETCRTN	Yes GO to A6. No GO to Pinpoint Test C.
(+) ETBTPS Connector, Harness Side	(-) ETBTPS Connector, Harness Side					
ETCREF	ETCRTN					
A6	CHECK THE FLASH EEPROM PROGRAMMING SIGNAL (FEPS) CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS					
- Key in OFF position. - TP Sensor connector connected. - ETBTPS connector connected. - Key ON, engine OFF. - 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 less than 9 V?		(+) DLC, Harness Side	(-) Vehicle Battery	FEPS - Pin 13	Negative terminal	Yes GO to A7. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) DLC, Harness Side	(-) Vehicle Battery					
FEPS - Pin 13	Negative terminal					

No Start

A

Test Step		Results / Action to Take
A7	CHECK THE RPM IN THE PCM	
Note: Connect the scan tool to a reliable voltage 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. Note: Normal engine cranking speed is between 150 RPM and 350 RPM. • Access the PCM and monitor the RPM PID. • Crank the engine while viewing the RPM PID. • Is the RPM between 150 RPM - 350 RPM?		Yes GO to A8. No For base engine concerns, REFER to Engine System - General Information and diagnose difficult starting symptom. For all others, GO to JD2.
A8	CHECK THE PCM DRIVER SIGNAL TO THE COILS	
Note: Test lamp bulb filament wattages vary widely. The intensity and duration of blinking depends on the test lamp being used. • Connect a test lamp between B+ and each coil driver circuit at the harness connector. • Crank the engine. • Does the test lamp blink consistently for each coil driver (1 blink per engine revolution)?		Yes GO to A9. No For coil-on-plug (COP) ignition testing, GO to JB2. For coil pack ignition testing, GO to JC2.
A9	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. Failure to follow these instructions may result in personal injury. Note: While activating the fuel pump on an electronic returnless fuel system a brief pressure spike may occur. • Key in OFF position. • Relieve the fuel pressure. Refer to Fuel Delivery and Air Induction, Fuel System for the Fuel System Pressure Release procedure. • Connect the fuel pressure gauge to the Schrader valve using the appropriate fuel pressure test hose and adaptor. • Key ON, engine OFF. • 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 GO to A10. No GO to Pinpoint Test HC.

No Start**A**

Test Step		Results / Action to Take
A10	CHECK THE FUEL PRESSURE LEAKDOWN	
	• Key ON, engine OFF. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Activate the fuel pump to obtain maximum fuel pressure. • Exit output test mode. • Monitor the fuel pressure. • 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 GO to A11 . No GO to Pinpoint Test HC.
A11	CHECK THE FUEL INJECTORS FOR VOLTAGE	
	Note: A no start condition typically exists only if greater than half of the fuel injectors are without voltage. Check at least 2 fuel injectors, 1 on each bank on V type engines. • Key in OFF position. • Disconnect 2 fuel injectors. • Key ON, engine OFF. • Measure the VPWR voltage at each fuel injector harness connector. • Is the voltage greater than 10 volts?	Yes GO to A12 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
A12	CHECK THE FUEL INJECTORS' ABILITY TO DELIVER FUEL	
	• Cycle the key several times to charge the fuel system. • Disable the 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 The electronic engine control (EEC) system is not the cause of the no start. RETURN to Symptom Charts for further direction. No GO to A13 .
A13	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

A10-A13

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

Powertrain Control Module (PCM) Power Relay

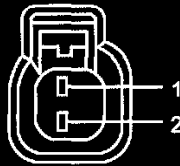
B

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

This pinpoint test is intended to diagnose the following:

- harness circuits: B+, IGN START/RUN, INJPWRM, ISP-R, PCMRC, VPWR and GND
- PCM power relay (12A646)
- PCM (12A650)

Injector (INJ) Connector



A0077568

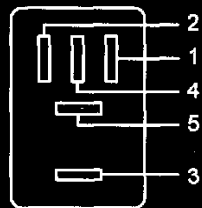
Vehicle	Connector	Pin	Circuit
Fusion 3.0L, Milan 3.0L	A	1	VPWR
All other vehicles	A	2	VPWR

Note And Injector (INJ) Connector

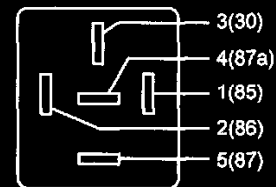
Powertrain Control Module (PCM) Power Relay

B

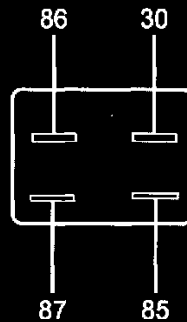
Powertrain Control Module Power (PCM Power) Relay Connector

A

A0077584

B

A0077582

C

N0047959

Vehicle	Connector	Pin	Circuit
Crown Victoria, Escape/Mariner, Grand Marquis	A	5 2 1 3	VPWR GND IGN START/RUN B+
Expedition, F-Super Duty, Fusion, Milan, MKZ, Navigator, Sable, Taurus, Taurus X	B	87 86 30, 85	VPWR PCMRC B+

(Continued)

Powertrain Control Module Power (PCM Power) Relay Connector

Powertrain Control Module (PCM) Power Relay

B

Vehicle	Connector	Pin	Circuit
Explorer, Explorer Sport Trac, Mountaineer	B	87 85 30, 86	VPWR PCMRC B+
F-150, Mark LT	A	5 1 2, 3	VPWR PCMRC B+
Focus	A	3 2 1, 5	VPWR PCMRC B+
Mustang	C	87 85 30, 86	VPWR PCMRC B+
All other vehicles	B	87 85 86 30	VPWR GND IGN START/RUN B+

Powertrain Control Module (PCM) Connector

Vehicle	Connector	Pin	Circuit
Edge, MKX, Sable, Taurus, Taurus X	190 Pin	B33 B51, B52, B53 B7 B8	INJPWRM VPWR ISP-R PCMRC
Escape/Mariner	150 (50-50-50) Pin	B35, B36	VPWR
Expedition, Navigator	140 Pin	B33 B51, B52, B53 B7 B8	INJPWRM VPWR ISP-R PCMRC
Explorer, Explorer Sport Trac, Mountaineer	170 Pin	B35, B36 B46 B37	VPWR ISP-R PCMRC
F-150 4.6L, F-150 5.4L, Mark LT	190 Pin	B51, B52, B53 B17 B40	VPWR ISP-R PCMRC
F-150 4.2L	190 Pin	B33 B51, B52, B53 B17 B40	INJPWRM VPWR ISP-R PCMRC
F-Super Duty	170 Pin	E23 B35, B36 B31 B37	INJPWRM VPWR ISP-R PCMRC

(Continued)

Powertrain Control Module (PCM) Power Relay

B

Vehicle	Connector	Pin	Circuit
Focus	190 Pin	B21 B67, B68 B42 B38	INJPWRM VPWR ISP-R PCMRC
Fusion, Milan, MKZ	140 Pin	B45 B51, B52 B37 B35	INJPWRM VPWR ISP-R PCMRC
Mustang	170 Pin	E23 B35, B36 B46 B37	INJPWRM VPWR ISP-R PCMRC
All other vehicles	170 Pin	B35, B36	VPWR

Test Step		Results / Action to Take						
B1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs) Is DTC P0685, P0689, or P0690 present?	Yes For DTCs P0685 or P0690, GO to B8 . For DTC P0689, GO to B11 . No GO to B2 .						
B2	CHECK THE B+ AND IGN START/RUN VOLTAGE TO PCM POWER RELAY - Key in OFF position. - PCM Power Relay connector disconnected. - Key ON, engine OFF. - Measure the voltage between: <table border="1"><tr><td>(+) PCM Power 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 V?	(+) PCM Power Relay Connector, Harness Side	(-)	B+	Ground	IGN START/RUN	Ground	Yes For Crown Victoria, Grand Marquis, E-Series, Escape/Mariner, Ranger, and Town Car, GO to B6 . For all others, GO to B3 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Power Relay Connector, Harness Side	(-)							
B+	Ground							
IGN START/RUN	Ground							
B3	CHECK THE PCMRC CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between: <table border="1"><tr><td>(+) PCM Power Relay Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>PCMRC</td><td>PCMRC</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Power Relay Connector, Harness Side	(-) PCM Connector, Harness Side	PCMRC	PCMRC	Yes GO to B4 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) PCM Power Relay Connector, Harness Side	(-) PCM Connector, Harness Side							
PCMRC	PCMRC							

Powertrain Control Module (PCM) Power Relay

B

Test Step		Results / Action to Take				
B4	CHECK THE PCMRC CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>PCMRC</td><td>Ground</td></tr></table> - Is any voltage present?	(+) PCM Connector, Harness Side	(-)	PCMRC	Ground	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to B5.
(+) PCM Connector, Harness Side	(-)					
PCMRC	Ground					
B5	CHECK THE ISP-R VOLTAGE AT THE PCM HARNESS CONNECTOR - Key in OFF position. - PCM Power Relay connector connected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>ISP-R</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) PCM Connector, Harness Side	(-)	ISP-R	Ground	Yes GO to B7. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
ISP-R	Ground					
B6	CHECK THE PCM POWER RELAY GROUND CIRCUIT FOR AN OPEN - Measure the voltage between:<table><tr><td>(+) PCM Power Relay Connector, Harness Side</td><td>(-) PCM Power Relay Connector, Harness Side</td></tr><tr><td>B+</td><td>GND</td></tr></table> - Is the voltage greater than 10 V?	(+) PCM Power Relay Connector, Harness Side	(-) PCM Power Relay Connector, Harness Side	B+	GND	Yes GO to B7. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Power Relay Connector, Harness Side	(-) PCM Power Relay Connector, Harness Side					
B+	GND					
B7	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>(+) PCM Power 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?	(+) PCM Power Relay Connector, Harness Side	(-) PCM Connector, Harness Side	VPWR	VPWR	Yes INSTALL a new PCM Power relay. CLEAR the DTCs. REPEAT the self-test. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Power Relay Connector, Harness Side	(-) PCM Connector, Harness Side					
VPWR	VPWR					

Powertrain Control Module (PCM) Power Relay

B

Test Step		Results / Action to Take				
B8	DTCS P0685 OR P0690: CHECK THE PCMRC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Key in OFF position. - PCM Power Relay connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>PCMRC</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-)	PCMRC	Ground	Yes GO to B9. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
PCMRC	Ground					
B9	CHECK THE ISP-R CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key in OFF position. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>ISP-R</td><td>Ground</td></tr></table> - Is any voltage present?	(+) PCM Connector, Harness Side	(-)	ISP-R	Ground	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to B10.
(+) PCM Connector, Harness Side	(-)					
ISP-R	Ground					
B10	CHECK THE INJPWRM CIRCUIT FOR AN OPEN IN THE HARNESS - INJ connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) INJ Connector, Harness Side</td></tr><tr><td>INJPWRM</td><td>VPWR</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) INJ Connector, Harness Side	INJPWRM	VPWR	Yes GO to B12. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) INJ Connector, Harness Side					
INJPWRM	VPWR					
B11	DTC P0689: CHECK THE ISP-R VOLTAGE AT THE PCM HARNESS CONNECTOR - Key in OFF position. - PCM connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>ISP-R</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) PCM Connector, Harness Side	(-)	ISP-R	Ground	Yes GO to B12. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
ISP-R	Ground					

Powertrain Control Module (PCM) Power Relay

B

Test Step		Results / Action to Take
B12	CHECK FOR CORRECT PCM OPERATION	
• Key in OFF position. • 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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

B12

Test C: Reference Voltage (VREF)

PINPOINT TEST C: REFERENCE VOLTAGE (VREF)

Reference Voltage (VREF)

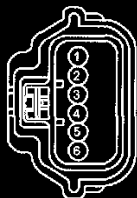
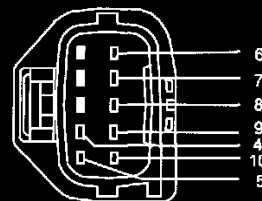
C

⚠ WARNING: Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.

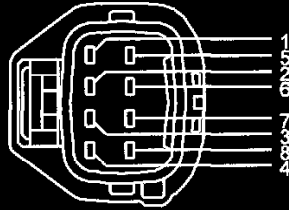
This pinpoint test is intended to diagnose the following:

- harness circuits: ETCREF, ETCRTN, SIGRTN and VREF
- accelerator pedal position (APP) sensor (9F836)
- air conditioning pressure (ACP) transducer sensor (19D594)
- differential pressure feedback exhaust gas recirculation (EGR) sensor (9J460)
- EGR system module (ESM) (9Y456)
- fuel rail pressure temperature (FRPT) sensor (9G756)
- fuel tank pressure (FTP) sensor (9C052)
- manifold absolute pressure (MAP) sensor (9F479)
- power steering pressure (PSP) sensor (3N824)
- throttle position (TP) sensor (9B989)
- powertrain control module (PCM) (12A650)

Accelerator Pedal Position (APP) Sensor Connector

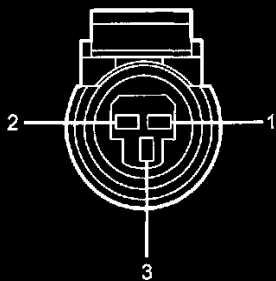
A**B**

N0025957

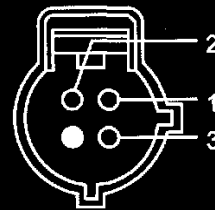
Reference Voltage (VREF)**C****C**

A0077570

Vehicle	Connector	Pin	Circuit
Focus	A	3, 4 1, 6	ETCRTN ETCREF
Fusion, Milan, MKZ	B	6, 9 10, 8	ETCRTN ETCREF
All other vehicles	C	1, 3 6, 7	ETCRTN ETCREF

Air Conditioning Pressure (ACP) Transducer Sensor Connector**A**

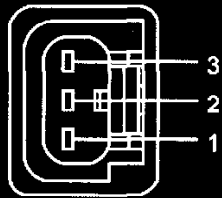
N0025673

B

A0077539

Reference Voltage (VREF)**C**

Vehicle	Connector	Pin	Circuit
Edge, Fusion, Milan, MKX, MKZ	A	1 2	SIGRTN VREF
All other vehicles	B	1 2	SIGRTN VREF

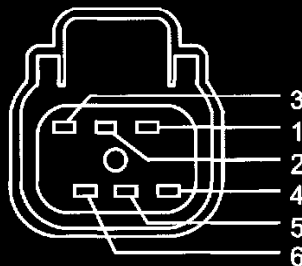
Differential Pressure Feedback EGR Sensor Connector**A**

A0077573

B

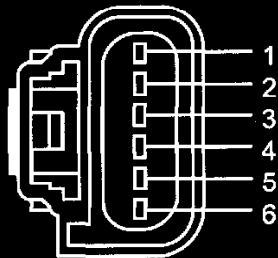
A0077575

Vehicle	Connector	Pin	Circuit
Vehicles equipped with a tube mounted differential pressure feedback EGR sensor	A	1 2	VREF SIGRTN
All other vehicles	B	3 2	VREF SIGRTN

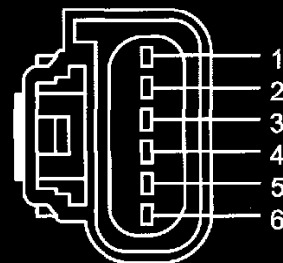
Reference Voltage (VREF)**C****EGR System Module (ESM) Connector**

A0077577

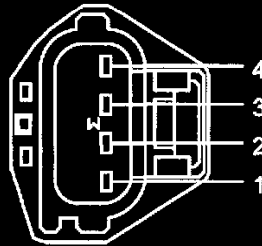
Pin	Circuit
6	SIGRTN (Signal Return)
2	VREF (Reference Voltage)

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

A0077520

B

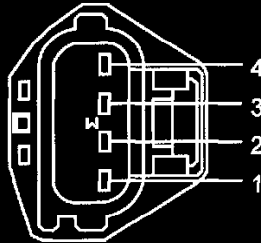
A0094772

Reference Voltage (VREF)**C****C**

A0077519

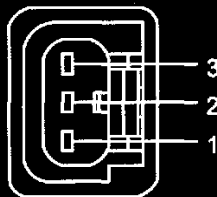
Vehicle	Connector	Pin	Circuit
E-Series 4.6L, Edge, F-150 4.2L, F-150 4.6L, Focus, MKX, MKZ, Sable, Taurus, Taurus X	A	2 3	ETCRTN ETCREF
Fusion 2.3L, Milan 2.3L	B	3 5	ETCRTN ETCREF
Fusion 3.0L, Milan 3.0L	B	4 5	ETCRTN ETCREF
All other vehicles	C	3 2	ETCRTN ETCREF

Electronic Throttle Body Throttle Position Sensor (ETBTPS) Connector

Reference Voltage (VREF)**C****Fuel Rail Pressure Temperature (FRPT) Sensor Connector**

A0077567

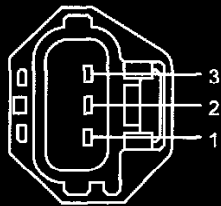
Pin	Circuit
2	VREF (Reference Voltage)
4	SIGRTN (Signal Return)

Fuel Tank Pressure (FTP) Sensor Connector

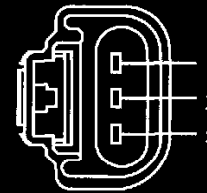
A0077573

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

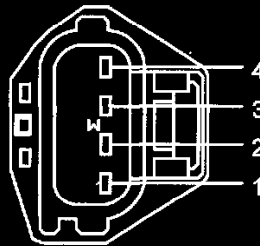
Fuel Rail Pressure Temperature (FRPT) Sensor Connector And Fuel Tank Pressure (FTP) Sensor Connector

Reference Voltage (VREF)**C****Manifold Absolute Pressure (MAP) Sensor Connector****A**

A0077537

B

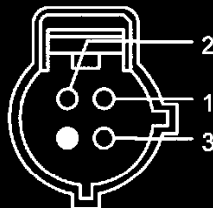
N0025955

C

A0077519

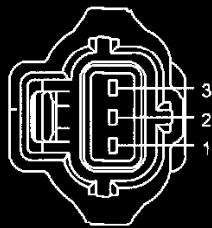
Vehicle	Connector	Pin	Circuit
Escape/Mariner 3.0L	A	3 1	SIGRTN VREF
Fusion 3.0L, Milan 3.0L	B	2 3	SIGRTN VREF
All other vehicles	C	4 2	SIGRTN VREF

Manifold Absolute Pressure (MAP) Sensor Connector

Reference Voltage (VREF)**C****Power Steering Pressure (PSP) Sensor Connector**

A0077539

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

Throttle Position (TP) Sensor Connector**A****B**

A0077554



A0077555

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

Power Steering Pressure (PSP) Sensor Connector And Throttle Position (TP) Sensor Connector

Reference Voltage (VREF)

C

Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
Crown Victoria, Grand Marquis, Mustang, Town Car	170 Pin	B35, B36 B41, E58, T41 B41, B6, E59 B40, E57 B24, B4, E66	VPWR SIGRTN ETCRTN VREF ETCREF
E-Series, F-Super Duty	170 Pin	B35, B36 B41, E58, T41 B18, B6, E59 B40, E57 B16, B4, E66	VPWR SIGRTN ETCRTN VREF ETCREF
Escape/Mariner	150 (50-50-50) Pin	B35, B36 B41, E41, T41 B40, E40	VPWR SIGRTN VREF
Expedition, Navigator	140 Pin	B51, B52, B53 B58, E58 B59, B65, E59 E57 B21, B28, E66	VPWR SIGRTN ETCRTN VREF ETCREF
Explorer, Explorer Sport Trac, Mountaineer	170 Pin	B35, B36 B41, E58, T41 B43, B6, E59 B40, E57 B24, B4, E66	VPWR SIGRTN ETCRTN VREF ETCREF
F-150, Mark LT	190 Pin	B51, B52, B53 B58, E58, T43 B58, B59, E59 B29, E57 B21, B28, E66	VPWR SIGRTN ETCRTN VREF ETCREF
Focus	190 Pin	B67, B68 B58, E64, T40 B44, B60, E60 B52, B66, E63 B45, B61, E59	VPWR SIGRTN ETCRTN VREF ETCREF
Fusion, Milan, MKZ	140 Pin	B51, B52 B58, E58 B59, B60, E59 B33, E57 B21, B28, E66	VPWR SIGRTN ETCRTN VREF ETCREF
Ranger	170 Pin	B35, B36 B41, E58, T41 B40, E57	VPWR SIGRTN VREF
All other vehicles	190 Pin	B51, B52, B53 B58, E58 B59, B65, E59 B29, B64 B21, B28, E66	VPWR SIGRTN ETCRTN VREF ETCREF

Powertrain Control Module (PCM) Connector

Reference Voltage (VREF)

C

SENSORS CONNECTED TO VREF/ETCREF

Applications	TP or ETC	APP	Differential Pressure Feedback EGR or ESM	FTP	ACP	PSPT	FRPT	MAP
Crown Victoria/Grand Marquis	ETC	X	X	X	X		X	
Edge/MKX	ETC	X		X	X			
Escape/Mariner - 2.3L	TP			X			X	X
Escape/Mariner - 3.0L	TP		X	X			X	X
E-Series - 4.6L/5.4L	ETC	X	X	X			X	
E-Series - 6.8L	ETC	X		X			X	
Expedition/Navigator	ETC	X		X				
Explorer/Explorer Sport Trac/Mountaineer	ETC	X	X	X			X	
F-150 - 4.2L	ETC	X	X	X			X	
F-150 - 4.6L	ETC	X	X	X		X	X	
F-150 - 5.4L/Mark LT	ETC	X		X		X	X	
F-Super Duty	ETC	X		X			X	
Focus	ETC	X		X		X		X
Fusion/Milan/MKZ	ETC	X		X	X			X
Mustang - 4.0L	ETC	X	X	X	X		X	
Mustang - 4.6L	ETC	X		X			X	
Mustang - 5.4L	ETC	X	X	X			X	
Ranger - 2.3L	TP			X				X
Ranger - 3.0L/4.0L	TP		X	X				
Taurus/Taurus X/Sable	ETC	X		X	X			
Town Car	ETC	X	X	X	X		X	

Note:

- 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 Electronic Engine Controls Cell for schematic and connector information.

Reference Voltage (VREF)**C**

Test Step		Results / Action to Take								
C1	CHECK THE REFERENCE VOLTAGE TO SIGRTN/ETCRTN Note: Diagnostic trouble codes (DTCs) P0642 and P0643 are set due to VREF circuit concerns only. When diagnosing DTC P0642 or P0643, follow the path for VREF concerns. • Key in OFF position. • Disconnect the suspect sensor. • Key ON, engine OFF. • 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 - 5.5 V?	(+) 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 - 5.5 V?	(+) 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 (VREF)**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 Electronic Engine Controls Cell to identify the sensors connected to VREF/ETCREF. • Key in OFF position. • Disconnect all of the sensors connected to the VREF/ETCREF circuit. • Key ON, engine OFF. • 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 - 5.5 V?	(+) 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. CLEAR the DTCs. REPEAT the self-test.
(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side									
ETCREF	ETCREF									
(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side									
VREF	VREF									

Reference Voltage (VREF)

C

Test Step		Results / Action to Take																
C5	CHECK THE REFERENCE VOLTAGE CIRCUIT FOR A SHORT TO GROUND - 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 10K 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. CLEAR the DTCs. REPEAT the self-test.
(+) 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. CLEAR the DTCs. REPEAT the self-test.								
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side																	
ETCREF	VPWR																	
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side																	
VREF	VPWR																	

Reference Voltage (VREF)

C

Test Step		Results / Action to Take								
C7	CHECK THE REFERENCE VOLTAGE FOR A SHORT TO VOLTAGE - Key ON, engine OFF. - 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 present?	(+) PCM Connector, Harness Side	(-)	ETCREF	Ground	(+) PCM Connector, Harness Side	(-)	VREF	Ground	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to C20.
(+) PCM Connector, Harness Side	(-)									
ETCREF	Ground									
(+) PCM Connector, Harness Side	(-)									
VREF	Ground									
C8	CHECK THE REFERENCE VOLTAGE WITH THE ELECTRONIC THROTTLE CONTROL CONNECTED Note: If this sensor was used for the ETCREF measurement in C3, GO to C9. - Key in OFF position. - Connect the electronic throttle body throttle position sensor (ETBTPS). - Key ON, engine OFF. - 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> - Is the voltage between 4.5 - 5.5 V?	(+) Suspect Sensor Connector, Harness Side	(-)	ETCREF	Ground	Yes The concern is intermittent. GO to Pinpoint Test Z. No INSTALL a new ETBTPS. CLEAR the DTCs. REPEAT the self-test.				
(+) Suspect Sensor Connector, Harness Side	(-)									
ETCREF	Ground									
C9	CHECK THE REFERENCE VOLTAGE WITH THE APP SENSOR CONNECTED - Key in OFF position. - Connect the APP sensor. - Key ON, engine OFF. - 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> - Is the voltage between 4.5 - 5.5 V?	(+) Suspect Sensor Connector, Harness Side	(-)	ETCREF	Ground	Yes The concern is intermittent. GO to Pinpoint Test Z. No INSTALL a new APP sensor. CLEAR the DTCs. REPEAT the self-test.				
(+) Suspect Sensor Connector, Harness Side	(-)									
ETCREF	Ground									

Reference Voltage (VREF)

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 ON, engine OFF. • 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 - 5.5 V?	(+) Suspect Sensor Connector, Harness Side	(-)	VREF	Ground	Yes For additional sensors disconnected, GO to C11. For no additional sensors disconnected, GO to Pinpoint Test Z. No INSTALL a new TP sensor. CLEAR the DTCs. REPEAT the self-test.
(+) Suspect Sensor Connector, Harness Side	(-)					
VREF	Ground					
C11	CHECK THE REFERENCE VOLTAGE WITH THE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR CONNECTED Note: If the vehicle is not equipped with a differential pressure feedback EGR sensor or if this sensor was used for the VREF measurement in C3, GO to C12. • Key in OFF position. • Differential Pressure Feedback EGR Sensor connector connected. • Key ON, engine OFF. • 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 - 5.5 V?	(+) Suspect Sensor Connector, Harness Side	(-)	VREF	Ground	Yes For additional sensors disconnected, GO to C12. For no additional sensors disconnected, GO to Pinpoint Test Z. No INSTALL a new Differential Pressure Feedback EGR sensor. CLEAR the DTCs. REPEAT the self-test.
(+) Suspect Sensor Connector, Harness Side	(-)					
VREF	Ground					
C12	CHECK THE REFERENCE VOLTAGE WITH THE ESM CONNECTED Note: If the 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 ON, engine OFF. • 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 - 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. CLEAR the DTCs. REPEAT the self-test.
(+) Suspect Sensor Connector, Harness Side	(-)					
VREF	Ground					

Reference Voltage (VREF)

C

Test Step		Results / Action to Take				
C13	CHECK THE REFERENCE VOLTAGE WITH THE MAP SENSOR CONNECTED Note: If the 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 ON, engine OFF. • 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 - 5.5 V?	(+) Suspect Sensor Connector, Harness Side	(-)	VREF	Ground	Yes For additional sensors disconnected, GO to C14. For no additional sensors disconnected, GO to Pinpoint Test Z. No INSTALL a new MAP sensor. CLEAR the DTCs. REPEAT the self-test.
(+) Suspect Sensor Connector, Harness Side	(-)					
VREF	Ground					
C14	CHECK THE REFERENCE VOLTAGE WITH THE FRPT SENSOR CONNECTED Note: If the vehicle is not equipped with a FRPT sensor or if this sensor was used for the VREF measurement in C3, GO to C15. • Key in OFF position. • Connect the FRPT sensor. • Key ON, engine OFF. • 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 - 5.5 V?	(+) Suspect Sensor Connector, Harness Side	(-)	VREF	Ground	Yes For additional sensors disconnected, GO to C15. For no additional sensors disconnected, GO to Pinpoint Test Z. No INSTALL a new FRPT sensor. CLEAR the DTCs. REPEAT the self-test.
(+) Suspect Sensor Connector, Harness Side	(-)					
VREF	Ground					
C15	CHECK THE REFERENCE VOLTAGE WITH THE FTP SENSOR CONNECTED Note: If the vehicle is not equipped with a FTP sensor or if this sensor was used for the VREF measurement in C3, GO to C16. • Key in OFF position. • Connect the FTP sensor. • Key ON, engine OFF. • 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 - 5.5 V?	(+) Suspect Sensor Connector, Harness Side	(-)	VREF	Ground	Yes For additional sensors disconnected, GO to C16. For no additional sensors disconnected, GO to Pinpoint Test Z. No INSTALL a new FTP sensor. CLEAR the DTCs. REPEAT the self-test.
(+) Suspect Sensor Connector, Harness Side	(-)					
VREF	Ground					

Reference Voltage (VREF)**C**

Test Step		Results / Action to Take				
C16	CHECK THE REFERENCE VOLTAGE WITH THE ACP TRANSDUCER SENSOR CONNECTED					
Note: If the vehicle is not equipped with an ACP transducer sensor or if this sensor was used for the VREF measurement in C3, GO to C17. • Key in OFF position. • Connect the ACP transducer sensor. • Key ON, engine OFF. • 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 - 5.5 V?		(+) Suspect Sensor Connector, Harness Side	(-)	VREF	Ground	Yes For additional sensors disconnected, GO to C17. For no additional sensors disconnected, GO to Pinpoint Test Z. No INSTALL a new Air Conditioning Pressure (ACP) Transducer Sensor. CLEAR the DTCs. REPEAT the self-test.
(+) 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 ON, engine OFF. • 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 - 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. CLEAR the DTCs. REPEAT the self-test.
(+) Suspect Sensor Connector, Harness Side	(-)					
VREF	Ground					

Reference Voltage (VREF)

C

Test Step		Results / Action to Take								
C18	CHECK THE SIGRTN OR ETCRTN CIRCUIT(S) FOR AN OPEN Note: Refer to Vehicle/Diagrams Electronic Engine Controls Cell for specific vehicle applicator 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	Yes GO to C20. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side									
ETCRTN	ETCRTN									
(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side									
SIGRTN	SIGRTN									
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 ON, engine OFF. • Carry out the PCM self-test. • Is the concern still present?	Yes INSTALL a new sensor for the sensor in question. CLEAR the DTCs. REPEAT the self-test. 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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.								

C18-C20

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

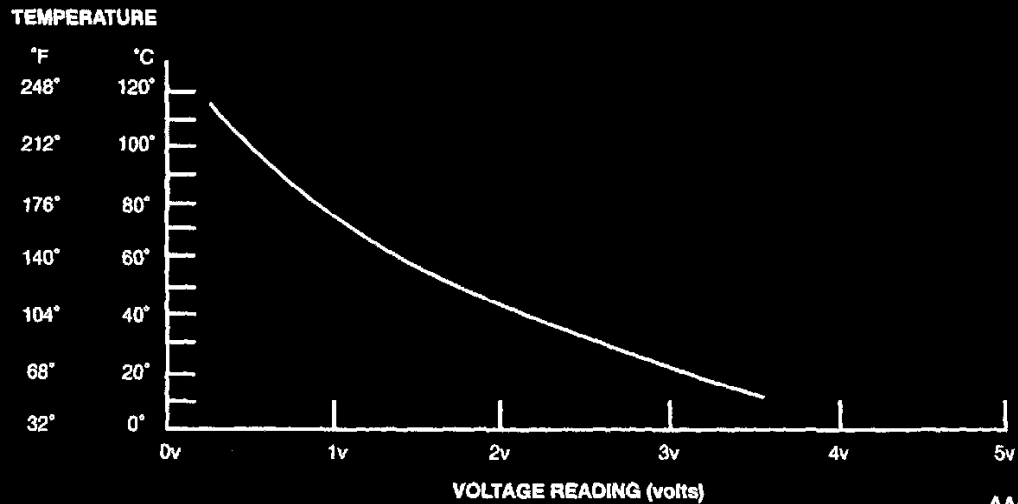
Intake Air Temperature (IAT) Sensor

DA

This pinpoint test is intended to diagnose the following:

- integrated mass air flow/intake air temperature (MAF/IAT) sensor (12B579)
- harness circuits: IAT and SIGRTN
- powertrain control module (PCM) (12A650)

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



AA4397-A

TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS

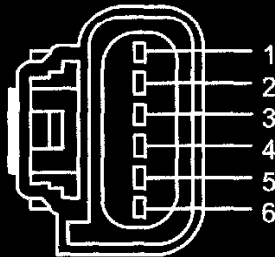
Temperature		Temperature Sensor Values	
°C	°F	Voltage	Resistance (K ohms)
120	248	0.28	1.18
110	230	0.36	1.55
100	212	0.47	2.07
90	194	0.61	2.80
80	176	0.80	3.84
70	158	1.05	5.37
60	140	1.37	7.70
50	122	1.77	10.97
40	104	2.23	16.15
30	86	2.74	24.27
20	68	3.26	37.30

(Continued)

Description, Graph And Temperature Sensor Voltage And Resistance Specifications

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

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

A0077520

Pin	Circuit
4	MAF RTN (Mass Air Flow Return)
2	SIGRTN (Signal Return)
1	IAT (Intake Air Temperature)

Powertrain Control Module (PCM) Connector

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

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

Vehicle	Connector	Pin	Circuit
Crown Victoria, Grand Marquis, Town Car	170 Pin	T41 E22	SIGRTN IAT
Edge, MKX, Sable, Taurus, Taurus X	190 Pin	B58 B43	SIGRTN IAT
Escape/Mariner 3.0L	150 (50-50-50) Pin	B41 B20	SIGRTN IAT
Escape/Mariner 2.3L	150 (50-50-50) Pin	B41 B39	SIGRTN IAT
Expedition, Fusion, Milan, MKZ, Navigator	140 Pin	B58 B43	SIGRTN IAT
F-150, Mark LT	190 Pin	E58 E22	SIGRTN IAT
Focus	190 Pin	B58 B47	SIGRTN IAT
All other vehicles	170 Pin	E58 E22	SIGRTN IAT

Test Step		Results / Action to Take
DA1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCS)	Yes For DTC P0111, GO to DA12 . For KOEO and KOER DTC P0112, GO to DA6 . For KOEO and KOER DTC P0113, GO to DA2 . For continuous memory DTCs P0112, P0113 or P1112, GO to DA9 . For DTC P0114, GO to DA9 . No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
	Are DTCS P0111, P0112, P0113, P0114, or P1112 present?	

DA1

Intake Air Temperature (IAT) Sensor

DA

Test Step		Results / Action to Take						
DA2	DTC P0113: CHECK THE IAT SIGNAL CIRCUIT Note: The DTC indicates the sensor signal is greater than the self-test maximum. - MAF/IAT Sensor connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) MAF/IAT Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>IAT - Pin 1</td><td>Ground</td></tr></table> - Is the voltage between 4.5 - 5.5 V?	(+) MAF/IAT Sensor Connector, Harness Side	(-)	IAT - Pin 1	Ground	Yes GO to DA3. No GO to DA4.		
(+) MAF/IAT Sensor Connector, Harness Side	(-)							
IAT - Pin 1	Ground							
DA3	CHECK THE IAT SENSOR RESISTANCE - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) MAF/IAT Sensor Connector, Component Side</td><td>(-) MAF/IAT Sensor Connector, Component Side</td></tr><tr><td>IAT - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> - Is the resistance between 1K - 500K ohms?	(+) MAF/IAT Sensor Connector, Component Side	(-) MAF/IAT Sensor Connector, Component Side	IAT - Pin 1	SIGRTN - Pin 2	Yes GO to DA4. No INSTALL a new MAF/IAT sensor. CLEAR the DTCs. REPEAT the self-test.		
(+) MAF/IAT Sensor Connector, Component Side	(-) MAF/IAT Sensor Connector, Component Side							
IAT - Pin 1	SIGRTN - Pin 2							
DA4	CHECK THE SIGNAL AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) MAF/IAT Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>IAT - Pin 1</td><td>IAT</td></tr><tr><td>SIGRTN - Pin 2</td><td>SIGRTN</td></tr></table> - Are the resistances less than 5 ohms?	(+) MAF/IAT Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	IAT - Pin 1	IAT	SIGRTN - Pin 2	SIGRTN	Yes GO to DA5. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) MAF/IAT Sensor Connector, Harness Side	(-) PCM Connector, Harness Side							
IAT - Pin 1	IAT							
SIGRTN - Pin 2	SIGRTN							
DA5	CHECK THE SIGNAL FOR A SHORT TO VOLTAGE IN HARNESS - Key in OFF position. - PCM connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) MAF/IAT Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>IAT - Pin 1</td><td>Ground</td></tr></table> - Is the voltage greater than 1 V?	(+) MAF/IAT Sensor Connector, Harness Side	(-)	IAT - Pin 1	Ground	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to DA14.		
(+) MAF/IAT Sensor Connector, Harness Side	(-)							
IAT - Pin 1	Ground							

Intake Air Temperature (IAT) Sensor

DA

Test Step		Results / Action to Take								
DA6	DTC P0112: SIMULATE AN OPPOSITE SIGNAL TO THE PCM Note: The DTC indicates the sensor signal is less than the self-test minimum. • MAF/IAT Sensor connector disconnected. • Key ON, engine OFF. • Access the PCM and monitor the IAT PID. • Is the voltage greater than 4.2 V?	Yes INSTALL a new MAF/IAT sensor. CLEAR the DTCs. REPEAT the self-test. No GO to DA7 .								
DA7	CHECK THE IAT CIRCUIT FOR A SHORT TO MAF RTN • Key in OFF position. • PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) MAF/IAT Sensor Connector, Harness Side</td><td>(-) MAF/IAT Sensor Connector, Harness Side</td></tr><tr><td>IAT - Pin 1</td><td>MAF RTN - Pin 4</td></tr></table> • Is the resistance less than 5 ohms?	(+) MAF/IAT Sensor Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side	IAT - Pin 1	MAF RTN - Pin 4	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to DA8 .				
(+) MAF/IAT Sensor Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side									
IAT - Pin 1	MAF RTN - Pin 4									
DA8	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 Battery</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 Battery	IAT	Negative terminal	Yes GO to DA14 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
IAT	SIGRTN									
(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery									
IAT	Negative terminal									

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

Test Step		Results / Action to Take
DA9	SELF-TEST DTCS P0112, P0113, P0114 OR P1112: INTERMITTENT CHECK	
	• Key ON, engine OFF. • Access the PCM and monitor the IAT 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 MAF/IAT sensor. CLEAR the DTCs. REPEAT the self-test. No GO to DA10.
DA10	CHECK THE ELECTRONIC ENGINE CONTROL (EEC) WIRING HARNESS	
	• Access the PCM and monitor the IAT PID. • While observing the PID, 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 concern. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DA11.
DA11	CHECK THE PCM AND VEHICLE HARNESS CONNECTORS	
	• Key in OFF position. • PCM connector disconnected. • MAF/IAT Sensor connector disconnected. • Are the connectors and terminals OK?	Yes The concern is not present at this time. DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.

Intake Air Temperature (IAT) Sensor

DA

Test Step		Results / Action to Take				
DA12	DTC P0111: CHECK THE RESISTANCE OF THE IAT SENSOR WITH THE ENGINE OFF Note: Verify the engine temperature is at ambient temperature before continuing with this test. • Key in OFF position. • IAT Sensor connector disconnected. • Measure the resistance between: <table><tr><td>(+) IAT Sensor Connector, Component Side</td><td>(-) IAT Sensor Connector, Component Side</td></tr><tr><td>IAT</td><td>SIGRTN</td></tr></table> • Refer to the chart at the beginning of this test for the resistance specifications. • Is the resistance within specification?	(+) IAT Sensor Connector, Component Side	(-) IAT Sensor Connector, Component Side	IAT	SIGRTN	Yes GO to DA13 . No INSTALL a new IAT sensor. CLEAR the DTCs. REPEAT the self-test.
(+) IAT Sensor Connector, Component Side	(-) IAT Sensor Connector, Component Side					
IAT	SIGRTN					
DA13	DTC P0111: CHECK THE RESISTANCE OF THE IAT SENSOR Note: Verify the engine is at operating temperature before taking the IAT reading. • IAT Sensor connector connected. • Run the engine until the engine temperature stabilizes. • Key in OFF position. • IAT Sensor connector disconnected. • Measure the resistance between: <table><tr><td>(+) IAT Sensor Connector, Component Side</td><td>(-) IAT Sensor Connector, Component Side</td></tr><tr><td>IAT</td><td>SIGRTN</td></tr></table> • Refer to the chart at the beginning of this test for the resistance specifications. • Is the resistance within specification?	(+) IAT Sensor Connector, Component Side	(-) IAT Sensor Connector, Component Side	IAT	SIGRTN	Yes The concern 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 REPEAT the PCM self-test if necessary. No INSTALL a new IAT sensor. CLEAR the DTCs. REPEAT the self-test.
(+) IAT Sensor Connector, Component Side	(-) IAT Sensor Connector, Component Side					
IAT	SIGRTN					
DA14	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.				

DA12-DA14

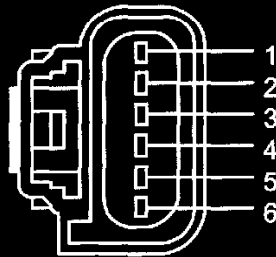
Test DC: Mass Air Flow (MAF) Sensor

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 (MAF) 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

A0077520

Pin	Circuit
1	IAT (Intake Air Temperature)
2	SIGRTN (Signal Return)
4	MAF RTN (Mass Air Flow Return)
3	MAF (Mass Air Flow)
5	PWRGND (Power Ground)
6	VPWR (Vehicle Power)

Powertrain Control Module (PCM) Connector

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

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

Vehicle	Connector	Pin	Circuit
Edge, MKX, Sable, Taurus, Taurus X	190 Pin	B41 B42	MAF MAF RTN
Escape/Mariner	150 (50-50-50) Pin	B32 B43	MAF MAF RTN
Expedition, Fusion, Milan, MKZ, Navigator	140 Pin	B41 B42	MAF MAF RTN
F-150, Mark LT	190 Pin	E25 E26	MAF MAF RTN
Focus	190 Pin	B40 B41	MAF MAF RTN
All other vehicles	170 Pin	E25 E26	MAF MAF RTN

Test Step		Results / Action to Take
DC1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	
	Are DTCs P0102, P0103, P0104, P1100, or P1101 present?	Yes For KOER and continuous memory DTC P0102, P0104, GO to DC5. For DTC P0103, GO to DC21. For KOEO DTC P1101, GO to DC7. For KOER and continuous memory DTC P1101, GO to DC2. For continuous memory DTC P1100, GO to DC19. No For all other symptoms without DTCs, GO to DC27.
DC2	DTC P1101: CHECK FOR MAF SENSOR CONTINUOUS MEMORY DTCs	
	- Retrieve continuous memory DTCs. - Is a continuous memory MAF DTC present with the KOER DTC P1101?	Yes GO to DC3. No GO to DC5.
DC3	VERIFY CONTINUOUS MEMORY DTC P0102	
	Is a continuous memory DTC P0102 present with the KOER DTC P1101?	Yes GO to DC5. No GO to DC4.

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

Test Step		Results / Action to Take
DC4	VERIFY CONTINUOUS MEMORY DTC P0103 Is a continuous memory DTC P0103 present with the KOER DTC P1101?	Yes GO to DC21 . No All other continuous memory DTCs: DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
DC5	KOER AND CONTINUOUS MEMORY DTCS P0102, P0104 OR P1101: CHECK THE INTAKE AIR SYSTEM FOR LEAKS, OBSTRUCTIONS, AND DAMAGE - Key in OFF position. - 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. Check the throttle body bore for sludge. Verify the MAF sensor is connected. Repair as necessary. - Are there any concerns found during the visual inspection?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DC6 .
DC6	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 PID. - Is the voltage less than 0.23 V?	Yes GO to DC9 . No GO to DC7 .
DC7	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. Repeat the KOEO self-test. - Key in OFF position. - MAF/IAT Sensor connector connected. - Key ON, engine OFF. - Access the PCM and monitor the MAF PID. - Is the voltage less than 0.2 V?	Yes GO to DC8 . No GO to DC9 .

Mass Air Flow (MAF) Sensor

DC

Test Step		Results / Action to Take										
DC8	CHECK THE MAF SIGNAL SENT TO THE PCM • Key ON, engine running. • Access the PCM and monitor the MAF PID. • Is the voltage between 0.46 - 2.44 V?	Yes Unable to identify the concern at this time. GO to Pinpoint Test Z. No GO to DC9 .										
DC9	CHECK THE VPWR TO THE MAF SENSOR • Key in OFF position. • MAF/IAT Sensor connector disconnected. • Key ON, engine OFF. • Measure the voltage between:<table><tr><td>(+) MAF/IAT Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VPWR - Pin 6</td><td>Negative terminal</td></tr></table> • Is the voltage greater than 10 V?	(+) MAF/IAT Sensor Connector, Harness Side	(-) Vehicle Battery	VPWR - Pin 6	Negative terminal	Yes GO to DC10 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.						
(+) MAF/IAT Sensor Connector, Harness Side	(-) Vehicle Battery											
VPWR - Pin 6	Negative terminal											
DC10	CHECK THE PWRGND CIRCUIT TO THE 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 - Pin 5</td></tr></table> • Is the voltage greater than 10 V?	(+) Vehicle Battery	(-) MAF/IAT Sensor Connector, Harness Side	Positive terminal	PWRGND - Pin 5	Yes GO to DC11 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.						
(+) Vehicle Battery	(-) MAF/IAT Sensor Connector, Harness Side											
Positive terminal	PWRGND - Pin 5											
DC11	CHECK FOR SHORTS BETWEEN THE CIRCUITS IN THE MAF HARNESS • Key in OFF position. • MAF/IAT Sensor connector disconnected. • PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) MAF/IAT Sensor Connector, Harness Side</td><td>(-) MAF/IAT Sensor Connector, Harness Side</td></tr><tr><td>MAF - Pin 3</td><td>PWRGND - Pin 5</td></tr><tr><td>MAF - Pin 3</td><td>MAF RTN - Pin 4</td></tr><tr><td>MAF - Pin 3</td><td>SIGRTN - Pin 2</td></tr><tr><td>MAF - Pin 3</td><td>IAT - Pin 1</td></tr></table> • Are the resistances greater than 10K ohms?	(+) MAF/IAT Sensor Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side	MAF - Pin 3	PWRGND - Pin 5	MAF - Pin 3	MAF RTN - Pin 4	MAF - Pin 3	SIGRTN - Pin 2	MAF - Pin 3	IAT - Pin 1	Yes GO to DC12 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) MAF/IAT Sensor Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side											
MAF - Pin 3	PWRGND - Pin 5											
MAF - Pin 3	MAF RTN - Pin 4											
MAF - Pin 3	SIGRTN - Pin 2											
MAF - Pin 3	IAT - Pin 1											

Mass Air Flow (MAF) Sensor

DC

Test Step		Results / Action to Take						
DC12	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 - Pin 4</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side	MAF RTN	MAF RTN - Pin 4	Yes GO to DC13. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) PCM Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side							
MAF RTN	MAF RTN - Pin 4							
DC13	CHECK THE MAF RTN CIRCUIT FOR A SHORT TO PWRGND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) MAF/IAT Sensor Connector, Harness Side</td><td>(-) MAF/IAT Sensor Connector, Harness Side</td></tr><tr><td>MAF RTN - Pin 4</td><td>PWRGND - Pin 5</td></tr></table> - Is the resistance greater than 10K ohms?	(+) MAF/IAT Sensor Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side	MAF RTN - Pin 4	PWRGND - Pin 5	Yes GO to DC14. No REPAIR the short circuit to GND. CLEAR the DTCs. REPEAT the self-test.		
(+) MAF/IAT Sensor Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side							
MAF RTN - Pin 4	PWRGND - Pin 5							
DC14	CHECK THE MAF CIRCUIT FOR A SHORT TO PWRGND IN THE PCM - PCM connector connected. - Measure the resistance between:<table><tr><td>(+) MAF/IAT Sensor Connector, Harness Side</td><td>(-) MAF/IAT Sensor Connector, Harness Side</td></tr><tr><td>MAF - Pin 3</td><td>PWRGND - Pin 5</td></tr></table> - Is the resistance greater than 10K ohms?	(+) MAF/IAT Sensor Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side	MAF - Pin 3	PWRGND - Pin 5	Yes GO to DC15. No GO to DC31.		
(+) MAF/IAT Sensor Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side							
MAF - Pin 3	PWRGND - Pin 5							
DC15	CHECK THE MAF CIRCUIT VOLTAGE CYCLING INTEGRITY - Key ON, engine OFF. - Access the PCM and monitor the MAF PID. - Connect a 5 amp fused jumper wire between the following:<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 - Pin 4</td><td>PWRGND - Pin 5</td></tr><tr><td>MAF - Pin 3</td><td>VPWR - Pin 6</td></tr></table> - Record the PID reading while both jumpers are installed. - Remove the VPWR jumper while observing the MAF PID. - Does the MAF 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 - Pin 4	PWRGND - Pin 5	MAF - Pin 3	VPWR - Pin 6	Yes 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 DC16.
Point A MAF/IAT Sensor Connector, Harness Side	Point B MAF/IAT Sensor Connector, Harness Side							
MAF RTN - Pin 4	PWRGND - Pin 5							
MAF - Pin 3	VPWR - Pin 6							

Mass Air Flow (MAF) Sensor

DC

Test Step		Results / Action to Take				
DC16	CHECK THE MAF CIRCUIT FOR AN OPEN 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>(-) MAF/IAT Sensor Connector, Harness Side</td></tr><tr><td>MAF</td><td>MAF - Pin 3</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side	MAF	MAF - Pin 3	Yes GO to DC17 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side					
MAF	MAF - Pin 3					
DC17	CHECK THE PWRGND CIRCUIT FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) MAF/IAT Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>PWRGND - Pin 5</td><td>Negative terminal</td></tr></table> - Is the resistance less than 5 ohms?	(+) MAF/IAT Sensor Connector, Harness Side	(-) Vehicle Battery	PWRGND - Pin 5	Negative terminal	Yes GO to DC18 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) MAF/IAT Sensor Connector, Harness Side	(-) Vehicle Battery					
PWRGND - Pin 5	Negative terminal					
DC18	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 - Pin 4</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side	MAF RTN	MAF RTN - Pin 4	Yes GO to DC31 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) MAF/IAT Sensor Connector, Harness Side					
MAF RTN	MAF RTN - Pin 4					

Mass Air Flow (MAF) Sensor

DC

Test Step		Results / Action to Take
DC19	DTC P1100: CHECK THE MAF CIRCUIT FOR INTERMITTENT VOLTAGE TO THE PCM	Yes INSPECT the MAF/IAT sensor connector. 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 DC20.
	- 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 PID. - If idle is not stable, refer to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index. - 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 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?	
DC20	CHECK THE MAF CIRCUIT FOR AN INTERMITTENT OPEN OR SHORTS	Yes REPAIR as necessary. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No Unable to duplicate or identify the concern at this time. CLEAR the DTCs. REPEAT the self-test.
	- Key ON, engine running. - Access the PCM and monitor the MAF 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?	
DC21	DTC P0103: CHECK THE MAF SENSOR SCREEN FOR CONTAMINATION	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DC22.
	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. Are any concerns present?	
DC22	DTC P0103: CHECK THE MAF SENSOR SIGNAL HIGH INPUT TO THE PCM	Yes GO to DC23. No GO to DC25.
	- Key ON, engine OFF. - Access the PCM and monitor the MAF PID. Is the voltage greater than 2.44 V?	

Mass Air Flow (MAF) Sensor

DC

Test Step		Results / Action to Take				
DC23	CHECK THE MAF SENSOR SIGNAL SENT TO THE PCM - Key in OFF position. - MAF/IAT Sensor connector disconnected. - Connect a 5 amp fused jumper wire between the following:<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 - Pin 4</td><td>PWRGND - Pin 5</td></tr></table> - Key ON, engine OFF. - Access the PCM and monitor the MAF 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 - Pin 4	PWRGND - Pin 5	Yes CHECK the MAF/IAT sensor electrical connector for damage, corrosion, and water ingress. 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 DC24 .
Point A MAF/IAT Sensor Connector, Harness Side	Point B MAF/IAT Sensor Connector, Harness Side					
MAF RTN - Pin 4	PWRGND - Pin 5					
DC24	CHECK THE MAF CIRCUIT FOR A SHORT TO VOLTAGE - Key in OFF position. - PCM connector disconnected. - Key ON, engine OFF. - 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	Ground	Yes GO to DC26 . No REPAIR the short circuit to PWR. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
MAF	Ground					
DC25	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 PID. Is the voltage between 0.23 - 4.6 V?	Yes This is an intermittent concern. GO to Pinpoint Test Z. No GO to DC23 .				
DC26	VERIFY THE IDLE CONCERN - PCM connector connected. - MAF/IAT Sensor connector connected. - Key ON, engine running. Is an idle concern present?	Yes DISREGARD DTC P0103 at this time. The concern is elsewhere. RETURN to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index to diagnose unique idle concerns. No GO to DC31 .				

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

Test Step		Results / Action to Take
DC27	SYMPTOMS WITHOUT DTCS: CHECK THE CONDITIONS RELATED TO THE MAF SENSOR	Yes REPAIR as necessary. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). No GO to DC28 .
	• 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. • Is a concern present?	
DC28	DTCS P0171, P0172, P0174, P0175, P2195, P2196, P2197 OR P2198: CHECK THE FUNCTIONALITY OF THE MAF SENSOR	Yes GO to DC30 . No GO to DC29 .
	Note: A MAF PID value of less than 0.6 volt may indicate an incorrectly installed air cleaner or a leak in the air inlet system. • Key ON, engine running. • Allow the engine to stabilize at the correct operating temperature. • Access the PCM and monitor the MAF PID. • Check that the MAF PID at idle and NEUTRAL is not greater than 30% of the normal MAF listed in Reference Values or not greater than 1.3 volts. • Is the PID value within the expected range?	
DC29	CHECK TO ISOLATE THE MAF SENSOR FROM A LEAN DRIVEABILITY OCCURRENCE	Yes 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 DC30 .
	Note: 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 MAF PID indicates a MAF sensor concern, install a new MAF sensor. Refer to Computers and Control Systems, Electronic Engine Controls. • Key in OFF position. • 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?	

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

Test Step		Results / Action to Take
DC30	VERIFY THE DTC • Are any of the following DTCs present: P0171, P0172, P0174, P0175, P2195, P2196, P2197, or P2198?	Yes Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z. No The concern is elsewhere. RETURN to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index to diagnose performance while driving concerns.
DC31	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

DC30-DC31

Test DD: Fuel Rail Pressure Temperature (FRPT) Sensor
PINPOINT TEST DD: FUEL RAIL PRESSURE TEMPERATURE (FRPT) SENSOR

Fuel Rail Pressure Temperature (FRPT) Sensor

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. Failure to follow these instructions may result in personal injury.

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

This pinpoint test is intended to diagnose the following:

- fuel rail pressure temperature (FRPT) sensor (9G756)
- harness circuits: FRP and FRT
- powertrain control module (PCM) (12A650)

Tables and Graphs

FRPT 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

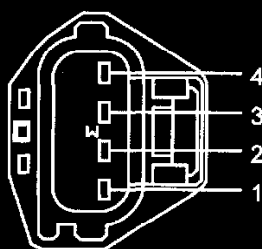
FRPT SENSOR TEMPERATURE, VOLTAGE, AND RESISTANCE SPECIFICATIONS

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

(Continued)

**Fuel Rail Pressure Temperature (FRPT)
Sensor****DD****FRPT SENSOR TEMPERATURE, VOLTAGE, AND RESISTANCE SPECIFICATIONS**

Temperature		Sensor	
°C	°F	Volts	K Ohms
70	158	1.06	5.351
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 Temperature (FRPT) Sensor
Connector**

A0077567

Fuel Rail Pressure Temperature (FRPT) Sensor

DD

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

Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
Escape/Mariner	150 (50-50-50) Pin	E40 E28 E41 E37	VREF FRT SIGRTN FRP
F-150, Mark LT	190 Pin	E57 E19 E58 E32	VREF FRT SIGRTN FRP
All other vehicles	170 Pin	E57 E19 E58 E32	VREF FRT SIGRTN FRP

Test Step		Results / Action to Take
DD1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTC)	
	Are DTCs P0180, P0181, P0182, P0183, P0190, P0191, P0192 or P0193 present?	Yes For DTC P0180, GO to DD24. For DTC P0181, GO to DD26. For continuous memory DTCs P0182 or P0183, GO to DD2. For KOEO and KOER DTCs P0182 or P0183, GO to DD17. For continuous memory DTC P0190, GO to DD3. For DTC P0191, GO to DD11. For KOEO and KOER DTCs P0192 or P0193, GO to DD16. No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.

Fuel Rail Pressure Temperature (FRPT) Sensor

DD

Test Step		Results / Action to Take			
DD2	CHECK THE FRPT AND PCM CONNECTORS FOR DAMAGE	Yes ISOLATE the concern and REPAIR as necessary. No DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.			
	• Key ON, engine OFF. • Access the PCM and monitor the FRT 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 and PCM connectors for damage and corrosion. • Is a concern present?				
DD3	CONTINUOUS MEMORY DTC P0190, KOEO AND KOER DTCS P0192 AND P0193: CHECK THE 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. REFER to Computers and Control Systems, Electronic Engine Controls . CLEAR the DTCs. REPEAT the self-test. No GO to DD4 .			
	Note: Repair any fuel pump DTCs prior to this test. • Key ON, engine running. • Idle the engine for 2 minutes. • Inspect the FRPT vacuum hose between the intake manifold and the FRPT 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 any fuel present?				
DD4	CHECK THE VREF AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS	Yes For DTC P0190, GO to DD12 . For DTC P0192, GO to DD5 . For DTC P0193, GO to DD7 . No GO to Pinpoint Test C.			
	• Connect the vacuum hose to the FRPT. • FRPT Sensor connector disconnected. • Key ON, engine OFF. • Measure the voltage between:<table border="1"><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 - 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 Temperature (FRPT) Sensor

DD

Test Step		Results / Action to Take										
DD5	INDUCE A HIGH VOLTAGE ON THE FRPT CIRCUIT • Key in OFF position. • 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 ON, engine OFF. • Access the PCM and monitor the FRP 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. REFER to Computers and Control Systems, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test. No GO to DD6 .						
Point A FRPT Sensor Connector, Harness Side	Point B FRPT Sensor Connector, Harness Side											
VREF - Pin 2	FRP - Pin 1											
DD6	CHECK THE FRP CIRCUIT FOR A SHORT TO FRT, SIGRTN, AND 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><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 GO to DD28 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side											
FRP	SIGRTN											
FRP	FRT											
(+) PCM Connector, Harness Side	(-)											
FRP	Ground											
DD7	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 DD8 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.						
(+) PCM Connector, Harness Side	(-) FRPT Sensor Connector, Harness Side											
FRP	FRP - Pin 1											

Fuel Rail Pressure Temperature (FRPT) Sensor

DD

Test Step		Results / Action to Take						
DD8	CHECK THE FRP CIRCUIT FOR A SHORT TO VREF AND FRT IN THE 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 DD9. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
FRP	VREF							
FRP	FRT							
DD9	CHECK THE FRP CIRCUIT FOR A SHORT TO VOLTAGE - Key ON, engine OFF. - 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. CLEAR the DTCs. REPEAT the self-test. No GO to DD10.		
(+) FRPT Sensor Connector, Harness Side	(-)							
FRP - Pin 1	Ground							
DD10	INDUCE A LOW VOLTAGE ON THE FRPT CIRCUIT - Key in OFF position. - PCM connector connected. - 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 ON, engine OFF. - Access the PCM and monitor the FRP 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. REFER to Computers and Control Systems, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test. No GO to DD28.		
Point A FRPT Sensor Connector, Harness Side	Point B FRPT Sensor Connector, Harness Side							
FRP - Pin 1	SIGRTN - Pin 4							
DD11	DTC P0191: CHECK FOR FUEL PUMP DTCS - Check for self-test DTCs. - Are DTCs P1233, P1234, P1235, P1236, P1237 or P1238 present?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to DD12.						

Fuel Rail Pressure Temperature (FRPT) Sensor

DD

Test Step		Results / Action to Take
DD12	INSPECT ALL THE VACUUM HOSES CONNECTED TO THE INTAKE MANIFOLD FOR LEAKS	
	• 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 concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DD13.
DD13	CHECK THE FRPT CONNECTOR FOR DAMAGE OR CORROSION	
	• Key in OFF position. • FRPT Sensor connector disconnected. • Inspect the sensor, wiring, and connector for damage, corrosion, or water intrusion. • Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DD14.
DD14	CHECK THE FRP PID	
	Note: The fuel pressure is likely to increase after the fuel pressure is relieved with the system closed. The rate and amount of the fuel pressure increase is dependent upon the ambient air and fuel temperatures. Note: Prepare to record the FRP PID value within 5 seconds after the engine is shut off and also after the fuel pressure is relieved. • FRPT Sensor connector connected. • Key ON, engine running. • Allow the engine idle to stabilize. • Access the PCM and monitor the FRP PID. • Key in OFF position. • Key ON, engine OFF. • Record the FRP PID value within 5 seconds of the key off. • Relieve the fuel pressure. Refer to Fuel Delivery and Air Induction, Fuel System for the Fuel System Pressure Release procedure. • Disable the fuel pump. • Key ON, engine OFF. • Record the FRP PID value within 5 seconds of carrying out the fuel system pressure release procedure. • Is the difference between the recorded FRP PID values greater than 34 kPa (5 psi)?	Yes GO to Pinpoint Test HC. No GO to DD15.

Fuel Rail Pressure Temperature (FRPT) Sensor

DD

Test Step		Results / Action to Take
DD15	COMPARE THE FRP PID TO THE MECHANICAL GAUGE	
	Note: Most mechanical gauges are referenced to atmospheric pressure. The FRPT sensor is referenced to manifold pressure. In order to make a valid comparison, the engine must be off. Note: The vehicle may exhibit a long crank until the fuel system is pressurized. • Key in OFF position. • Connect a mechanical fuel pressure gauge. • Key ON, engine OFF. • Monitor the mechanical gauge. • Access the PCM and monitor the FRP PID. • Compare the FRP PID value to the mechanical gauge. • Key in OFF position. • Pressurize the fuel system. Refer to Fuel Delivery and Air Induction, Fuel System for the Fuel System Pressure Release procedure to pressurize the fuel system. • Key ON, engine running. • Allow the fuel pressure to stabilize. • Key in OFF position. • Key ON, engine OFF. • Compare the FRP PID value to the mechanical gauge. • Are the FRP PID values within 34 kPa (5 psi) of the mechanical gauge readings?	Yes GO to DD28. 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. REFER to Computers and Control Systems, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test.
DD16	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 ON, engine OFF. • Access the PCM and monitor the FRP 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 concern present?	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to Pinpoint Test Z.

Fuel Rail Pressure Temperature (FRPT) Sensor

DD

Test Step		Results / Action to Take										
DD17	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><td>(+) FRPT Sensor Connector, Component Side</td><td>(-) FRPT Sensor Connector, Component Side</td></tr><tr><td>FRT - Pin 3</td><td>SIGRTN - Pin 4</td></tr></table> - Is the resistance between 2K - 96K ohms?	(+) FRPT Sensor Connector, Component Side	(-) FRPT Sensor Connector, Component Side	FRT - Pin 3	SIGRTN - Pin 4	Yes GO to DD18 . 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. REFER to Computers and Control Systems, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test.						
(+) FRPT Sensor Connector, Component Side	(-) FRPT Sensor Connector, Component Side											
FRT - Pin 3	SIGRTN - Pin 4											
DD18	CHECK THE FRPT FOR INTERNAL SHORTS - Measure the resistance between:<table><tr><td>(+) FRPT Sensor Connector, Component Side</td><td>(-)</td></tr><tr><td>FRT - Pin 3</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?	(+) FRPT Sensor Connector, Component Side	(-)	FRT - Pin 3	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 DD19 . For DTC P0183, GO to DD21 . 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. REFER to Computers and Control Systems, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test.
(+) FRPT Sensor Connector, Component Side	(-)											
FRT - Pin 3	Ground											
(+) FRPT Sensor Connector, Component Side	(-) FRPT Sensor Connector, Component Side											
FRT - Pin 3	FRP - Pin 1											
FRT - Pin 3	VREF - Pin 2											
DD19	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 DD20 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side											
FRT	SIGRTN											
(+) PCM Connector, Harness Side	(-)											
FRT	Ground											

Fuel Rail Pressure Temperature (FRPT) Sensor

DD

Test Step		Results / Action to Take						
DD20	FRPT SENSOR: INDUCE A HIGH VOLTAGE ON THE FRT CIRCUIT							
- PCM connector connected. - Key ON, engine OFF. - Access the PCM and monitor the FRT PID. - Is the voltage greater than 4.5 V?		Yes Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z. No GO to DD28 .						
DD21	CHECK THE FRT AND SIG RTN CIRCUIT(S) FOR AN OPEN IN THE HARNESS							
- PCM connector disconnected. - Measure the resistance between: <table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) FRPT Sensor Connector, Harness Side</th></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 DD22 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) FRPT Sensor Connector, Harness Side							
FRT	FRT - Pin 3							
SIGRTN	SIGRTN - Pin 4							
DD22	CHECK THE FRT SIGNAL FOR A SHORT TO VREF AND FRP							
- Measure the resistance between: <table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></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 DD23 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
FRT	VREF							
FRT	FRP							
DD23	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><th>Point A FRPT Sensor Connector, Harness Side</th><th>Point B FRPT Sensor Connector, Harness Side</th></tr><tr><td>FRT - Pin 3</td><td>SIGRTN - Pin 4</td></tr></table> - Key ON, engine OFF. - Access the PCM and monitor the FRT 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 duplicate or identify the concern at this time. GO to Pinpoint Test Z. No GO to DD28 .		
Point A FRPT Sensor Connector, Harness Side	Point B FRPT Sensor Connector, Harness Side							
FRT - Pin 3	SIGRTN - Pin 4							
DD24	DTC P0180: CHECK FOR THE PRESENCE OF DTC P0182 OR P0183							
- Key ON, engine OFF. - Check for self-test DTCs. - Are DTCs P0182 or P0183 present?		Yes GO to DD17 . No GO to DD25 .						

Fuel Rail Pressure Temperature (FRPT) Sensor

DD

Test Step		Results / Action to Take
DD25	CHECK THE FRT CIRCUIT FOR AN INTERMITTENT CONCERN	Yes GO to DD27 . No ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
- PCM connector connected. - Access the PCM and monitor the FRT PID. - Carry out a thorough wiggle test on the FRPT sensor harness. - Is the FRT signal stable?		
DD26	KOEO AND KOER DTC P0181: CHECK THE FRT PID	Yes GO to DD27 . No DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
Note: Allow vehicle temperatures to stabilize prior to temperature sensor tests. - Key ON, engine OFF. - The normal test range is 0°C to 100°C (32°F to 212°F). - Access the PCM and monitor the FRT PID. - Is the voltage between 0.4 - 4.5 V?		
DD27	COMPARE THE PIDS AFTER STABILIZING THE VEHICLE TEMPERATURE	Yes The concern is not present at this time. CLEAR the DTCs. REPEAT the self-test. No GO to Pinpoint Test Z.
- Access the PCM and monitor the FRT, CHT and ECT PIDs. - Are the temperature PIDs nearly equal in value?		
DD28	CHECK FOR CORRECT PCM OPERATION	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.
- 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?		

DD25-DD28

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

Vehicle Speed Circuit (VSC) Check

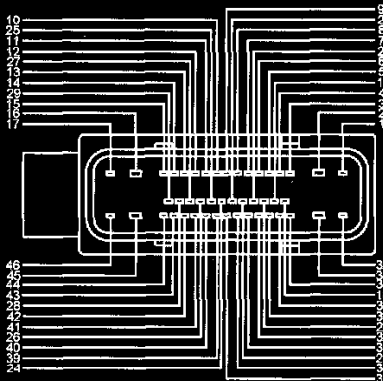
DF

 **WARNING:** Strict observance of posted speed limits and driving conditions is mandatory when proceeding through the following drive cycles. Failure to follow these instructions may result in personal injury.

This pinpoint test is intended to diagnose the following:

- harness circuits: VSC
- powertrain control module (PCM) (12A650)

Anti-lock Brake System (ABS) Module Connector



A0077542

Pin	Circuit
21	VSC (Vehicle Speed Circuit)

Powertrain Control Module (PCM) Connector

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

Warning, Anti-Lock Brake System (ABS) Module Connector And Powertrain Control Module (PCM) Connector

Vehicle Speed Circuit (VSC) Check

DF

Connector	Pin	Circuit
170 Pin	B29	VSC

Test Step		Results / Action to Take			
DF1	DTCS P0500, P0503, P1500, P1501 AND P1502: CHECK THE VEHICLE SPEED CIRCUIT FOR INTERMITTENT CONCERNS	Yes The vehicle speed input is incorrect. GO to DF2 . No The vehicle speed input is correct. The concern that produced the original DTC may be intermittent. GO to DF5 .			
	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 ON, engine OFF. • 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 ON, engine OFF. • Check for continuous memory DTCs. • Are DTCs P0500, P0503, P1500, P1501 or P1502 present?				
DF2	CHECK THE VSC CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS	Yes GO to DF3 . No GO to DF6 .			
	• Key in OFF position. • PCM connector disconnected. • Anti-lock Brake System (ABS) Module connector disconnected. • Key ON, engine OFF. • Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>VSC - Pin B29</td><td>Ground</td></tr></table> • Is the voltage less than 1 V?		(+) PCM Connector, Harness Side	(-)	VSC - Pin B29
(+) PCM Connector, Harness Side	(-)				
VSC - Pin B29	Ground				
DF3	CHECK FOR AN OPEN VSC BETWEEN THE PCM AND THE ABS CONTROL MODULE	Yes GO to DF4 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test. GO to DF7 .			
	• 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 - Pin B29</td><td>VSC - Pin 21</td></tr></table> • Is the resistance less than 5 ohms?		(+) PCM Connector, Harness Side	(-) Anti-lock Brake System (ABS) Module Connector, Harness Side	VSC - Pin B29
(+) PCM Connector, Harness Side	(-) Anti-lock Brake System (ABS) Module Connector, Harness Side				
VSC - Pin B29	VSC - Pin 21				

Vehicle Speed Circuit (VSC) Check

DF

Test Step		Results / Action to Take				
DF4	CHECK THE VSC 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>VSC - Pin B29</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-)	VSC - Pin B29	Ground	Yes REFER to Vehicle Dynamic Systems to continue diagnosis of the ABS control module, speed sensors and wheel speed sensor harness circuits. If these components are working properly, GO to DF8 . No GO to DF6 .
(+) PCM Connector, Harness Side	(-)					
VSC - Pin B29	Ground					
DF5	VISUAL INSPECTION Note: Refer to the Vehicle/Diagrams for harness, module, and connector locations. - Key in OFF position. - 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. - Does the visual inspection reveal a concern?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. GO to DF7 . No Unable to duplicate or identify the concern at this time. REFER to Vehicle Dynamic Systems to continue diagnosis of the ABS control module, speed sensors and wheel speed sensor harness circuits.				
DF6	VERIFY IF THE VSC IS SHORTED IN THE HARNESS OR ANOTHER MODULE - Key in OFF position. - Determine which, if any, modules are connected to the VSC. Refer to the Vehicle/Diagrams. If no other modules are connected to the VSC, go to the YES 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. - Does the short circuit remain after all associated modules are disconnected?	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. GO to DF7 . No REFER to Diagnose the appropriate module for further diagnosis of the appropriate module. GO to DF7 .				

Vehicle Speed Circuit (VSC) Check

DF

Test Step		Results / Action to Take
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 ON, engine OFF. - Check for continuous memory DTCs. Are DTCs P0500, P0503, P1500, P1501 or P1502 present?	Yes REFER to Vehicle Dynamic Systems to continue diagnosis of the ABS control module, speed sensors and wheel speed sensor harness circuits. If these components are working properly, GO to DF8. No The repair has been verified.
DF8	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

DF7-DF8

Test DH: Throttle Position (TP) Sensor

PINPOINT TEST DH: THROTTLE POSITION (TP) SENSOR

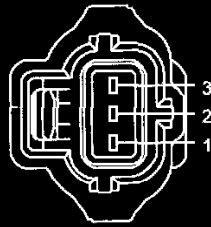
Throttle Position (TP) Sensor

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

Powertrain Control Module (PCM) Connector

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

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

Throttle Position (TP) Sensor

DH

Vehicle	Connector	Pin	Circuit
Escape/Mariner	150 (50-50-50) Pin	E41 B47, B48, B49, B50 B40, E40 B35, B36 E19	SIGRTN PWRGND VREF VPWR TP
Ranger	170 Pin	E58 B47, B48, B49, B50 B40, E57 B35, B36 E61	SIGRTN PWRGND VREF VPWR TP

Test Step		Results / Action to Take
DH1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	
	Are DTCs P0068, P0121, P0122, P0123, P1120, or P1124 present?	Yes For DTC P0068, GO to DH18. For DTC P0121, GO to DH24. For KOEO and KOER DTC P0122, GO to DH14. For continuous memory DTC P0122, GO to DH13. For DTC P0123, GO to DH9. For DTC P1120, GO to DH4. For DTC P1124, GO to DH2. No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
DH2	KOEO AND KOER DTC P1124: CHECK FOR ANY OTHER DTCs	
	- Key ON, engine OFF. - Check for KOEO and KOER DTCs. - Is DTC P0405 present?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to DH3.
DH3	CHECK FOR A STUCK THROTTLE PLATE OR LINKAGE	
	- Key in OFF position. - 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 DH9. No REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.

DH1-DH3

Throttle Position (TP) Sensor

DH

Test Step		Results / Action to Take				
DH4	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 concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DH5 .				
DH5	CHECK FOR A STUCK TP SENSOR					
	• Key ON, engine OFF. • 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 PID. • Is the voltage greater than 4.5 V?	Yes GO to DH22 . No GO to DH6 .				
DH6	CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN CIRCUITS AT THE TP SENSOR HARNESS CONNECTOR					
	• TP Sensor connector disconnected. • Key ON, engine OFF. • 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 - 5.5 V?	(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side	VREF	SIGRTN	Yes GO to DH7 . No GO to Pinpoint Test C.
(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side					
VREF	SIGRTN					
DH7	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 DH8 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) TP Sensor Connector, Harness Side					
TP	TP					

Throttle Position (TP) Sensor

DH

Test Step		Results / Action to Take						
DH8	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 OFF position. • Key ON, engine OFF. • Access the PCM and monitor the TP 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 - 0.49 V?	Yes INSTALL a new TP sensor. CLEAR the DTCs. REPEAT the self-test. No If DTC P1120 is still present, GO to DH22.						
DH9	DTC P0123 OR DTC P1124: INDUCE THE OPPOSITE TP SENSOR VOLTAGE • TP Sensor connector disconnected. • Key ON, engine OFF. • Access the PCM and monitor the TP PID. • Is the voltage less than 0.17 V?	Yes GO to DH10. No GO to DH11.						
DH10	CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN CIRCUITS AT THE TP SENSOR VEHICLE HARNESS CONNECTOR • Key ON, engine OFF. • 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 - 5.5 V?	(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side	VREF	SIGRTN	Yes INSTALL a new TP sensor. CLEAR the DTCs. REPEAT the self-test. No GO to Pinpoint Test C.		
(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side							
VREF	SIGRTN							
DH11	CHECK THE CIRCUIT FOR A SHORT TO VREF AND VPWR IN THE HARNESS • 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>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 GO to DH12. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
VPWR	TP							
VREF	TP							

Throttle Position (TP) Sensor

DH

Test Step		Results / Action to Take						
DH12	CHECK FOR AN INTERMITTENT SHORT TO VOLTAGE IN THE TP CIRCUIT - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>VPWR</td><td>TP</td></tr><tr><td>VREF</td><td>TP</td></tr></table> - Observe the digital multimeter (DMM) for an indication of a concern while shaking, wiggling, and bending the TP circuit between the TP sensor and the PCM. - Is a concern present?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	VPWR	TP	VREF	TP	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to DH26.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
VPWR	TP							
VREF	TP							
DH13	CONTINUOUS MEMORY DTC P0122: CHECK THE TP CIRCUIT FOR AN INTERMITTENT CONCERN - Key ON, engine OFF. - Clear the PCM DTCs. - Key ON, engine running. - Check for continuous memory DTCs. - Is DTC P0122 present?	Yes GO to DH14. No GO to Pinpoint Test Z.						
DH14	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 ON, engine OFF. - Measure the voltage between:<table><tr><th>(+) TP Sensor Connector, Harness Side</th><th>(-) TP Sensor Connector, Harness Side</th></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> - Is the voltage between 4.5 - 5.5 V?	(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side	VREF	SIGRTN	Yes GO to DH15. No GO to Pinpoint Test C.		
(+) TP Sensor Connector, Harness Side	(-) TP Sensor Connector, Harness Side							
VREF	SIGRTN							
DH15	CHECK THE TP CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) TP Sensor Connector, Harness Side</th></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 DH16. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) PCM Connector, Harness Side	(-) TP Sensor Connector, Harness Side							
TP	TP							

Throttle Position (TP) Sensor

DH

Test Step		Results / Action to Take						
DH16	CHECK THE TP CIRCUIT FOR A SHORT TO PWRGND OR SIGRTN IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></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 DH17. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
TP	PWRGND							
TP	SIGRTN							
DH17	INDUCE THE OPPOSITE TP SENSOR VOLTAGE - PCM connector connected. - Connect a 5 amp fused jumper wire between the following:<table><tr><th>Point A TP Sensor Con- nector, Harness Side</th><th>Point B TP Sensor Con- nector, Harness Side</th></tr><tr><td>VREF</td><td>TP</td></tr></table> - Key ON, engine OFF. - Access the PCM and monitor the TP PID. - Is the voltage greater than 4.65 V?	Point A TP Sensor Con- nector, Harness Side	Point B TP Sensor Con- nector, Harness Side	VREF	TP	Yes INSTALL a new TP sensor. CLEAR the DTCs. REPEAT the self-test. No GO to DH26.		
Point A TP Sensor Con- nector, Harness Side	Point B TP Sensor Con- nector, Harness Side							
VREF	TP							
DH18	DTC P0068: CHECK THE RATIONALITY BETWEEN THE TP AND MAF SENSORS - Attempt to start the engine. - Does the engine start?	Yes GO to DH19. No CHECK for major leaks, cracks and openings between the MAF sensor and the throttle body. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. If OK, GO to Pinpoint Test A.						
DH19	CHECK THE TP SENSOR FOR MECHANICAL OPERATION - Key ON, engine OFF. - Access the PCM and monitor the TP 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 0.49 - 4.65 V?	Yes GO to DH20. No INSTALL a new TP sensor. CLEAR the DTCs. REPEAT the self-test.						

Throttle Position (TP) Sensor**DH**

Test Step		Results / Action to Take
DH20	CHECK THE TP SENSOR SIGNAL HIGH VERSUS THE ENGINE LOAD WHILE DRIVING THE VEHICLE • Key ON, engine running. • Access the PCM and monitor the TP and LOAD PIDs. • Drive the vehicle, exercising the throttle and TP sensor. • 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. REPAIR as necessary. If OK, INSTALL a new TP sensor. CLEAR the DTCs. REPEAT the self-test. No GO to DH21.
DH21	CHECK THE TP SENSOR SIGNAL LOW VERSUS THE ENGINE LOAD WHILE DRIVING THE VEHICLE • Key ON, engine running. • Access the PCM and monitor the TP and LOAD PIDs. • Drive the vehicle while exercising the throttle and TP sensor near higher gears (preferably overdrive). • Is the TP V PID less than 0.24 volt and the LOAD PID greater than 55%?	Yes If continuous memory DTC P0068 is present, INSTALL a new MAF sensor. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.
DH22	CHECK FOR AN INTERMITTENT TP SIGNAL • Key ON, engine running. • Access the PCM and monitor the TP PID. • Increase the engine speed to 1,500 RPM for 10 seconds. • 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 GO to DH23. No INSPECT the TP sensor connector. REPAIR as necessary. If OK, INSTALL a new TP sensor. CLEAR the DTCs. REPEAT the self-test.

Throttle Position (TP) Sensor

DH

Test Step		Results / Action to Take
DH23	CHECK THE TP SENSOR HARNESS FOR INTERMITTENT OPENS OR SHORTS	
	• Key in OFF position. • Key ON, engine OFF. • Access the PCM and monitor the TP 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?	Yes Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z. No ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
DH24	DTC P0121: CHECK FOR OBSTRUCTION OR STICKING CONCERNS	
	 CAUTION: Do not attempt to clean the throttle bore and plate area. Cleaning damages 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?	Yes INSPECT the cable(s). REPAIR as necessary. REPEAT the self-test. If DTC P0121 is still present, GO to DH25. No INSTALL a new throttle body assembly. CLEAR the DTCs. REPEAT the self-test.
DH25	CHECK THE FUNCTIONALITY OF THE THROTTLE POSITION SENSOR	
	• Key ON, engine OFF. • Access the PCM and monitor the TP PID. • While slowly pressing the accelerator from the closed throttle position to the wide open throttle position, observe the TP V PID. • Does the TP V PID display a smooth reading during accelerator movement?	Yes Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z. No INSTALL a new TP sensor. CLEAR the DTCs. REPEAT the self-test.

DH23-DH25

Throttle Position (TP) Sensor**DH**

Test Step		Results / Action to Take
DH26	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

DH26

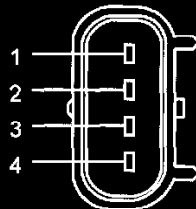
Test DG: Knock Sensor (KS)

PINPOINT TEST DG: KNOCK SENSOR (KS)

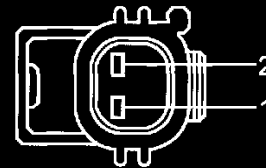
Knock Sensor (KS)**DG**

This pinpoint test is intended to diagnose the following:

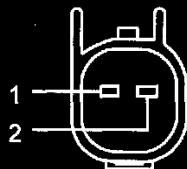
- knock sensors KS1, KS2 (12A699)
- harness circuits: KS1+, KS1-, KS2+, and KS2-
- powertrain control module (PCM) (12A650)

Knock Sensor 1 (KS1) Connector**A**

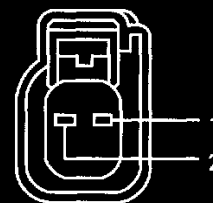
N0025954

B

A0077527

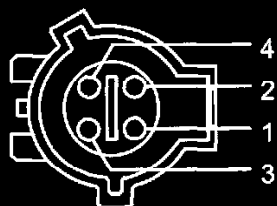
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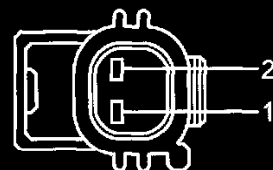
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N0002112

Description And Knock Sensor 1 (KS1) Connector

Knock Sensor (KS)**DG****E**

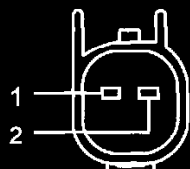
A0077507

F

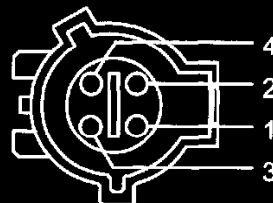
A0077524

Vehicle	Connector	Pin	Circuit
Edge, F-Super Duty 6.8L, MKX, Sable, Taurus, Taurus X	A	3 4 1 2	KS2+ KS2- KS1+ KS1-
Escape/Mariner, Fusion 2.3L, Milan 2.3L	B	1 2	KS1+ KS1-
Expedition, Navigator	C	1 2	KS1+ KS1-
F-150 4.2L, Ranger 3.0L	D	1 2	KS1+ KS1-
F-150 5.4L, F-Super Duty 5.4L, Mark LT	C	2 1	KS1+ KS1-
Fusion 3.0L, Milan 3.0L, Ranger 2.3L	B	2 1	KS1+ KS1-
MKZ	A	1 2	KS1+ KS1-
Mountaineer 4.6L	E	1 2	KS1+ KS1-
Mustang 4.6L	E	3 4	KS1+ KS1-
All other vehicles	F	2 1	KS1+ KS1-

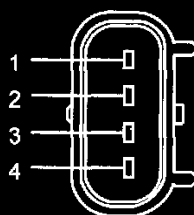
Knock Sensor 1 (KS1) Connector Continued

Knock Sensor (KS)**DG****Knock Sensor 2 (KS2) Connector****A**

N0025956

B

A0077507

C

N0025954

Vehicle	Connector	Pin	Circuit
Expedition, F-Super Duty 5.4L, Navigator	A	1 2	KS2+ KS2-
F-150, Mark LT	A	2 1	KS2+ KS2-
Mustang	B	1 2	KS2+ KS2-
All other vehicles	C	3 4	KS2+ KS2-

Knock Sensor 2 (KS2) Connector

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

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

Vehicle	Connector	Pin	Circuit
Edge, MKX, Sable, Taurus, Taurus X	190 Pin	E31 E30 E49 E48 B29, B64 B51	KS2+ KS2- KS1+ KS1- VREF VPWR
Escape/Mariner	150 (50-50-50) Pin	E32 E20 E40 B35	KS1+ KS1- VREF VPWR
Expedition, MKZ, Navigator	140 Pin	E31 E30 E49 E48 E57 B51	KS2+ KS2- KS1+ KS1- VREF VPWR
F-150 4.6L, F-150 4.2L	190 Pin	E49 E48 E57 B51	KS1+ KS1- VREF VPWR
F-150 5.4L, Mark LT	190 Pin	E31 E30 E49 E48 E57 B51	KS2+ KS2- KS1+ KS1- VREF VPWR
F-Super Duty, Mustang 4.6L	170 Pin	E31 E30 E49 E48 E57 B35	KS2+ KS2- KS1+ KS1- VREF VPWR
Focus	190 Pin	E46 E47 E63 B67	KS1+ KS1- VREF VPWR
Fusion, Milan	140 Pin	E49 E48 E57 B51	KS1+ KS1- VREF VPWR
All other vehicles	170 Pin	E49 E48 E57 B35	KS1+ KS1- VREF VPWR

Powertrain Control Module (PCM) Connector

Knock Sensor (KS)**DG**

Test Step		Results / Action to Take				
DG1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTC) Are DTCs P0325, P0326, P0330, or P0331 present?	Yes For KOER and continuous memory DTCs P0325, P0326, P0330 and P0331, GO to DG2 . No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.				
DG2	KOER AND CONTINUOUS MEMORY DTCS P0325, P0326, P0330 AND P0331: CHECK THE INTERNAL RESISTANCE OF THE KS - KS connector disconnected. - Measure the resistance between:<table><tr><td>(+) KS Connector, Component Side</td><td>(-) KS Connector, Component Side</td></tr><tr><td>Suspect KS+</td><td>Suspect KS-</td></tr></table> - Is the resistance between 4.39M - 5.35M ohms?	(+) KS Connector, Component Side	(-) KS Connector, Component Side	Suspect KS+	Suspect KS-	Yes GO to DG3 . No INSTALL a new KS. CLEAR the DTCs. REPEAT the self-test.
(+) KS Connector, Component Side	(-) KS Connector, Component Side					
Suspect KS+	Suspect KS-					
DG3	CHECK THE KS+ CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) KS Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>Suspect KS+</td><td>Suspect KS+</td></tr></table> - Is the resistance less than 5 ohms?	(+) KS Connector, Harness Side	(-) PCM Connector, Harness Side	Suspect KS+	Suspect KS+	Yes GO to DG4 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) KS Connector, Harness Side	(-) PCM Connector, Harness Side					
Suspect KS+	Suspect KS+					
DG4	CHECK THE KS- CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) KS Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>Suspect KS-</td><td>Suspect KS-</td></tr></table> - Is the resistance less than 5 ohms?	(+) KS Connector, Harness Side	(-) PCM Connector, Harness Side	Suspect KS-	Suspect KS-	Yes GO to DG5 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) KS Connector, Harness Side	(-) PCM Connector, Harness Side					
Suspect KS-	Suspect KS-					

Knock Sensor (KS)**DG**

Test Step		Results / Action to Take					
DG5	CHECK THE KS+ CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS	Yes GO to DG6 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.					
- Measure the resistance between:<table><tr><td>(+) KS Connector, Har- ness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>Suspect KS+</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?			(+) KS Connector, Har- ness Side	(-) Vehicle Battery	Suspect KS+	Negative terminal	
(+) KS Connector, Har- ness Side	(-) Vehicle Battery						
Suspect KS+	Negative terminal						
DG6	CHECK THE KS- CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS	Yes GO to DG7 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.					
- Measure the resistance between:<table><tr><td>(+) KS Connector, Har- ness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>Suspect KS-</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?			(+) KS Connector, Har- ness Side	(-) Vehicle Battery	Suspect KS-	Negative terminal	
(+) KS Connector, Har- ness Side	(-) Vehicle Battery						
Suspect KS-	Negative terminal						
DG7	CHECK THE KS+ CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS	Yes GO to DG8 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.					
- Measure the resistance between:<table><tr><td>(+) KS Connector, Har- ness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>Suspect KS+</td><td>VPWR</td></tr><tr><td>Suspect KS+</td><td>VREF</td></tr></table> - Are the resistances greater than 10K ohms?			(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side	Suspect KS+	VPWR	Suspect KS+
(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side						
Suspect KS+	VPWR						
Suspect KS+	VREF						
DG8	CHECK THE KS- CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS	Yes GO to DG9 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.					
- Measure the resistance between:<table><tr><td>(+) KS Connector, Har- ness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>Suspect KS-</td><td>VREF</td></tr><tr><td>Suspect KS-</td><td>VPWR</td></tr></table> - Are the resistances greater than 10K ohms?			(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side	Suspect KS-	VREF	Suspect KS-
(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side						
Suspect KS-	VREF						
Suspect KS-	VPWR						
DG9	CHECK THE KS+ CIRCUIT FOR INTERMITTENT CONCERNS	Yes GO to DG10 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.					
Note: Carefully wiggle all accessible wiring and connectors associated with the KS circuit. - Measure the resistance between:<table><tr><td>(+) KS Connector, Har- ness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>Suspect KS+</td><td>Suspect KS+</td></tr></table> - Is the resistance less than 5 ohms?			(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side	Suspect KS+	Suspect KS+	
(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side						
Suspect KS+	Suspect KS+						

Knock Sensor (KS)**DG**

Test Step		Results / Action to Take				
DG10	CHECK THE KS- CIRCUIT FOR INTERMITTENT CONCERNS	Yes GO to DG11. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.				
Note: Carefully wiggle all accessible wiring and connectors associated with the KS circuit. - Measure the resistance between: <table><tr><td>(+) KS Connector, Har- ness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>Suspect KS-</td><td>Suspect KS-</td></tr></table> - Is the resistance less than 5 ohms?			(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side	Suspect KS-	Suspect KS-
(+) KS Connector, Har- ness Side	(-) PCM Connector, Harness Side					
Suspect KS-	Suspect KS-					
DG11	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?						

DG10-DG11

Test DJ: Air Conditioning Evaporator Temperature (ACET) Sensor**PINPOINT TEST DJ: AIR CONDITIONING EVAPORATOR TEMPERATURE (ACET) SENSOR**

Air Conditioning Evaporator Temperature (ACET) Sensor

DJ

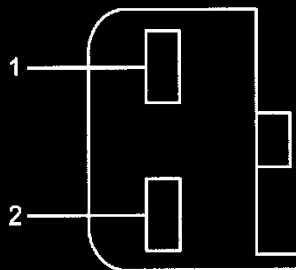
This pinpoint test is intended to diagnose the following:

- ACET sensor (19C734)
- harness circuits: ACET and SIGRTN
- powertrain control module (PCM) (12A650)

Air Conditioning 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 are equal to 5 volts.

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

N0072971

Pin	Circuit
1	SIGRTN (Signal Return)
2	ACET (Air Conditioning Evaporator Temperature)

Powertrain Control Module (PCM) Connector

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

Connector	Pin	Circuit
140 Pin	B33, E57 B58, E58 B53	VREF SIGRTN ACET

Air Conditioning Evaporator Temperature (ACET) Sensor

DJ

Test Step		Results / Action to Take						
DJ1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs) Are DTCs P0537, P0538, P1436, or P1437 present?	Yes For KOEO and KOER DTCs P0538 or P1437, GO to DJ2. For KOEO and KOER DTCs P0537 or P1436, GO to DJ6. For continuous memory DTCs P0537, P0538, P1436 or P1437, GO to DJ9. No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.						
DJ2	KOEO AND KOER DTCs P0538 OR P1437: SIMULATE AN OPPOSITE SIGNAL TO THE PCM - 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 - Pin 2</td><td>SIGRTN - Pin 1</td></tr></table> - Check for self-test DTCs. - Are DTCs P0537 or P1436 present?	Point A ACET Sensor Connector, Harness Side	Point B ACET Sensor Connector, Harness Side	ACET - Pin 2	SIGRTN - Pin 1	Yes INSTALL a new ACET sensor. CLEAR the DTCs. REPEAT the self-test. No GO to DJ3.		
Point A ACET Sensor Connector, Harness Side	Point B ACET Sensor Connector, Harness Side							
ACET - Pin 2	SIGRTN - Pin 1							
DJ3	CHECK THE ACET AND SIGRTN CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - Remove the jumper wire(s). - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) ACET Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>ACET - Pin 2</td><td>ACET - Pin B53</td></tr><tr><td>SIGRTN - Pin 1</td><td>SIGRTN - Pin B58, E58</td></tr></table> - Are the resistances less than 5 ohms?	(+) ACET Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	ACET - Pin 2	ACET - Pin B53	SIGRTN - Pin 1	SIGRTN - Pin B58, E58	Yes GO to DJ4. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) ACET Sensor Connector, Harness Side	(-) PCM Connector, Harness Side							
ACET - Pin 2	ACET - Pin B53							
SIGRTN - Pin 1	SIGRTN - Pin B58, E58							
DJ4	CHECK THE ACET CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) ACET Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>ACET - Pin 2</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) ACET Sensor Connector, Harness Side	(-)	ACET - Pin 2	Ground	Yes GO to DJ5. No REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) ACET Sensor Connector, Harness Side	(-)							
ACET - Pin 2	Ground							

Air Conditioning Evaporator Temperature (ACET) Sensor

DJ

Test Step		Results / Action to Take				
DJ5	CHECK THE ACET CIRCUIT FOR A SHORT TO VREF IN THE HARNESS - 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>ACET - Pin B53</td><td>VREF - Pin E57</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	ACET - Pin B53	VREF - Pin E57	Yes GO to DJ10. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side					
ACET - Pin B53	VREF - Pin E57					
DJ6	KOEO AND KOER DTCS P0537 OR P1436: SIMULATE AN OPPOSITE SIGNAL TO THE PCM - ACET Sensor connector disconnected. - Check for KOEO DTCs. - Are DTCs P0538 or P1437 present?	Yes INSTALL a new ACET sensor. CLEAR the DTCs. REPEAT the self-test. No GO to DJ7.				
DJ7	CHECK THE ACET CIRCUIT(S) FOR A SHORT TO SIGRTN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) ACET Sensor Connector, Harness Side</td><td>(-) ACET Sensor Connector, Harness Side</td></tr><tr><td>ACET - Pin 2</td><td>SIGRTN - Pin 1</td></tr></table> - Is the resistance greater than 10K ohms?	(+) ACET Sensor Connector, Harness Side	(-) ACET Sensor Connector, Harness Side	ACET - Pin 2	SIGRTN - Pin 1	Yes GO to DJ8. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) ACET Sensor Connector, Harness Side	(-) ACET Sensor Connector, Harness Side					
ACET - Pin 2	SIGRTN - Pin 1					
DJ8	CHECK THE ACET CIRCUIT(S) FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) ACET Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>ACET - Pin 2</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) ACET Sensor Connector, Harness Side	(-)	ACET - Pin 2	Ground	Yes GO to DJ10. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) ACET Sensor Connector, Harness Side	(-)					
ACET - Pin 2	Ground					

Air Conditioning Evaporator Temperature (ACET) Sensor

DJ

Test Step		Results / Action to Take				
DJ9	CONTINUOUS MEMORY DTCS P0537, P0538, P1436 OR P1437: CHECK THE ACET AND SIGRTN CIRCUIT FOR AN INTERMITTENT CONCERN Note: The voltage should be between 4.5 and 5.5 volts. The voltage reading changes suddenly when a concern is detected. For P0537/P1436, a sudden change could indicate a short to ground. For P0538/P1436, a sudden change could indicate an open ACET or SIGRTN circuit. - ACET Sensor connector disconnected. - Inspect the connectors for signs of damage, water intrusion, or corrosion. - Measure the voltage between: <table><tr><td>(+) ACET Sensor Connector, Harness Side</td><td>(-) ACET Sensor Connector, Harness Side</td></tr><tr><td>ACET - Pin 2</td><td>SIGRTN - Pin 1</td></tr></table> - Key ON, engine OFF. - While monitoring the voltage reading on the digital multimeter (DMM), wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM. - Key in OFF position. Is there any change in the voltage reading, or is a concern found?	(+) ACET Sensor Connector, Harness Side	(-) ACET Sensor Connector, Harness Side	ACET - Pin 2	SIGRTN - Pin 1	
(+) ACET Sensor Connector, Harness Side	(-) ACET Sensor Connector, Harness Side					
ACET - Pin 2	SIGRTN - Pin 1					

DJ9-DJ10

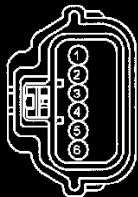
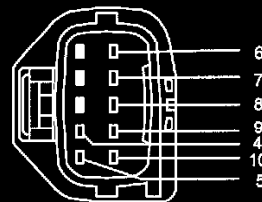
Test DK: Accelerator Pedal Position (APP) Sensor
PINPOINT TEST DK: ACCELERATOR PEDAL POSITION (APP) SENSOR

Accelerator Pedal Position (APP) Sensor**DK**

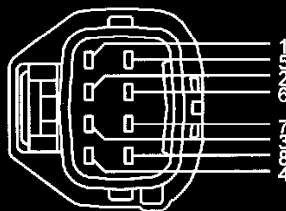
Note: After clearing an APP sensor diagnostic trouble code (DTC) to verify a repair or an intermittent concern, apply the accelerator pedal before carrying out the self-test. Take 10 seconds to carry out a full sweep of the accelerator pedal from fully released to fully applied and back to fully released.

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**A****B**

N0025957

C

A0077570

Note And Accelerator Pedal Position (APP) Sensor Connector

Accelerator Pedal Position (APP) Sensor**DK**

Vehicle	Connector	Pin	Circuit
Focus	A	5 2 3, 4 1, 6	APP2 APP1 ETCRTN ETCREF
Fusion, Milan, MKZ	B	4 5 7 6, 9 10, 8	APP3 APP2 APP1 ETCRTN ETCREF
All other vehicles	C	8 5 2 1, 3 6, 7	APP3 APP2 APP1 ETCRTN ETCREF

Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
Crown Victoria, Grand Marquis, Mustang, Town Car	170 Pin	B41, B6, E59 B24, B4, E66 B35, B36 B28 B17 B5	ETCRTN ETCREF VPWR APP3 APP2 APP1
E-Series, F-Super Duty	170 Pin	B18, B6, E59 B16, B4, E66 B35, B36 B28 B17 B5	ETCRTN ETCREF VPWR APP3 APP2 APP1
Expedition, Navigator	140 Pin	B59, B65, E59 B21, B28, E66 B51, B52, B53 B27 B26 B25	ETCRTN ETCREF VPWR APP3 APP2 APP1
Explorer, Explorer Sport Trac, Mountaineer	170 Pin	B43, B6, E59 B24, B4, E66 B35, B36 B28 B17 B5	ETCRTN ETCREF VPWR APP3 APP2 APP1

(Continued)

Accelerator Pedal Position (APP) Sensor Connector And Powertrain Control Module (PCM) Connector

Accelerator Pedal Position (APP) Sensor

DK

Vehicle	Connector	Pin	Circuit
F-150, Mark LT	190 Pin	B58, B59, E59 B21, B28, E66 B51, B52, B53 B27 B26 B25	ETCRTN ETCREF VPWR APP3 APP2 APP1
Focus	190 Pin	B44, B60, E60 B45, B61, E59 B67, B68 B29 B28	ETCRTN ETCREF VPWR APP2 APP1
Fusion, Milan, MKZ	140 Pin	B59, B60, E59 B21, B28, E66 B51, B52 B27 B26 B25	ETCRTN ETCREF VPWR APP3 APP2 APP1
All other vehicles	190 Pin	B59, B65, E59 B21, B28, E66 B51, B52, B53 B27 B26 B25	ETCRTN ETCREF VPWR APP3 APP2 APP1

Test Step		Results / Action to Take
DK1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	Yes For DTC P1575, GO to DK2 . For all others, GO to DK4 . No For a lack/loss of power, GO to DK3 . For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
	Are DTCs P1575, P2104, P2121, P2122, P2123, P2126, P2127, P2128, P2131, P2132, P2133, or P2138 present?	
DK2	DTC P1575: REPEAT THE KOEO SELF-TEST	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to DK3 .
	Note: Make sure the accelerator pedal is not applied during the KOEO self-test. - Key ON, engine OFF. - Carry out the KOEO self-test. - Are any DTCs present other than P1575?	

Accelerator Pedal Position (APP) Sensor

DK

Test Step		Results / Action to Take																																																
DK3	CHECK THE ACCELERATOR PEDAL FOR OBSTRUCTION	Yes GO to DK4. No ISOLATE and REPAIR the obstruction. CLEAR the DTCs. REPEAT the self-test.																																																
	- Key ON, engine OFF. - Press the accelerator pedal fully to the floor and release. - Does the pedal move freely to the floor and back?																																																	
DK4	CHECK THE APP SENSOR SIGNAL VOLTAGE RANGES FOR THE ACCELERATOR PEDAL FULLY APPLIED AND RELEASED POSITIONS																																																	
	- Access the PCM and monitor the APP1, APP2 and APP3 PIDs. - Press the accelerator pedal fully to the floor and release. Accelerator Pedal Fully Applied Voltage Values <table><tr><th>Vehicle</th><th>APP1</th><th>APP2</th><th>APP3</th></tr><tr><td>E-Series</td><td>0.73 - 1.28</td><td>3.03 - 4.55</td><td>2.59 - 3.89</td></tr><tr><td>Expedition, Navigator</td><td>0.79 - 2.09</td><td>2.75 - 4.33</td><td>2.26 - 3.73</td></tr><tr><td>Explorer, Explorer Sport Trac, 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, Mark LT</td><td>0.60 - 1.57</td><td>3.07 - 4.50</td><td>2.57 - 3.89</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>Focus</td><td>3.69 - 4.60</td><td>1.75 - 2.40</td><td>-</td></tr><tr><td>Fusion, Milan, MKZ</td><td>1.20 - 2.50</td><td>2.50 - 3.94</td><td>2.00 - 3.33</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>APP1</th><th>APP2</th><th>APP3</th></tr><tr><td>Focus</td><td>0.70 - 0.90</td><td>0.30 - 0.50</td><td>-</td></tr><tr><td>All vehicles</td><td>3.43 - 4.69</td><td>1.13 - 1.88</td><td>0.64 - 1.28</td></tr></table> - Are all APP signals out of range for the pedal fully applied and released positions?	Vehicle	APP1	APP2	APP3	E-Series	0.73 - 1.28	3.03 - 4.55	2.59 - 3.89	Expedition, Navigator	0.79 - 2.09	2.75 - 4.33	2.26 - 3.73	Explorer, Explorer Sport Trac, Mountaineer	0.60 - 1.57	3.07 - 4.50	2.57 - 3.89	F-150, Mark LT	0.60 - 1.57	3.07 - 4.50	2.57 - 3.89	F-Super Duty	0.39 - 0.97	3.45 - 4.71	2.95 - 4.10	Focus	3.69 - 4.60	1.75 - 2.40	-	Fusion, Milan, MKZ	1.20 - 2.50	2.50 - 3.94	2.00 - 3.33	All others	0.48 - 1.76	2.95 - 4.62	2.43 - 4.02	Vehicle	APP1	APP2	APP3	Focus	0.70 - 0.90	0.30 - 0.50	-	All vehicles	3.43 - 4.69	1.13 - 1.88	0.64 - 1.28	Yes GO to DK5. No For continuous memory DTCs P2121 and P2126 with P2131, GO to DK22. For all others, GO to DK5.
Vehicle	APP1	APP2	APP3																																															
E-Series	0.73 - 1.28	3.03 - 4.55	2.59 - 3.89																																															
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Accelerator Pedal Position (APP) Sensor

DK

Test Step		Results / Action to Take																																																				
DK5	CHECK THE VREF VOLTAGE TO APP SENSOR • Key in OFF position. • APP Sensor connector disconnected. • Key ON, engine OFF. • Measure the voltage between:<table><tr><td>(+) APP Sensor Connector, Harness Side</td><td>(-) APP Sensor Connector, Harness Side</td></tr><tr><td>ETCREF</td><td>ETCRTN</td></tr></table> • Is the voltage between 4 - 6 V?	(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side	ETCREF	ETCRTN	Yes For E-Series, Explorer, Explorer Sport Trac, F-150, Mark LT, and Mountaineer, GO to DK6 . For F-Super Duty, GO to DK7 . For Fusion, Milan, and MKZ, GO to DK8 . For Focus with DTC P2122, P2123 or P2138, GO to DK10 . For Focus with DTC P2127 or P2128, GO to DK14 . For all others, GO to DK9 . No GO to Pinpoint Test C.																																																
(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side																																																					
ETCREF	ETCRTN																																																					
DK6	E-SERIES, EXPLORER, EXPLORER SPORT TRAC, F-150, MARK LT, MOUNTAINEER: CHECK THE APP SENSOR FOR THE CORRECT RESISTANCE • Key in OFF position. • APP Sensor connector disconnected. • Measure the resistance between:<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>APP1</td><td>ETCREF</td><td>550</td><td>1,390</td></tr><tr><td>APP1</td><td>ETCRTN</td><td>1,030</td><td>2,590</td></tr><tr><td>APP1</td><td>APP2</td><td>2,125</td><td>5,335</td></tr><tr><td>APP1</td><td>APP3</td><td>1,930</td><td>4,845</td></tr><tr><td>APP2</td><td>ETCREF</td><td>1,785</td><td>4,480</td></tr><tr><td>APP2</td><td>ETCRTN</td><td>1,475</td><td>3,705</td></tr><tr><td>APP2</td><td>APP3</td><td>2,520</td><td>6,330</td></tr><tr><td>APP3</td><td>ETCREF</td><td>1,620</td><td>4,070</td></tr><tr><td>APP3</td><td>ETCRTN</td><td>1,135</td><td>2,860</td></tr><tr><td>ETCREF</td><td>ETCRTN</td><td>780</td><td>1,955</td></tr><tr><td>ETCREF</td><td>ETCREF</td><td>0</td><td>10</td></tr><tr><td>ETCRTN</td><td>ETCRTN</td><td>0</td><td>10</td></tr></table> • Are all the resistances within specifications?	(+) APP Sensor Connector, Component Side	(-) APP Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)	APP1	ETCREF	550	1,390	APP1	ETCRTN	1,030	2,590	APP1	APP2	2,125	5,335	APP1	APP3	1,930	4,845	APP2	ETCREF	1,785	4,480	APP2	ETCRTN	1,475	3,705	APP2	APP3	2,520	6,330	APP3	ETCREF	1,620	4,070	APP3	ETCRTN	1,135	2,860	ETCREF	ETCRTN	780	1,955	ETCREF	ETCREF	0	10	ETCRTN	ETCRTN	0	10	Yes For DTCs P2121, P2122 or P2123 alone or in combination, GO to DK10 . For DTCs P2126, P2127 or P2128 alone or in combination, GO to DK14 . For DTCs P2131, P2132 or P2133 alone or in combination, GO to DK18 . For DTC P2104 alone, GO to DK28 . For a lack/loss of power, the concern is elsewhere. RETURN to Symptom Charts for further direction. For all others, GO to DK22 . No INSTALL a new APP sensor. CLEAR the DTCs. REPEAT the self-test.
(+) APP Sensor Connector, Component Side	(-) APP Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)																																																			
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ETCRTN	ETCRTN	0	10																																																			

Accelerator Pedal Position (APP) Sensor

DK

Test Step

Results / Action to Take

DK7

F-SUPER DUTY: CHECK THE APP SENSOR FOR THE CORRECT RESISTANCE

- Key in OFF position.
- APP Sensor connector disconnected.
- Measure the resistance between:
- For vehicles with a fixed accelerator pedal.

(+) APP Sensor Connector, Component Side	(-) APP Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)
APP1	ETCREF	1,080	1,865
APP1	ETCRTN	1,535	2,860
APP1	APP2	2,820	5,225
APP1	APP3	2,775	5,205
APP2	ETCREF	1,995	3,700
APP2	ETCRTN	1,625	3,170
APP2	APP3	3,000	5,835
APP3	ETCREF	1,985	3,735
APP3	ETCRTN	1,440	2,870
ETCREF	ETCRTN	805	1,500
ETCREF	ETCREF	0	10
ETCRTN	ETCRTN	0	10

- For vehicles with an adjustable accelerator pedal.

(+) APP Sensor Connector, Component Side	(-) APP Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)
APP1	ETCREF	550	1,390
APP1	ETCRTN	1,030	2,590
APP1	APP2	2,125	5,335
APP1	APP3	1,930	4,845
APP2	ETCREF	1,785	4,480
APP2	ETCRTN	1,475	3,705
APP2	APP3	2,520	6,330
APP3	ETCREF	1,620	4,070
APP3	ETCRTN	1,135	2,860
ETCREF	ETCRTN	780	1,955
ETCREF	ETCREF	0	10
ETCRTN	ETCRTN	0	10

- Are all the resistances within specifications?

Yes

For DTCs P2121, P2122 or P2123 alone or in combination, GO to **DK10**.

For DTCs P2126, P2127 or P2128 alone or in combination, GO to **DK14**.

For DTCs P2131, P2132 or P2133 alone or in combination, GO to **DK18**.

For DTC P2104 alone, GO to **DK28**.

For a lack/loss of power, the concern is elsewhere. RETURN to Symptom Charts for further direction.

For all others, GO to **DK22**.

No

INSTALL a new APP sensor.

CLEAR the DTCs. REPEAT the self-test.

Accelerator Pedal Position (APP) Sensor

DK

Test Step		Results / Action to Take																																																					
DK8	FUSION, MILAN, MKZ: CHECK THE APP SENSOR FOR THE CORRECT RESISTANCE																																																						
- Key in OFF position. - APP Sensor connector disconnected. - Measure the resistance between:																																																							
<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>APP1</td><td>ETCREF</td><td>650</td><td>1,340</td></tr><tr><td>APP1</td><td>ETCRTN</td><td>1,210</td><td>2,470</td></tr><tr><td>APP1</td><td>APP2</td><td>2,430</td><td>4,960</td></tr><tr><td>APP1</td><td>APP3</td><td>2,390</td><td>4,880</td></tr><tr><td>APP2</td><td>ETCREF</td><td>2,020</td><td>4,120</td></tr><tr><td>APP2</td><td>ETCRTN</td><td>1,650</td><td>3,380</td></tr><tr><td>APP2</td><td>APP3</td><td>3,000</td><td>6,130</td></tr><tr><td>APP3</td><td>ETCREF</td><td>2,010</td><td>4,110</td></tr><tr><td>APP3</td><td>ETCRTN</td><td>1,450</td><td>2,970</td></tr><tr><td>ETCREF</td><td>ETCRTN</td><td>900</td><td>1,840</td></tr><tr><td>ETCREF</td><td>ETCREF</td><td>0</td><td>10</td></tr><tr><td>ETCRTN</td><td>ETCRTN</td><td>0</td><td>10</td></tr></table>		(+) APP Sensor Connector, Component Side	(-) APP Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)	APP1	ETCREF	650	1,340	APP1	ETCRTN	1,210	2,470	APP1	APP2	2,430	4,960	APP1	APP3	2,390	4,880	APP2	ETCREF	2,020	4,120	APP2	ETCRTN	1,650	3,380	APP2	APP3	3,000	6,130	APP3	ETCREF	2,010	4,110	APP3	ETCRTN	1,450	2,970	ETCREF	ETCRTN	900	1,840	ETCREF	ETCREF	0	10	ETCRTN	ETCRTN	0	10		
(+) APP Sensor Connector, Component Side	(-) APP Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)																																																				
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ETCREF	ETCREF	0	10																																																				
ETCRTN	ETCRTN	0	10																																																				
Are all the resistances within specifications?		Yes For DTCs P2121, P2122 or P2123 alone or in combination, GO to DK10. For DTCs P2126, P2127 or P2128 alone or in combination, GO to DK14. For DTCs P2131, P2132 or P2133 alone or in combination, GO to DK18. For DTC P2104 alone, GO to DK28. For a lack/loss of power, the concern is elsewhere. RETURN to Symptom Charts for further direction. For all others, GO to DK22. No INSTALL a new APP sensor. CLEAR the DTCs. REPEAT the self-test.																																																					

Accelerator Pedal Position (APP) Sensor

DK

Test Step		Results / Action to Take																																																				
DK9	ALL OTHERS: CHECK THE APP SENSOR FOR THE CORRECT RESISTANCE - Key in OFF position. - APP Sensor connector disconnected. - Measure the resistance between: <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>APP1</td><td>ETCREF</td><td>600</td><td>1,370</td></tr><tr><td>APP1</td><td>ETCRTN</td><td>720</td><td>1,660</td></tr><tr><td>APP1</td><td>APP2</td><td>1,300</td><td>2,960</td></tr><tr><td>APP1</td><td>APP3</td><td>1,250</td><td>2,860</td></tr><tr><td>APP2</td><td>ETCREF</td><td>750</td><td>1,720</td></tr><tr><td>APP2</td><td>ETCRTN</td><td>660</td><td>1,520</td></tr><tr><td>APP2</td><td>APP3</td><td>1,230</td><td>2,810</td></tr><tr><td>APP3</td><td>ETCREF</td><td>710</td><td>1,640</td></tr><tr><td>APP3</td><td>ETCRTN</td><td>580</td><td>1,340</td></tr><tr><td>ETCREF</td><td>ETCRTN</td><td>200</td><td>470</td></tr><tr><td>ETCREF</td><td>ETCREF</td><td>0</td><td>10</td></tr><tr><td>ETCRTN</td><td>ETCRTN</td><td>0</td><td>10</td></tr></table> - Are all the resistances within specifications?	(+) APP Sensor Connector, Component Side	(-) APP Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)	APP1	ETCREF	600	1,370	APP1	ETCRTN	720	1,660	APP1	APP2	1,300	2,960	APP1	APP3	1,250	2,860	APP2	ETCREF	750	1,720	APP2	ETCRTN	660	1,520	APP2	APP3	1,230	2,810	APP3	ETCREF	710	1,640	APP3	ETCRTN	580	1,340	ETCREF	ETCRTN	200	470	ETCREF	ETCREF	0	10	ETCRTN	ETCRTN	0	10	Yes For DTCs P2121, P2122 or P2123 alone or in combination, GO to DK10. For DTCs P2126, P2127 or P2128 alone or in combination, GO to DK14. For DTCs P2131, P2132 or P2133 alone or in combination, GO to DK18. For DTC P2104 alone, GO to DK28. For a lack/loss of power, the concern is elsewhere. RETURN to Symptom Charts for further direction. For all others, GO to DK22. No INSTALL a new APP sensor. CLEAR the DTCs. REPEAT the self-test.
(+) APP Sensor Connector, Component Side	(-) APP Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)																																																			
APP1	ETCREF	600	1,370																																																			
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ETCREF	ETCRTN	200	470																																																			
ETCREF	ETCREF	0	10																																																			
ETCRTN	ETCRTN	0	10																																																			
DK10	CHECK THE APP1 CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - APP Sensor connector disconnected. - 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>APP1</td><td>APP1</td></tr></table> - Is the resistance less than 5 ohms?	(+) APP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	APP1	APP1	Yes GO to DK11. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.																																																
(+) APP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side																																																					
APP1	APP1																																																					
DK11	CHECK THE APP1 CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between: <table><tr><th>(+) APP Sensor Connector, Harness Side</th><th>(-) Vehicle Battery</th></tr><tr><td>APP1</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) APP Sensor Connector, Harness Side	(-) Vehicle Battery	APP1	Negative terminal	Yes GO to DK12. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.																																																
(+) APP Sensor Connector, Harness Side	(-) Vehicle Battery																																																					
APP1	Negative terminal																																																					

Accelerator Pedal Position (APP) Sensor

DK

Test Step		Results / Action to Take					
DK12	CHECK THE APP1 CIRCUIT FOR A SHORT IN THE HARNESS	Yes GO to DK13 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.					
	- Measure the resistance between: <table><tr><td>(+) APP Sensor Connector, Harness Side</td><td>(-) APP Sensor Connector, Harness Side</td></tr><tr><td>APP1</td><td>ETCRTN</td></tr><tr><td>APP1</td><td>ETCREF</td></tr></table> - Are the resistances greater than 10K ohms?		(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side	APP1	ETCRTN	APP1
(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side						
APP1	ETCRTN						
APP1	ETCREF						
DK13	CHECK THE APP1 CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to DK22 .					
	- Key ON, engine OFF. - Measure the voltage between: <table><tr><td>(+) APP Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>APP1</td><td>Negative terminal</td></tr></table> - Is any voltage present?		(+) APP Sensor Connector, Harness Side	(-) Vehicle Battery	APP1	Negative terminal	
(+) APP Sensor Connector, Harness Side	(-) Vehicle Battery						
APP1	Negative terminal						
DK14	CHECK THE APP2 CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to DK15 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.					
	- Key in OFF position. - APP Sensor connector disconnected. - 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>APP2</td><td>APP2</td></tr></table> - Is the resistance less than 5 ohms?		(+) APP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	APP2	APP2	
(+) APP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side						
APP2	APP2						
DK15	CHECK THE APP2 CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS	Yes GO to DK16 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.					
	- Measure the resistance between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>APP2</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?		(+) PCM Connector, Harness Side	(-) Vehicle Battery	APP2	Negative terminal	
(+) PCM Connector, Harness Side	(-) Vehicle Battery						
APP2	Negative terminal						

Accelerator Pedal Position (APP) Sensor

DK

Test Step		Results / Action to Take						
DK16	CHECK THE APP2 CIRCUIT FOR A SHORT IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) APP Sensor Con- nector, Harness Side</td><td>(-) APP Sensor Con- nector, Harness Side</td></tr><tr><td>APP2</td><td>ETCRTN</td></tr><tr><td>APP2</td><td>ETCREF</td></tr></table> - Are the resistances greater than 10K ohms?	(+) APP Sensor Con- nector, Harness Side	(-) APP Sensor Con- nector, Harness Side	APP2	ETCRTN	APP2	ETCREF	Yes GO to DK17 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) APP Sensor Con- nector, Harness Side	(-) APP Sensor Con- nector, Harness Side							
APP2	ETCRTN							
APP2	ETCREF							
DK17	CHECK THE APP2 CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>APP2</td><td>Negative terminal</td></tr></table> - Is any voltage present?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	APP2	Negative terminal	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to DK23 .		
(+) PCM Connector, Harness Side	(-) Vehicle Battery							
APP2	Negative terminal							
DK18	CHECK THE APP3 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>APP3</td><td>APP3</td></tr></table> - Is the resistance less than 5 ohms?	(+) APP Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side	APP3	APP3	Yes GO to DK19 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) APP Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side							
APP3	APP3							
DK19	CHECK THE APP3 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>APP3</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	APP3	Negative terminal	Yes GO to DK20 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) PCM Connector, Harness Side	(-) Vehicle Battery							
APP3	Negative terminal							
DK20	CHECK THE APP3 CIRCUIT FOR A SHORT IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) APP Sensor Con- nector, Harness Side</td><td>(-) APP Sensor Con- nector, Harness Side</td></tr><tr><td>APP3</td><td>ETCRTN</td></tr><tr><td>APP3</td><td>ETCREF</td></tr></table> - Are the resistances greater than 10K ohms?	(+) APP Sensor Con- nector, Harness Side	(-) APP Sensor Con- nector, Harness Side	APP3	ETCRTN	APP3	ETCREF	Yes GO to DK21 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) APP Sensor Con- nector, Harness Side	(-) APP Sensor Con- nector, Harness Side							
APP3	ETCRTN							
APP3	ETCREF							

Accelerator Pedal Position (APP) Sensor

DK

Test Step		Results / Action to Take										
DK21	CHECK THE APP3 CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - Measure the voltage between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) Vehicle Battery</th></tr><tr><td>APP3</td><td>Negative terminal</td></tr></table> - Is any voltage present?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	APP3	Negative terminal	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to DK24.						
(+) PCM Connector, Harness Side	(-) Vehicle Battery											
APP3	Negative terminal											
DK22	CHECK FOR THE APP1 CIRCUIT SHORTED TO SIGNALS IN THE SAME HARNESS - 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>APP1</td><td>APP2</td></tr><tr><td>APP1</td><td>APP3</td></tr><tr><td>APP1</td><td>ETCREF</td></tr><tr><td>APP1</td><td>ETCRTN</td></tr></table> - Are the resistances greater than 10K ohms?	(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side	APP1	APP2	APP1	APP3	APP1	ETCREF	APP1	ETCRTN	Yes GO to DK25. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side											
APP1	APP2											
APP1	APP3											
APP1	ETCREF											
APP1	ETCRTN											
DK23	CHECK FOR THE APP2 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>APP2</td><td>APP1</td></tr><tr><td>APP2</td><td>APP3</td></tr><tr><td>APP2</td><td>ETCREF</td></tr><tr><td>APP2</td><td>ETCRTN</td></tr></table> - Are the resistances greater than 10K ohms?	(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side	APP2	APP1	APP2	APP3	APP2	ETCREF	APP2	ETCRTN	Yes GO to DK25. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side											
APP2	APP1											
APP2	APP3											
APP2	ETCREF											
APP2	ETCRTN											

DK

Test Step		Results / Action to Take										
DK24	CHECK FOR THE APP3 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>APP3</td><td>APP1</td></tr> <tr> <td>APP3</td><td>APP2</td></tr> <tr> <td>APP3</td><td>ETCREF</td></tr> <tr> <td>APP3</td><td>ETCRTN</td></tr> </table> - Are the resistances greater than 10K ohms?	(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side	APP3	APP1	APP3	APP2	APP3	ETCREF	APP3	ETCRTN	Yes GO to DK25. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) APP Sensor Connector, Harness Side	(-) APP Sensor Connector, Harness Side											
APP3	APP1											
APP3	APP2											
APP3	ETCREF											
APP3	ETCRTN											
DK25	CHECK THE APP SENSOR CIRCUITS 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>APP1</td><td>APP1</td></tr> <tr> <td>APP2</td><td>APP2</td></tr> <tr> <td>APP3</td><td>APP3</td></tr> </table> - Are the resistances less than 5 ohms?	(+) APP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	APP1	APP1	APP2	APP2	APP3	APP3	Yes For Focus, GO to DK26. For all others, GO to DK28. No ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.		
(+) APP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side											
APP1	APP1											
APP2	APP2											
APP3	APP3											
DK26	CHECK FOR DTCs - PCM connector connected. - Key ON, engine OFF. - Carry out the KOEO self-test. - Are DTCs P2122 and P2127 present?	Yes GO to DK27. No GO to DK28.										
DK27	SIMULATE THE OPPOSITE SIGNAL - Key in OFF position. - Connect a 5 amp fused jumper wire between the following: <table> <tr> <th>Point A APP Sensor Connector, Harness Side</th><th>Point B APP Sensor Connector, Harness Side</th></tr> <tr> <td>ETCREF</td><td>APP1</td></tr> <tr> <td>ETCREF</td><td>APP2</td></tr> </table> - Key ON, engine OFF. - Access the PCM and monitor the APP1 and APP2 PIDs. - Are the voltages greater than 4.5 V?	Point A APP Sensor Connector, Harness Side	Point B APP Sensor Connector, Harness Side	ETCREF	APP1	ETCREF	APP2	Yes INSTALL a new APP sensor. No CLEAR the DTCs. REPEAT the self-test. No GO to DK28.				
Point A APP Sensor Connector, Harness Side	Point B APP Sensor Connector, Harness Side											
ETCREF	APP1											
ETCREF	APP2											

Accelerator Pedal Position (APP) Sensor**DK**

Test Step		Results / Action to Take
DK28	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

DK28

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

Cylinder Head Temperature (CHT) Sensor

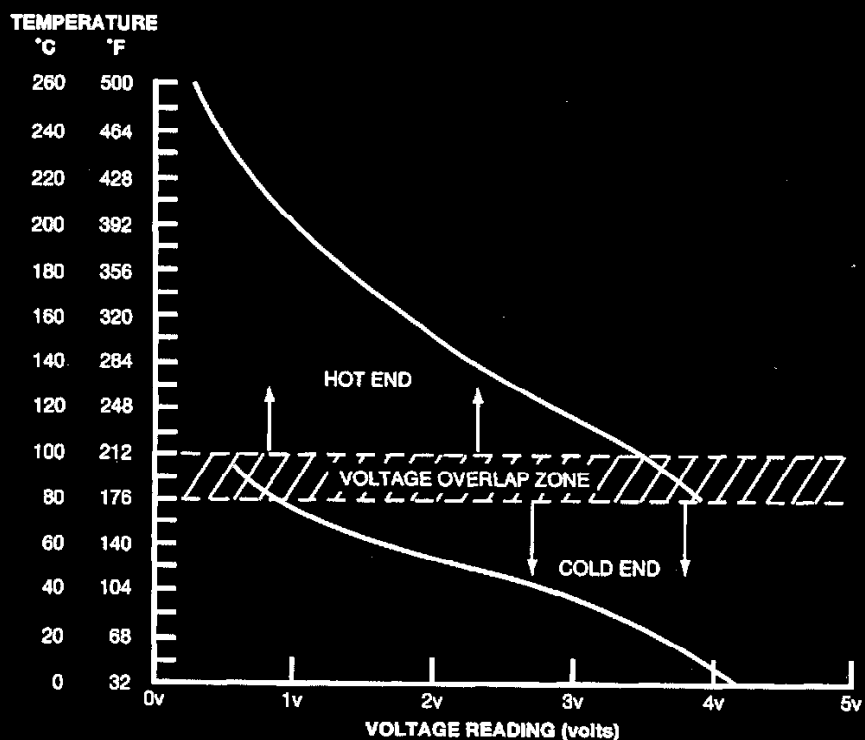
DL

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 engine coolant temperature (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.

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



AA0885-B

Description And Graph

Cylinder Head Temperature (CHT) Sensor

DL

Cylinder Head Temperature Sensor Expected Values

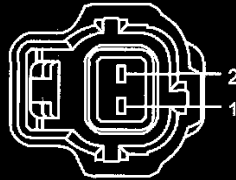
Temperature		CHT Sensor Values		
°C	°F	Cold End (volts)	Hot End (volts)	Resistance (K ohms)
-40	-40	4.89	-	965.808
-30	-22	4.81	-	513.019
-20	-4	4.67	-	283.664
-10	14	4.45	-	162.584
0	32	4.14	-	96.255
10	50	3.73	-	59.175
20	68	3.26	-	37.387
30	86	2.74	-	24.215
40	104	2.23	-	16.043
50	122	1.76	-	10.85
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

Cylinder Head Temperature Sensor Expected Values

Cylinder Head Temperature (CHT) Sensor

DL

Cylinder Head Temperature (CHT) Sensor Connector



A0077551

Pin	Circuit
2	SIGRTN (Signal Return)
1	CHT (Cylinder Head Temperature)

Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
Edge, MKX, Sable, Taurus, Taurus X	190 Pin	B29, B64 E58 E41	VREF SIGRTN CHT
Escape/Mariner	150 (50-50-50) Pin	E40 E41 E33	VREF SIGRTN CHT
Expedition, Fusion, Milan, MKZ, Navigator	140 Pin	E57 E58 E41	VREF SIGRTN CHT

(Continued)

Cylinder Head Temperature (CHT) Sensor Connector And Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
F-150, Mark LT	190 Pin	E57 E58 E41	VREF SIGRTN CHT
Focus	190 Pin	E63 E64 E15	VREF SIGRTN CHT
All other vehicles	170 Pin	E57 E58 E41	VREF SIGRTN CHT

Test Step		Results / Action to Take
DL1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	
• Are DTCs P0116, P0119, P0125, P0128, P1116, P1285, P1288, P1289, P128A, P1290, or P1299 present?		Yes For DTCs P1116 or P1288, GO to DL2. For KOEO and KOER DTCs P1289 or P1290, GO to DL8. For continuous memory DTCs P0119, P1289, P128A, or P1290, GO to DL15. For KOEO or continuous memory DTC P1299, GO to DL21. For continuous memory DTCs P0125 or P0128, GO to DL22. For continuous memory DTC P0116, GO to DL24. For DTC P1285, GO to DL18. No For Temperature Warning Indicator Lamp or Gauge (applications with CHT sensor only) symptom, GO to DL29. For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.

DL1

Cylinder Head Temperature (CHT) Sensor

DL

Test Step		Results / Action to Take				
DL2	SELF-TEST DTCS P1288 OR P1116: CHECK THE COOLING SYSTEM					
 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. Failure to follow these instructions may result in personal injury. - The DTC indicates the temperature sensor is out of self-test range. The engine is not at normal operating temperature. - Check the vehicle coolant level. - Is the cooling system OK?		Yes GO to DL3. No REFER to Cooling System, Engine Cooling, for loss of coolant diagnosis. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.				
DL3	CHECK IF THE VEHICLE ENGINE STARTS					
- Attempt to start the engine. - Does the engine start and run normally?		Yes GO to DL6. No GO to DL4.				
DL4	CHECK THE RESISTANCE OF THE CHT SENSOR WITH THE ENGINE OFF					
Note: Refer to the chart at the beginning of this test for the resistance specifications. - 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 - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> - Is the resistance within specification?		(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side	CHT - Pin 1	SIGRTN - Pin 2	Yes GO to DL5. No INSTALL a new CHT sensor. CLEAR the DTCs. REPEAT the self-test.
(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side					
CHT - Pin 1	SIGRTN - Pin 2					
DL5	CHECK THE CIRCUIT FROM THE MODULE TO THE COMPONENT					
Note: Refer to the chart at the beginning of this test for the resistance specifications. - CHT Sensor connector connected. - Key ON, engine OFF. - Access the PCM and monitor the CHT 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. - Does the measured value at the sensor agree with measured PID value at the PCM?		Yes The concern is elsewhere. RETURN to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index, for further direction. No GO to DL12.				

Cylinder Head Temperature (CHT) Sensor

DL

Test Step		Results / Action to Take			
DL6	CHECK THE CHT SENSOR OPERATION	Yes GO to DL7. No The engine temperature was not stabilized. REPAIR any other DTCs as necessary.			
- Run the engine until the engine temperature stabilizes. - Verify the radiator hoses are hot and the cooling system is pressurized. - Carry out the PCM self-test. - Are DTCs P1116 or P1288 present?					
DL7	CHECK THE RESISTANCE OF THE CHT SENSOR	Yes GO to DL31. No INSTALL a new CHT sensor. CLEAR the DTCs. REPEAT the self-test.			
Note: Refer to the chart at the beginning of this test for the resistance specifications. - The vehicle must be at normal operating temperature. - 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 - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> - Is the resistance within specification?			(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side	CHT - Pin 1
(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side				
CHT - Pin 1	SIGRTN - Pin 2				
DL8	DTCs P1289 OR P1290: ACCESS THE CHT PID AND CHECK THE VOLTAGE	Yes GO to DL9. No GO to DL10.			
- Key ON, engine OFF. - Access the PCM and monitor the CHT PID. - Is the voltage less than 0.2 V?					
DL9	CHECK FOR A GROUNDED CIRCUIT	Yes INSTALL a new CHT sensor. CLEAR the DTCs. REPEAT the self-test. No GO to DL14.			
- CHT Sensor connector disconnected. - Key ON, engine OFF. - Access the PCM and monitor the CHT PID. - Is the voltage greater than 4.6 V?					
DL10	CHECK THE CHT CIRCUIT FOR A SHORT TO VOLTAGE	Yes REPAIR the short circuit to PWR. CHECK the CHT sensor for damage. GO to DL11. No GO to DL11.			
- CHT Sensor connector disconnected. - Key ON, engine OFF. - Measure the voltage between: <table><tr><td>(+) CHT Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>CHT - Pin 1</td><td>Ground</td></tr></table> - Is the voltage greater than 5.5 V?			(+) CHT Sensor Connector, Harness Side	(-)	CHT - Pin 1
(+) CHT Sensor Connector, Harness Side	(-)				
CHT - Pin 1	Ground				

Cylinder Head Temperature (CHT) Sensor

DL

Test Step		Results / Action to Take								
DL11	CHECK THE RESISTANCE OF THE CHT SENSOR WITH THE ENGINE OFF Note: Refer to the chart at the beginning of this test for the resistance specifications. - 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 - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> - Is the resistance within specification?	(+) CHT Sensor Con- nector, Component Side	(-) CHT Sensor Con- nector, Component Side	CHT - Pin 1	SIGRTN - Pin 2	Yes GO to DL12. No INSTALL a new CHT sensor. CLEAR the DTCs. REPEAT the self-test.				
(+) CHT Sensor Con- nector, Component Side	(-) CHT Sensor Con- nector, Component Side									
CHT - Pin 1	SIGRTN - Pin 2									
DL12	CHECK THE SIGNAL AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between: <table><tr><td>(+) CHT Sensor Con- nector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>CHT - Pin 1</td><td>CHT</td></tr><tr><td>SIGRTN - Pin 2</td><td>SIGRTN</td></tr></table> - Are the resistances less than 5 ohms?	(+) CHT Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side	CHT - Pin 1	CHT	SIGRTN - Pin 2	SIGRTN	Yes GO to DL13. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) CHT Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side									
CHT - Pin 1	CHT									
SIGRTN - Pin 2	SIGRTN									
DL13	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 GO to DL31. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.				
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
CHT	VREF									
DL14	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 GO to DL31. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
CHT	SIGRTN									
(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Bat- tery									
CHT	Negative terminal									

DL11-DL14

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

Test Step		Results / Action to Take
DL15	DTCS P0119, P1289, P1290 OR P128A: INTERMITTENT CHECK	Yes DISCONNECT and INSPECT the connector. If OK, INSTALL a new CHT sensor. CLEAR the DTCs. REPEAT the self-test. No GO to DL16.
	• Key ON, engine OFF. • Access the PCM and monitor the CHT 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?	
DL16	CHECK THE ELECTRONIC ENGINE CONTROL (EEC) WIRING HARNESS	Yes ISOLATE the concern. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DL17.
	• Access the PCM and monitor the CHT PID. • While observing the PID, 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?	
DL17	CHECK THE PCM AND VEHICLE HARNESS CONNECTORS	Yes GO to DL31. No REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
	• PCM connector disconnected. • CHT Sensor connector disconnected. • Are the connectors and terminals OK?	

Cylinder Head Temperature (CHT) Sensor

DL

Test Step		Results / Action to Take			
DL18	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. Failure to follow these instructions may result in personal injury. Note: If the electric cooling fan does not operate, return to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions for electric cooling fan DTC. Return to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index for symptom diagnosis. • An engine overheat condition is 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 • Is the cooling system OK?	Yes GO to DL19 . No REFER to Cooling System, Engine Cooling, for loss of coolant diagnosis. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.			
DL19	CHECK THE OPERATION OF THE CYLINDER HEAD TEMPERATURE SENSOR • Run the engine until the engine temperature stabilizes. • Verify the radiator hoses are hot and the cooling system is pressurized. • Check for self-test DTCs. • Is DTC P1285 present?				
DL20	CHECK THE RESISTANCE OF THE CHT SENSOR Note: Refer to the chart at the beginning of this test for the resistance specifications. • The vehicle must be at normal operating temperature. • Key in OFF position. • CHT Sensor connector disconnected. • Measure the resistance between:<table border="1"><tr><td>(+) CHT Sensor Connector, Component Side</td><td>(-) CHT Sensor Connector, Component Side</td></tr><tr><td>CHT - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> • Is the resistance within specification?		(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side	CHT - Pin 1
(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side				
CHT - Pin 1	SIGRTN - Pin 2				
		Yes GO to DL31 . No INSTALL a new CHT sensor. <			

Cylinder Head Temperature (CHT) Sensor

DL

Test Step		Results / Action to Take
DL21	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. Failure to follow these instructions may result in personal injury. Note: Refer to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions 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, Engine Cooling to diagnose the engine overheating condition. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No REFER to Cooling System, Engine Cooling to diagnose the loss of coolant. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
DL22	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. Failure to follow these instructions may result in personal injury. Note: DTC P0125 or P0128 indicates the engine coolant temperature has not achieved the required engine operation temperature level, since start-up within a specified amount of time. • Check the engine coolant level. • Is the engine coolant fill level correct?	Yes GO to DL23. No REFER to Cooling System, Engine Cooling to diagnose the loss of coolant. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
DL23	CHECK THE SENSOR OPERATION	
	• Run the engine until the engine temperature stabilizes. • Verify the radiator hoses are 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 The test is complete. CLEAR the DTCs. REPEAT the self-test. No REFER to Cooling System, Engine Cooling to diagnosis engine not reaching normal operating temperature. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.

Cylinder Head Temperature (CHT) Sensor

DL

Test Step		Results / Action to Take				
DL24	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 DTC Index, 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 - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> • Refer to the chart at the beginning of this test for the resistance specifications. • Is the resistance within specification?	(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side	CHT - Pin 1	SIGRTN - Pin 2	Yes GO to DL25 . No INSTALL a new CHT sensor. CLEAR the DTCs. REPEAT the self-test.
(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side					
CHT - Pin 1	SIGRTN - Pin 2					
DL25	DTC P0116: CHECK THE RESISTANCE OF THE CHT SENSOR Note: Verify the engine is at operating temperature before taking the CHT reading. • CHT Sensor connector connected. • Run the engine until the engine temperature stabilizes. • 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 - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> • Refer to the chart at the beginning of this test for the resistance specifications. • Is the resistance within specification?	(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side	CHT - Pin 1	SIGRTN - Pin 2	Yes The concern 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. REPEAT the PCM self-test if necessary. No INSTALL a new CHT sensor. CLEAR the DTCs. REPEAT the self-test.
(+) CHT Sensor Connector, Component Side	(-) CHT Sensor Connector, Component Side					
CHT - Pin 1	SIGRTN - Pin 2					
DL26	DTC P0298: ENGINE OIL OVER TEMPERATURE CONDITION Note: The engine oil temperature protection strategy in the PCM has been activated. This protects the engine against mechanical damage due to overheating. Refer to DTC Index, 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?	Yes ISOLATE the concern. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DL27 .				

Cylinder Head Temperature (CHT) Sensor

DL

Test Step		Results / Action to Take
DL27	CHECK FOR CHT DTCS	Yes DISREGARD the engine oil temperature (EOT) diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to DL28 .
	- Check for self-test DTCS. - Are DTCS P1285, P1288, P1289 or P1299 present?	
DL28	ROAD TEST THE VEHICLE AND MONITOR FOR ENGINE OVER TEMPERATURE	Yes REFER to Cooling System, Engine Cooling to diagnose the overheat symptom. REPAIR as necessary. REPAIR as necessary. CLEAR the DTCS. REPEAT the self-test. No Unable to duplicate or identify the concern at this time.
	- Access the freeze frame data (if available) and record the DTC malfunction conditions. - Access the PCM and monitor the CHT PID. - Test drive the vehicle and allow the engine to reach normal operating temperature. - Observe CHT PID. - Does the engine overheat?	
DL29	ENGINE TEMPERATURE WARNING INDICATOR LAMP ON OR TEMPERATURE GAUGE INDICATES HOT, BUT ENGINE IS NOT OVERHEATING	Yes GO to DL30 . No The concern is elsewhere. RETURN to Symptom Charts, GO to Pinpoint Test QT for further direction.
	Note: The PCM self-test must be carried out prior to entering this pinpoint test. Was the PCM self-test carried out prior to entering this pinpoint test?	

Cylinder Head Temperature (CHT) Sensor

DL

Test Step		Results / Action to Take
DL30	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 sends a controller area network (CAN) message to the instrument cluster to signal an overheating condition. This causes the instrument cluster indicator to illuminate and forces the temperature gauge to the H (hot) zone. DTC P1285 is stored in the PCM. Note: For Engine Temperature Warning Indicator system problems, refer to Instrument Panel, Gauges and Warning Indicators, Instrument Cluster. • PCM connector disconnected. • Key ON, engine OFF. • 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 REFER to Cooling System, Engine Cooling to diagnose the overheat symptom. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No REFER to Instrument Panel, Gauges and Warning Indicators, Instrument Cluster to diagnose the incorrect temperature gauge. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
DL31	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

DL30-DL31

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

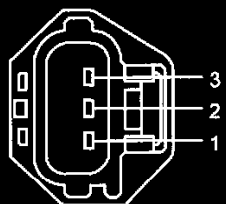
Manifold Absolute Pressure (MAP) Sensor

DM

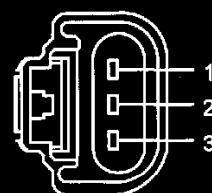
This pinpoint test is intended to diagnose the following:

- manifold absolute pressure (MAP) sensor (9F479)
- harness circuits: MAP, SIGRTN, VREF
- powertrain control module (PCM) (12A650)

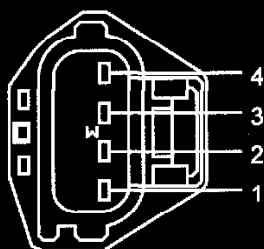
Manifold Absolute Pressure (MAP) Sensor Connector

A

A0077537

B

N0025955

C

A0077519

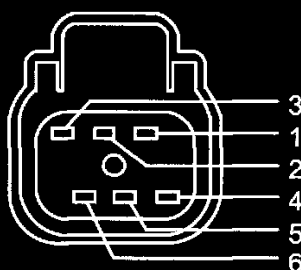
Description And Manifold Absolute Pressure (MAP) Sensor Connector

Manifold Absolute Pressure (MAP) Sensor

DM

Vehicle	Connector	Pin	Circuit
Escape/Mariner 3.0L	A	2 3 1	MAP SIGRTN VREF
Fusion 3.0L, Milan 3.0L	B	1 2 3	MAP SIGRTN VREF
All other vehicles	C	1 4 2	MAP SIGRTN VREF

EGR System Module (ESM) Connector



A0077577

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

Powertrain Control Module (PCM) Connector

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

Manifold Absolute Pressure (MAP) Sensor

DM

Vehicle	Connector	Pin	Circuit
Escape/Mariner	150 (50-50-50) Pin	B35, B36 B40, E40 B41, E41, T41 E23	VPWR VREF SIGRTN MAP
F-150	190 Pin	B51, B52, B53 B29, E57 B58, E58, T43 E62	VPWR VREF SIGRTN MAP
Focus	190 Pin	B67, B68 B52, B66, E63 B58, E64, T40 E40	VPWR VREF SIGRTN MAP
Fusion, Milan	140 Pin	B51, B52 B33, E57 B58, E58 E62	VPWR VREF SIGRTN MAP
All other vehicles	170 Pin	B35, B36 B40, E57 B41, E58, T41 E62	VPWR VREF SIGRTN MAP

Test Step		Results / Action to Take
DM1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	
	Are DTCs P0106, P0107, P0108, P0109, P012B, P012C, P012D, or P012E present?	Yes For vehicles with an EGR system module (ESM), KOEO, KOER DTCs P0107, P0108, P012C, or P012D. GO to DM2. For vehicles without an EGR system module (ESM), any DTC P0106, KOEO, KOER DTCs P0107 or P0108, GO to DM20. For vehicles with an EGR system module (ESM) continuous memory DTCs P0107, P0108, P012C, P012D or KOEO P0109, or P012E. GO to DM14. For vehicles without an EGR system module (ESM) continuous memory DTCs P0107, P0108, or KOEO P0109, GO to DM26. For vehicles with an EGR system module (ESM) DTC P0106, or P012B. GO to DM15. No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.

Manifold Absolute Pressure (MAP) Sensor

DM

Test Step		Results / Action to Take			
DM2	DTCS P0107 AND P0108: MONITOR THE MAP PID	Yes VERIFY the PCM is at the latest calibration level. REPROGRAM if necessary. If the PCM is at the latest calibration level, the concern is not present at this time. No GO to DM3.			
	- Key ON, engine running. - Carry out the KOER self-test. - Access the PCM and monitor the MAP PID. - Is the voltage between 0.05 - 4.95 V?				
DM3	VERIFY HARNESS AND CONNECTOR INTEGRITY	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DM4.			
	- Key in OFF position. - ESM connector disconnected. - Carry out a thorough visual inspection of the connector, pins and wires attaching to the pins. - Are there any concerns with the wiring or the ESM connection?				
DM4	MONITOR THE MAP PID	Yes The concern is not present at this time. CLEAR the DTCs. REPEAT the self-test. No GO to DM5.			
	- ESM connector connected. - Key ON, engine OFF. - Access the PCM and monitor the MAP PID. - Is the voltage between 0.05 - 4.95 V?				
DM5	DETERMINE THE PRESENT MAP PID VOLTAGE	Yes GO to DM6. No GO to DM9.			
	- Access the PCM and monitor the MAP PID. - Is the voltage less than 0.05 V?				
DM6	KOEO AND KOER DTC P0107: CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN CIRCUITS AT THE ESM HARNESS CONNECTOR	Yes GO to DM7. No GO to Pinpoint Test C.			
	- ESM connector disconnected. - Key ON, engine OFF. - 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 - 5.5 V?		(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side	VREF - Pin 2
(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side				
VREF - Pin 2	SIGRTN - Pin 6				

Manifold Absolute Pressure (MAP) Sensor

DM

Test Step		Results / Action to Take								
DM7	CHECK THE MAP CIRCUIT FOR A SHORT TO SIGRTN AND GND IN THE HARNESS - Key in OFF position. - 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 DM8 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) ESM Connector, Harness Side	(-)									
MAP - Pin 3	Ground									
(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side									
MAP - Pin 3	SIGRTN - Pin 6									
DM8	INDUCE THE OPPOSITE MAP SENSOR VOLTAGE TO SIMULATE A 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 ON, engine OFF. - Access the PCM and monitor the MAP 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 INSTALL a new ESM. CLEAR the DTCs. REPEAT the self-test. No GO to DM27 .				
Point A ESM Connector, Harness Side	Point B ESM Connector, Harness Side									
MAP - Pin 3	VREF - Pin 2									
DM9	KOEO AND KOER DTC P0108: CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN CIRCUITS AT THE ESM HARNESS CONNECTOR - ESM connector disconnected. - Key ON, engine OFF. - 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 - 5.5 V?	(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side	VREF - Pin 2	SIGRTN - Pin 6	Yes GO to DM10 . No GO to Pinpoint Test C.				
(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side									
VREF - Pin 2	SIGRTN - Pin 6									

Manifold Absolute Pressure (MAP) Sensor

DM

Test Step		Results / Action to Take						
DM10	CHECK THE MAP AND SIGRTN CIRCUIT(S) FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) ESM Connector, Harness Side</th></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 DM11. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) ESM Connector, Harness Side							
MAP	MAP - Pin 3							
SIGRTN	SIGRTN - Pin 6							
DM11	CHECK THE MAP CIRCUIT FOR A SHORT TO VREF IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) ESM Connector, Harness Side</th><th>(-) ESM Connector, Harness Side</th></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 DM12. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side							
MAP - Pin 3	VREF - Pin 2							
DM12	CHECK THE MAP CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) ESM Connector, Harness Side</th><th>(-) ESM Connector, Harness Side</th></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 DM13. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side							
MAP - Pin 3	VPWR - Pin 4							
DM13	INDUCE THE OPPOSITE MAP SENSOR VOLTAGE TO SIMULATE A 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 ON, engine OFF. - Access the PCM and monitor the MAP 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 INSTALL a new ESM. CLEAR the DTCs. REPEAT the self-test. No GO to DM27.		
Point A ESM Connector, Harness Side	Point B ESM Connector, Harness Side							
MAP - Pin 3	SIGRTN - Pin 6							

Manifold Absolute Pressure (MAP) Sensor

DM

Test Step		Results / Action to Take										
DM14	DTCS P0107, P0108 AND P0109: CHECK THE MAP CIRCUIT(S) FOR INTERMITTENT CONCERNS											
	• Key ON, engine OFF. • Access the PCM and monitor the MAP PID. • Carry out a thorough wiggle test on the ESM harness. • Lightly tap on the ESM and wiggle the harness connector to simulate road shock. • Does a sudden change in voltage occur while monitoring the PID?	Yes ISOLATE the concern. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.										
DM15	DTC P0106: MAP RANGE/PERFORMANCE											
	Note: If MAP DTC(s) P0107, P0108 or P0109 are present, diagnose those DTC(s) first. If any mass air flow (MAF) sensor related DTCs are present, diagnose those DTCs prior to diagnosing MAP DTC P0106. Disregard any DTC(s) generated as a result of this test. • Key in OFF position. • ESM connector disconnected. • 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, Component Side</td></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><td>(+) ESM Connector, Component Side</td><td>(-) Vehicle Battery</td></tr><tr><td>MAP - Pin 3</td><td>Negative terminal</td></tr></table> • Is the voltage between 1 - 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 GO to DM19. No GO to DM16.
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											
DM16	CHECK THE MAP CIRCUIT FOR AN OPEN IN THE ESM HARNESS											
	• Key in OFF position. • Remove the jumper wires. • 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></table> • Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) ESM Connector, Harness Side	MAP	MAP - Pin 3	Yes GO to DM17. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.						
(+) PCM Connector, Harness Side	(-) ESM Connector, Harness Side											
MAP	MAP - Pin 3											

Manifold Absolute Pressure (MAP) Sensor

DM

Test Step		Results / Action to Take												
DM17	CHECK THE MAP CIRCUIT FOR A SHORT IN THE ESM HARNESS - Measure the resistance between:<table><tr><th>(+) ESM Connector, Harness Side</th><th>(-) ESM Connector, Harness Side</th></tr><tr><td>MAP - Pin 3</td><td>SIGRTN - Pin 6</td></tr><tr><td>MAP - Pin 3</td><td>VREF - Pin 2</td></tr><tr><td>MAP - Pin 3</td><td>VPWR - Pin 4</td></tr></table> - Are the resistances greater than 10K ohms?	(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side	MAP - Pin 3	SIGRTN - Pin 6	MAP - Pin 3	VREF - Pin 2	MAP - Pin 3	VPWR - Pin 4	Yes GO to DM18 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.				
(+) ESM Connector, Harness Side	(-) ESM Connector, Harness Side													
MAP - Pin 3	SIGRTN - Pin 6													
MAP - Pin 3	VREF - Pin 2													
MAP - Pin 3	VPWR - Pin 4													
DM18	KOEO AND KOER MAP VOLTAGE Note: The MAP PID should change by at least 1.5 volts from key on engine off to key on engine running. - Key in OFF position. - ESM connector connected. - PCM connector connected. - Key ON, engine OFF. - Access the PCM and monitor the MAP PID. - Record the KOEO MAP voltage. - Key ON, engine running. - Access the PCM and monitor the MAP PID. - Record the KOER MAP voltage. - Does the MAP PID value change?	Yes GO to DM19 . No CHECK the MAP hose for freezing or obstructions. If OK, INSTALL a new ESM. CLEAR the DTCs. REPEAT the self-test.												
DM19	COMPARE ACTUAL MAP VOLTAGE TO MAP PID VOLTAGE - 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><tr><td>MAP - Pin 3</td><td>MAP - Pin 3</td></tr></table> - Measure the voltage between:<table><tr><th>(+) ESM Connector, Harness Side</th><th>(-)</th></tr><tr><td>MAP - Pin 3</td><td>Ground</td></tr></table> - Record the actual MAP voltage values at key on engine off, idle, 1,000 and 2,000 RPM. - Access the PCM and monitor the MAP PID. - Record the MAP PID voltage values at key on engine off, idle, 1,000 and 2,000 RPM. - Does the MAP PID voltage stay within 0.5 volt of the actual MAP voltage?	Point A ESM Connector, Harness Side	Point B ESM Connector, Component Side	VREF - Pin 2	VREF - Pin 2	SIGRTN - Pin 6	SIGRTN - Pin 6	MAP - Pin 3	MAP - Pin 3	(+) ESM Connector, Harness Side	(-)	MAP - Pin 3	Ground	Yes The concern is not present at this time. CLEAR the DTCs. REPEAT the self-test. No CARRY OUT a visual inspection. CHECK for loose connections, and damaged or corroded pins. WIGGLE the harness, attempting to RECREATE the concern. CLEAR the DTCs. REPEAT the self-test.
Point A ESM Connector, Harness Side	Point B ESM Connector, Component Side													
VREF - Pin 2	VREF - Pin 2													
SIGRTN - Pin 6	SIGRTN - Pin 6													
MAP - Pin 3	MAP - Pin 3													
(+) ESM Connector, Harness Side	(-)													
MAP - Pin 3	Ground													

Manifold Absolute Pressure (MAP) Sensor

DM

Test Step		Results / Action to Take				
DM20	KOEO AND KOER DTCS P0106, P0107 AND P0108: CHECK THE VOLTAGE BETWEEN VREF AND SIGRTN AT THE MAP SENSOR - MAP Sensor connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) MAP Sensor Con- nector, Harness Side</td><td>(-) MAP Sensor Con- nector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> - Is the voltage between 4.5 - 5.5 V?	(+) MAP Sensor Con- nector, Harness Side	(-) MAP Sensor Con- nector, Harness Side	VREF	SIGRTN	Yes GO to DM22 . No GO to DM21 .
(+) MAP Sensor Con- nector, Harness Side	(-) MAP Sensor Con- nector, Harness Side					
VREF	SIGRTN					
DM21	CHECK FOR VREF VOLTAGE AT THE SENSOR - Measure the voltage between:<table><tr><td>(+) MAP Sensor Con- nector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VREF</td><td>Negative terminal</td></tr></table> - Is the voltage between 4.5 - 5.5 V?	(+) MAP Sensor Con- nector, Harness Side	(-) Vehicle Battery	VREF	Negative terminal	Yes REPAIR the open SIGRTN circuit. CLEAR the DTCs. REPEAT the self-test. No GO to Pinpoint Test C.
(+) MAP Sensor Con- nector, Harness Side	(-) Vehicle Battery					
VREF	Negative terminal					
DM22	CHECK MAP SIGNAL VOLTAGE AT THE SENSOR - Measure the voltage between:<table><tr><td>(+) MAP Sensor Con- nector, Harness Side</td><td>(-) MAP Sensor Con- nector, Harness Side</td></tr><tr><td>MAP</td><td>SIGRTN</td></tr></table> - Is the voltage between 4.5 - 5.5 V?	(+) MAP Sensor Con- nector, Harness Side	(-) MAP Sensor Con- nector, Harness Side	MAP	SIGRTN	Yes GO to DM24 . No GO to DM23 .
(+) MAP Sensor Con- nector, Harness Side	(-) MAP Sensor Con- nector, Harness Side					
MAP	SIGRTN					
DM23	CHECK THE MAP CIRCUIT(S) FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) MAP Sensor Con- nector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>MAP</td><td>MAP</td></tr></table> - Is the resistance less than 5 ohms?	(+) MAP Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side	MAP	MAP	Yes GO to DM24 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) MAP Sensor Con- nector, Harness Side	(-) PCM Connector, Harness Side					
MAP	MAP					

Manifold Absolute Pressure (MAP) Sensor

DM

Test Step		Results / Action to Take								
DM24	CHECK THE MAP CIRCUIT FOR A SHORT TO VOLTAGE OR SIGRTN IN THE HARNESS - 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>MAP</td><td>VREF</td></tr><tr><td>MAP</td><td>SIGRTN</td></tr><tr><td>MAP</td><td>VPWR</td></tr></table> - Are the resistances greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	MAP	VREF	MAP	SIGRTN	MAP	VPWR	Yes GO to DM25 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
MAP	VREF									
MAP	SIGRTN									
MAP	VPWR									
DM25	INDUCE THE OPPOSITE SIGNAL - PCM connector connected. - 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, Harness Side</th></tr><tr><td>MAP</td><td>SIGRTN</td></tr></table> - Access the PCM and monitor the MAP 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. REPEAT the self-test. No GO to DM27 .				
Point A MAP Sensor Connector, Harness Side	Point B MAP Sensor Connector, Harness Side									
MAP	SIGRTN									
DM26	DTCS P0107, P0108 AND P0109: CHECK THE MAP CIRCUIT(S) FOR INTERMITTENT CONCERNS - Key ON, engine OFF. - Access the PCM and monitor the MAP PID. - Carry out a thorough wiggle test on the MAP harness. - Lightly tap on the MAP and wiggle the harness connector to simulate road shock. - Does a sudden change in voltage occur while monitoring the PID?	Yes GO to DM20 . No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.								
DM27	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.								

DM24-DM27

Test DP: Output Shaft Speed (OSS) Sensor/Vehicle Speed Sensor (VSS)/Transfer Case Speed Sensor (TCSS)

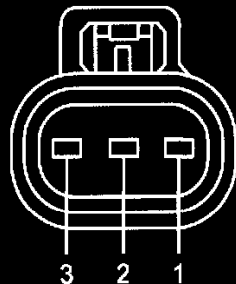
PINPOINT TEST DP: OUTPUT SHAFT SPEED (OSS) SENSOR/VEHICLE SPEED SENSOR (VSS)/TRANSFER CASE SPEED SENSOR (TCSS)

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

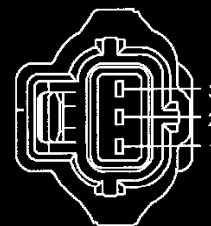
 **WARNING:** Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.

This pinpoint test is intended to diagnose the following:

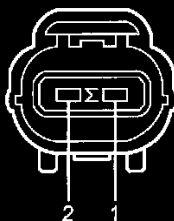
- OSS/VSS/TCSS (7F293/7M101/7H103)
- harness circuits: OSS/VSS, TCSS, and SIGRTN
- powertrain control module (PCM) (12A650)

**Output Shaft Sensor/Vehicle Speed Sensor
(OSS/VSS) Connector****A**

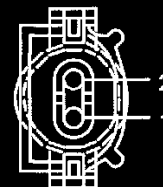
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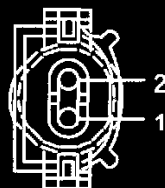
D

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Warning And Output Shaft Sensor/Vehicle Speed Sensor (OSS/VSS) Connector

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

Vehicle	Connector	Pin	Circuit
F-Super Duty	A	3 2 1	SIGRTN OSS/VSS VPWR
Focus	B	2 1 3	OSS/VSS PWRGND VPWR
Fusion 2.3L, Milan 2.3L	C	2 1	SIGRTN OSS/VSS
Mustang	D	2 1	SIGRTN OSS/VSS
All other vehicles	D	1 2	SIGRTN OSS/VSS

Transfer Case Speed Sensor (TCSS) Connector

A0077536

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

Powertrain Control Module (PCM) Connector

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

Output Shaft Speed (OSS) Sensor/Vehicle Speed Sensor (VSS)/Transfer Case Speed Sensor (TCSS)

DP

Vehicle	Connector	Pin	Circuit
Escape/Mariner	150 (50-50-50) Pin	B35 B47, B48, B49, B50 B41, E41, T41 T4	VPWR PWRGND SIGRTN OSS/VSS
F-150 4.2L	190 Pin	B51 B67, B68, B69, B70 B58, E58, T43 T14	VPWR PWRGND SIGRTN OSS/VSS
F-Super Duty, Mustang, Ranger	170 Pin	B35 B47, B48, B49, B50 B41, E58, T41 T3	VPWR PWRGND SIGRTN OSS/VSS
Focus	190 Pin	B67 B69, B70 B58, E64, T40 T2	VPWR PWRGND SIGRTN OSS/VSS
Fusion, Milan	140 Pin	B51 B67, B68, B69 B58, E58 B65	VPWR PWRGND SIGRTN OSS/VSS
All other vehicles	190 Pin	B51 T16 B67, B68, B69, B70 B58, E58, T43	VPWR TCSS PWRGND SIGRTN

Test Step		Results / Action to Take
DP1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTC)	Yes For DTCs P0500, P0503, P1500, P1501 or P1502, with manual shift transfer case, GO to DP16 . For DTCs P0500, P0720, P0721, P0722, P0723, P1502 or P1900, with a manual transmission or an electronic shift transfer case, GO to DP2 . For DTCs P0503 or P1500, with a manual transmission or an electronic shift transfer case, GO to DP13 . For DTC P1501, with a manual transmission or an electronic shift transfer case, GO to DP12 . No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
	Note: For vehicles with automatic transmission and output shaft speed (OSS) sensor DTC's, refer to Diagnostic Trouble Code (DTC) Charts. Are DTCs P0500, P0503, P0720, P0721, P0722, P0723, P1500, P1501, P1502 or P1900 present?	

Output Shaft Speed (OSS) Sensor/Vehicle Speed Sensor (VSS)/Transfer Case Speed Sensor (TCSS)

DP

Test Step		Results / Action to Take			
DP2	DTCS P0500, P0720, P0721, P0722, P0723, P1502 AND P1900: VERIFY THE DRIVE CYCLE	Yes GO to DP3. No GO to DP4.			
	- Access the PCM and monitor the OSS/VSS sensor 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?				
DP3	VISUAL INSPECTION	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to Pinpoint Test Z.			
	- OSS/VSS connector disconnected. - Inspect the OSS/VSS harness for damage. - Inspect the OSS/VSS vehicle harness connector for damage and proper seating. - If possible, carry out a wiggle test. - Is a concern present?				
DP4	VERIFY THE TYPE OF OSS/VSS SENSOR	Yes GO to DP5. No GO to DP7.			
	Note: The variable reluctance (VR) sensors have 2-wire connectors, Hall-effect sensors have 3-wire connectors. - Key in OFF position. - Inspect for a Hall-effect or a VR type of OSS/VSS sensor. - Is this a Hall-effect type OSS/VSS sensor?				
DP5	CHECK VOLTAGE TO THE OSS/VSS SENSOR	Yes GO to DP6. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.			
	- Key in OFF position. - OSS/VSS connector disconnected. - Key ON, engine OFF. - Measure the voltage between: <table><tr><td>(+) OSS/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 V?		(+) OSS/VSS Connector, Harness Side	(-) Vehicle Battery	VPWR
(+) OSS/VSS Connector, Harness Side	(-) Vehicle Battery				
VPWR	Negative terminal				
DP6	CHECK THE VPWR GROUND TO THE OSS/VSS SENSOR	Yes GO to DP7. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.			
	- Key in OFF position. - Measure the resistance between: <table><tr><td>(+) OSS/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?		(+) OSS/VSS Connector, Harness Side	(-) Vehicle Battery	PWRGND
(+) OSS/VSS Connector, Harness Side	(-) Vehicle Battery				
PWRGND	Negative terminal				

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

Test Step		Results / Action to Take								
DP7	CHECK THE OSS/VSS CIRCUIT FOR A SHORT TO VREF AND VOLTAGE IN THE HARNESS • Key ON, engine OFF. • OSS/VSS connector disconnected. • Measure the voltage between:<table><tr><td>(+) OSS/VSS Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>OSS/VSS</td><td>Negative terminal</td></tr></table> • Is the voltage less than 1 V?	(+) OSS/VSS Connector, Harness Side	(-) Vehicle Battery	OSS/VSS	Negative terminal	Yes GO to DP8. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.				
(+) OSS/VSS Connector, Harness Side	(-) Vehicle Battery									
OSS/VSS	Negative terminal									
DP8	CHECK THE OSS/VSS CIRCUIT(S) FOR AN OPEN IN THE HARNESS Note: Hall-effect sensors are not equipped with a SIGRTN circuit. Disregard the SIGRTN measurement. • Key in OFF position. • PCM connector disconnected. • OSS/VSS connector disconnected. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) OSS/VSS Connector, Harness Side</td></tr><tr><td>OSS/VSS</td><td>OSS/VSS</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr><tr><td>PWRGND</td><td>PWRGND</td></tr></table> • Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) OSS/VSS Connector, Harness Side	OSS/VSS	OSS/VSS	SIGRTN	SIGRTN	PWRGND	PWRGND	Yes GO to DP9. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) OSS/VSS Connector, Harness Side									
OSS/VSS	OSS/VSS									
SIGRTN	SIGRTN									
PWRGND	PWRGND									
DP9	CHECK THE OSS/VSS CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS • Measure the resistance between:<table><tr><td>(+) OSS/VSS Connector, Harness Side</td><td>(-) OSS/VSS Connector, Harness Side</td></tr><tr><td>OSS/VSS</td><td>PWRGND</td></tr></table> • Is the resistance greater than 10K ohms?	(+) OSS/VSS Connector, Harness Side	(-) OSS/VSS Connector, Harness Side	OSS/VSS	PWRGND	Yes For Hall-effect sensors, GO to DP10. For VR sensors, GO to DP11. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.				
(+) OSS/VSS Connector, Harness Side	(-) OSS/VSS Connector, Harness Side									
OSS/VSS	PWRGND									

Output Shaft Speed (OSS) Sensor/Vehicle Speed Sensor (VSS)/Transfer Case Speed Sensor (TCSS)

DP

Test Step		Results / Action to Take				
DP10	CHECK THE OSS/VSS SIGNAL OUTPUT TO THE PCM, HALL-EFFECT TYPE SENSOR Note: The opposite wheel must be held stationary. - PCM connector disconnected. - Raise the vehicle to allow for the rotation of the front drive wheels. - Key ON, engine OFF. - Transmission gear selector in NEUTRAL. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>OSS/VSS</td><td>PWRGND</td></tr></table> - The voltage should rise above 5 volts and fall below 1 volt in a regular cycle. Observe several cycles. - Does the OSS/VSS output voltage rise and fall as specified?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	OSS/VSS	PWRGND	Yes GO to DP22. No REMOVE the OSS/VSS sensor and inspect the target wheel. REPAIR as necessary. If OK, INSTALL a new OSS/VSS sensor. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side					
OSS/VSS	PWRGND					
DP11	CHECK THE RESISTANCE OF THE OSS/VSS SENSOR - Measure the resistance between:<table><tr><td>(+) OSS/VSS Connector, Component Side</td><td>(-) OSS/VSS Connector, Component Side</td></tr><tr><td>OSS/VSS</td><td>SIGRTN</td></tr></table> - Is the resistance between 170 - 270 ohms (VSS) or 400 - 1.25K ohms (OSS)?	(+) OSS/VSS Connector, Component Side	(-) OSS/VSS Connector, Component Side	OSS/VSS	SIGRTN	Yes GO to DP22. No REMOVE the OSS/VSS sensor and inspect the target wheel. REPAIR as necessary. If OK, INSTALL a new OSS/VSS sensor. CLEAR the DTCs. REPEAT the self-test.
(+) OSS/VSS Connector, Component Side	(-) OSS/VSS Connector, Component Side					
OSS/VSS	SIGRTN					
DP12	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 concern at this time. REFER to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions for possible causes and additional DTC description information. If DTC P1501 still exists, GO to Pinpoint Test Z. No GO to DP15.				

Output Shaft Speed (OSS) Sensor/Vehicle Speed Sensor (VSS)/Transfer Case Speed Sensor (TCSS)

DP

Test Step		Results / Action to Take
DP13	DTCS P0503 AND P1500: INSPECT THE VSS AND THE CIRCUIT FOR AN INTERMITTENT	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DP14 .
	- 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?	
DP14	CHECK THE PCM VSS PID FOR AN INPUT SIGNAL	Yes GO to DP15 . No Unable to duplicate or identify the concern at this time. REPAIR any other DTCs. RETURN to Symptom Charts for further direction.
	Note: For scan tools which have a data record feature, record the data for future playback to help identify any variations. - Access the PCM and monitor the VSS PID. - Drive the vehicle at several steady state speeds above and below 50 km/h (30 mph). Are there any indicators of a noisy or intermittent signal with the VSS PID?	
DP15	CHECK THE VSS HARNESS ROUTING	Yes REPAIR as necessary. No Unable to duplicate or identify the concern at this time. REFER to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions for possible causes and additional DTC description information. GO to Pinpoint Test Z.
	Note: Refer to Pinpoint Test Schematic and Connectors at the beginning of this pinpoint test. - 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. Is a concern present?	
DP16	DTCS P0500, P0503, P1500, P1501 AND P1502: VISUAL INSPECTION OF TCSS	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DP17 .
	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?	

Output Shaft Speed (OSS) Sensor/Vehicle Speed Sensor (VSS)/Transfer Case Speed Sensor (TCSS)

DP

Test Step		Results / Action to Take						
DP17	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 - 1.25K ohms?	(+) TCSS Connector, Component Side	(-) TCSS Connector, Component Side	SIGRTN - Pin 1	TCSS - Pin 2	Yes GO to DP18. No INSTALL a new TCSS. CLEAR the DTCs. REPEAT the self-test.		
(+) TCSS Connector, Component Side	(-) TCSS Connector, Component Side							
SIGRTN - Pin 1	TCSS - Pin 2							
DP18	CHECK THE TCSS SENSOR OUTPUT Note: The opposite wheel must be held stationary. - With the vehicle in NEUTRAL and the parking brake off, position it on a hoist. Refer to Maintenance/Service and Repair, Jacking and Lifting for the locations of the lifting points. - Raise the vehicle. - 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. - 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 DP19. No REMOVE the TCSS and inspect the target wheel. REPAIR as necessary. If OK, INSTALL a new TCSS sensor. CLEAR the DTCs. REPEAT the self-test.		
(+) TCSS Connector, Component Side	(-) TCSS Connector, Component Side							
SIGRTN - Pin 1	TCSS - Pin 2							
DP19	CHECK THE TCSS CIRCUIT(S) FOR A SHORT TO GROUND AND VOLTAGE IN THE HARNESS - Key ON, engine OFF. - 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 GO to DP20. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) TCSS Connector, Harness Side	(-)							
TCSS - Pin 2	Ground							
DP20	CHECK THE 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>(-) 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 DP21. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) TCSS Connector, Harness Side							
TCSS	TCSS - Pin 2							
SIGRTN	SIGRTN - Pin 1							

Output Shaft Speed (OSS) Sensor/Vehicle Speed Sensor (VSS)/Transfer Case Speed Sensor (TCSS)

DP

Test Step		Results / Action to Take								
DP21	CHECK THE HARNESS FOR A SHORT TO GROUND - Measure the resistance between: <table border="1"> <tr> <td>(+) TCSS Connector, Harness Side</td> <td>(-) TCSS Connector, Harness Side</td> </tr> <tr> <td>SIGRTN - Pin 1</td> <td>TCSS - Pin 2</td> </tr> </table> - Measure the resistance between: <table border="1"> <tr> <td>(+) TCSS Connector, Harness Side</td> <td>(-)</td> </tr> <tr> <td>TCSS - Pin 2</td> <td>Ground</td> </tr> </table> - Are the resistances greater than 10K ohms?	(+) TCSS Connector, Harness Side	(-) TCSS Connector, Harness Side	SIGRTN - Pin 1	TCSS - Pin 2	(+) TCSS Connector, Harness Side	(-)	TCSS - Pin 2	Ground	Yes GO to DP22. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) TCSS Connector, Harness Side	(-) TCSS Connector, Harness Side									
SIGRTN - Pin 1	TCSS - Pin 2									
(+) TCSS Connector, Harness Side	(-)									
TCSS - Pin 2	Ground									
DP22	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.								

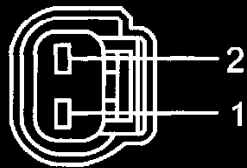
DP21-DP22

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

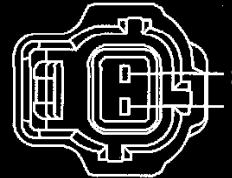
Camshaft Position (CMP) Sensor**DR**

This pinpoint test is intended to diagnose the following:

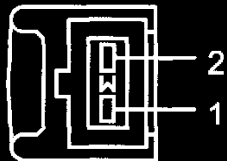
- camshaft position (CMP) sensor (6B288)
- harness circuits: CMP, CMP2, SIGRTN, VBPWR, VRSRTN, and VRSRTN2
- powertrain control module (PCM) (12A650)

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

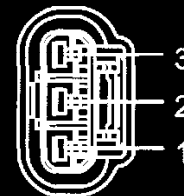
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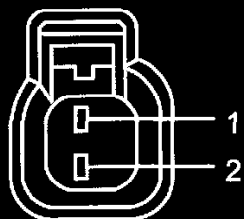
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N0002293

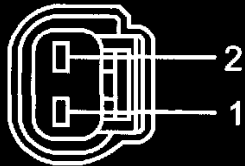
Description And Camshaft Position (CMP) Sensor Connector

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

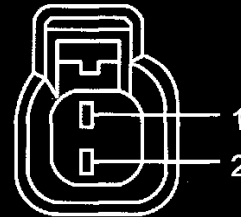
A0077525

Vehicle	Connector	Pin	Circuit
Edge, Expedition, F-150 4.6L, F-150 5.4L, Mark LT, MKX, MKZ, Navigator, Sable, Taurus, Taurus X	A	1 2	VRSRTN CMP
Escape/Mariner 2.3L, Ranger 2.3L	B	1 2	SIGRTN CMP
Explorer 4.0L, Explorer Sport Trac 4.0L, Mountaineer 4.0L, Mustang 4.0L, Ranger 4.0L	C	2 1	SIGRTN CMP
Fusion 2.3L, Milan 2.3L	D	1 3 2	VBPWR SIGRTN CMP
Fusion 3.0L, Milan 3.0L	E	2 1	VRSRTN CMP
F-150 4.2L	D	3 1 2	PWRGND VPWR CMP
Focus	F	1 3 2	VBPWR SIGRTN CMP
All other vehicles	A	1 2	SIGRTN CMP

Camshaft Position (CMP) Sensor Connector Continued

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

A0077505

B

A0077525

Vehicle	Connector	Pin	Circuit
Edge, MKX, MKZ, Sable, Taurus, Taurus X	A	1 2	VRSRTN CMP2
Expedition, F-150 5.4L, Mark LT, Navigator	A	1 2	VRSRTN2 CMP2
Fusion 3.0L, Milan 3.0L	B	2 1	VRSRTN CMP2
All other vehicles	A	1 2	SIGRTN CMP2

Powertrain Control Module (PCM) Connector

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

Camshaft Position 2 (CMP2) Sensor Connector And Powertrain Control Module (PCM) Connector

Camshaft Position (CMP) Sensor

DR

Vehicle	Connector	Pin	Circuit
Edge, MKX, Sable, Taurus, Taurus X	190 Pin	E44 E42 E45	CMP2 VRSRTN CMP
Escape/Mariner	150 (50-50-50) Pin	E41 E25	SIGRTN CMP
Expedition, Navigator	140 Pin	E5 E44 E4 E45	VRSRTN2 CMP2 VRSRTN CMP
Explorer 4.6L, Explorer Sport Trac 4.6L, F-Super Duty 5.4L, Mountaineer 4.6L, Mustang 4.6L	170 Pin	E44 E58 E45	CMP2 SIGRTN CMP
F-150 4.6L	190 Pin	E4 E45	VRSRTN CMP
F-150 4.2L	190 Pin	E45	CMP
F-150 5.4L, Mark LT	190 Pin	E5 E44 E4 E45	VRSRTN2 CMP2 VRSRTN CMP
Focus	190 Pin	E64 E8	SIGRTN CMP
Fusion 3.0L, Milan 3.0L, MKZ	140 Pin	E44 E33 E45	CMP2 VRSRTN CMP
Fusion 2.3L, Milan 2.3L	140 Pin	E58 E45	SIGRTN CMP
All other vehicles	170 Pin	E58 E45	SIGRTN CMP

Test Step		Results / Action to Take
DR1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	Yes For DTCs P0340, P0344, P0345 or P0349, GO to DR2 . No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
	Are DTCs P0340, P0344, P0345, or P0349 present?	
DR2	CONTINUOUS MEMORY DTCs P0340, P0344, P0345 AND P0349: CHECK IF THE ENGINE STARTS	Yes GO to DR3 . No RETURN to Symptom Charts for further direction.
	- Attempt to start the engine. - Does the engine start?	

DR1-DR2

Camshaft Position (CMP) Sensor

DR

Test Step		Results / Action to Take
DR3	CLEAR AND ATTEMPT TO RETRIEVE THE DTC	
	Note: If DTCs P0340, P0344, P0345, or P0349 are present, ignition, alternator noise, RFI and CKP concerns should be considered. Note: For vehicles with variable camshaft timing (VCT), concerns with the engine oil level, oil filter, oil contamination, or the VCT system may cause camshaft positioning errors. • Key ON, engine OFF. • 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, P0344, P0345 or P0349 present?	Yes GO to DR4. No GO to Pinpoint Test Z.
DR4	CHECK THE GENERATOR FOR EXCESSIVE ELECTRICAL NOISE	
	Note: If the generator/regulator is electrically noisy, the noise decreases when the B+ connector is disconnected. • PCM connector connected. • CMP Sensor connector connected. • Key ON, engine running. • Monitor the generator for an audible electric noise. • Key in OFF position. • Generator/regulator B+ connector disconnected. • Key ON, engine running. • With the engine running, determine if the generator is still noisy. • Does the noise remain constant when the B+ connector is disconnected?	Yes For continuous memory DTCs P0340 or P0344, GO to DR5. For continuous memory DTCs P0345 or P0349, GO to DR13. No REFER to Charging System to diagnose the generator is noisy symptom.
DR5	DETERMINE THE CMP SENSOR PHYSICAL TYPE	
	• Key in OFF position. • Is the CMP sensor a synchronizer (gear driven) type?	Yes GO to DR6. No GO to DR7.
DR6	VERIFY THE CORRECT INSTALLATION OF THE CMP SENSOR	
	Note: 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. • Is the CMP sensor installed correctly?	Yes GO to DR7. No INSTALL the CMP sensor correctly. CLEAR the DTCs. REPEAT the self-test.

Camshaft Position (CMP) Sensor

DR

Test Step		Results / Action to Take																											
DR7	DETERMINE THE CMP SENSOR ELECTRONIC TYPE Note: The variable reluctance (VR) sensors have 2-wire connectors, Hall-effect sensors have 3-wire connectors. Is the CMP sensor a VR type?	Yes GO to DR8 . No The CMP sensor is a Hall-effect type. GO to DR19 .																											
DR8	CONTINUOUS MEMORY DTCS P0340 AND P0344: CHECK THE CMP SENSOR RESISTANCE - Key in OFF position. - CMP Sensor connector disconnected. - Measure the resistance between: <table border="1"><thead><tr><th>(+) CMP Sensor Con- nector, Component Side</th><th>(-) CMP Sensor Con- nector, Component Side</th></tr></thead><tbody><tr><td>CMP</td><td>SIGRTN</td></tr><tr><td>CMP</td><td>VRSRTN</td></tr></tbody></table> <table border="1"><thead><tr><th>Vehicle</th><th>Minimum Resistance (ohms)</th><th>Maximum Resistance (ohms)</th></tr></thead><tbody><tr><td>Edge, MKX</td><td>586</td><td>2,033</td></tr><tr><td>F-150 4.6L</td><td>1,978</td><td>5,590</td></tr><tr><td>F-150, Mark LT</td><td>205</td><td>579</td></tr><tr><td>MKZ</td><td>586</td><td>2,033</td></tr><tr><td>Taurus, Taurus X, Sable</td><td>586</td><td>2,033</td></tr><tr><td>All others</td><td>250</td><td>1,000</td></tr></tbody></table> - Is the resistance within specification?	(+) CMP Sensor Con- nector, Component Side	(-) CMP Sensor Con- nector, Component Side	CMP	SIGRTN	CMP	VRSRTN	Vehicle	Minimum Resistance (ohms)	Maximum Resistance (ohms)	Edge, MKX	586	2,033	F-150 4.6L	1,978	5,590	F-150, Mark LT	205	579	MKZ	586	2,033	Taurus, Taurus X, Sable	586	2,033	All others	250	1,000	Yes GO to DR9 . No INSTALL a new CMP sensor. CLEAR the DTCs. REPEAT the self-test.
(+) CMP Sensor Con- nector, Component Side	(-) CMP Sensor Con- nector, Component Side																												
CMP	SIGRTN																												
CMP	VRSRTN																												
Vehicle	Minimum Resistance (ohms)	Maximum Resistance (ohms)																											
Edge, MKX	586	2,033																											
F-150 4.6L	1,978	5,590																											
F-150, Mark LT	205	579																											
MKZ	586	2,033																											
Taurus, Taurus X, Sable	586	2,033																											
All others	250	1,000																											
DR9	CHECK THE CMP CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - PCM connector disconnected. - Key ON, engine OFF. - Measure the voltage between: <table border="1"><thead><tr><th>(+) CMP Sensor Con- nector, Harness Side</th><th>(-) Vehicle Battery</th></tr></thead><tbody><tr><td>CMP</td><td>Negative terminal</td></tr></tbody></table> - Is the voltage less than 1 V?	(+) CMP Sensor Con- nector, Harness Side	(-) Vehicle Battery	CMP	Negative terminal	Yes GO to DR10 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.																							
(+) CMP Sensor Con- nector, Harness Side	(-) Vehicle Battery																												
CMP	Negative terminal																												

Camshaft Position (CMP) Sensor

DR

Test Step		Results / Action to Take														
DR10	CHECK THE CMP AND SIGRTN OR VRSRTN CIRCUITS FOR AN OPEN IN THE HARNESS - Key in OFF position. - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) CMP Sensor Connector, Harness Side</th></tr><tr><td>CMP</td><td>CMP</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr><tr><td>VRSRTN</td><td>VRSRTN</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) CMP Sensor Connector, Harness Side	CMP	CMP	SIGRTN	SIGRTN	VRSRTN	VRSRTN	Yes GO to DR11 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.						
(+) PCM Connector, Harness Side	(-) CMP Sensor Connector, Harness Side															
CMP	CMP															
SIGRTN	SIGRTN															
VRSRTN	VRSRTN															
DR11	CHECK FOR A SHORT IN THE HARNESS BETWEEN THE PCM AND THE CMP SENSOR - Measure the resistance between:<table><tr><th>(+) CMP Sensor Connector, Harness Side</th><th>(-) CMP Sensor Connector, Harness Side</th></tr><tr><td>CMP</td><td>SIGRTN</td></tr><tr><td>CMP</td><td>VRSRTN</td></tr></table> - Measure the resistance between:<table><tr><th>(+) CMP Sensor Connector, Harness Side</th><th>(-) Vehicle Battery</th></tr><tr><td>CMP</td><td>Negative terminal</td></tr><tr><td>SIGRTN</td><td>Negative terminal</td></tr><tr><td>VRSRTN</td><td>Negative terminal</td></tr></table> - Are the resistances greater than 10K ohms?	(+) CMP Sensor Connector, Harness Side	(-) CMP Sensor Connector, Harness Side	CMP	SIGRTN	CMP	VRSRTN	(+) CMP Sensor Connector, Harness Side	(-) Vehicle Battery	CMP	Negative terminal	SIGRTN	Negative terminal	VRSRTN	Negative terminal	Yes GO to DR12 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) CMP Sensor Connector, Harness Side	(-) CMP Sensor Connector, Harness Side															
CMP	SIGRTN															
CMP	VRSRTN															
(+) CMP Sensor Connector, Harness Side	(-) Vehicle Battery															
CMP	Negative terminal															
SIGRTN	Negative terminal															
VRSRTN	Negative terminal															

Camshaft Position (CMP) Sensor**DR**

Test Step		Results / Action to Take						
DR12	CHECK THE CMP SENSOR OUTPUT • Key in OFF position. • Generator/regulator B+ connector connected. • CMP Sensor connector disconnected. • Key ON, engine running. • Digital multimeter (DMM) on low voltage AC scale. • Measure the voltage between: <table border="1"><tr><th>(+) CMP Sensor Con- nector, Component Side</th><th>(-) CMP Sensor Con- nector, Component Side</th></tr><tr><td>CMP</td><td>SIGRTN</td></tr><tr><td>CMP</td><td>VRSRTN</td></tr></table> • Run the engine at approximately 2,500 RPM. • Is the voltage greater than 0.25 V?	(+) CMP Sensor Con- nector, Component Side	(-) CMP Sensor Con- nector, Component Side	CMP	SIGRTN	CMP	VRSRTN	Yes For Edge, Expedition, Explorer 4.6L, Explorer Sport Trac 4.6L, F-150 5.4L, F-Super Duty 5.4L, Fusion, Mark LT, Milan, MKX, MKZ, Mountaineer 4.6L, Mustang 4.6L, Navigator, Sable, Taurus, and Taurus X, GO to DR25 . For all others, GO to DR26 . No INSTALL a new CMP sensor.
(+) CMP Sensor Con- nector, Component Side	(-) CMP Sensor Con- nector, Component Side							
CMP	SIGRTN							
CMP	VRSRTN							
		CLEAR the DTCs. REPEAT the self-test.						

Camshaft Position (CMP) Sensor

DR

Test Step		Results / Action to Take																										
DR13	CONTINUOUS MEMORY DTCS P0345 AND P0349: 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><tr><td>CMP2</td><td>VRSRTN</td></tr><tr><td>CMP2</td><td>VRSRTN2</td></tr></table> <table><tr><th>Vehicle</th><th>Minimum Resistance (ohms)</th><th>Maximum Resistance (ohms)</th></tr><tr><td>Edge, MKX</td><td>586</td><td>2,033</td></tr><tr><td>F-150, Mark LT</td><td>205</td><td>579</td></tr><tr><td>MKZ</td><td>586</td><td>2,033</td></tr><tr><td>Taurus, Taurus X, Sable</td><td>586</td><td>2,033</td></tr><tr><td>All others</td><td>250</td><td>1,000</td></tr></table> - Is the resistance value(s) within specifications?	(+) CMP2 Sensor Connector, Component Side	(-) CMP2 Sensor Connector, Component Side	CMP2	SIGRTN	CMP2	VRSRTN	CMP2	VRSRTN2	Vehicle	Minimum Resistance (ohms)	Maximum Resistance (ohms)	Edge, MKX	586	2,033	F-150, Mark LT	205	579	MKZ	586	2,033	Taurus, Taurus X, Sable	586	2,033	All others	250	1,000	Yes GO to DR14. No INSTALL a new CMP2 sensor. CLEAR the DTCs. REPEAT the self-test.
(+) CMP2 Sensor Connector, Component Side	(-) CMP2 Sensor Connector, Component Side																											
CMP2	SIGRTN																											
CMP2	VRSRTN																											
CMP2	VRSRTN2																											
Vehicle	Minimum Resistance (ohms)	Maximum Resistance (ohms)																										
Edge, MKX	586	2,033																										
F-150, Mark LT	205	579																										
MKZ	586	2,033																										
Taurus, Taurus X, Sable	586	2,033																										
All others	250	1,000																										
DR14	CHECK THE CMP2 CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - PCM connector disconnected. - Key ON, engine OFF. - 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 GO to DR15. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.																						
(+) CMP2 Sensor Connector, Harness Side	(-) Vehicle Battery																											
CMP2	Negative terminal																											
DR15	CHECK THE CMP2 AND SIGRTN, VRSRTN, OR VRSRTN2 CIRCUITS FOR AN OPEN IN THE HARNESS - Key in OFF position. - 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><tr><td>VRSRTN</td><td>VRSRTN</td></tr><tr><td>VRSRTN2</td><td>VRSRTN2</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) CMP2 Sensor Connector, Harness Side	CMP2	CMP2	SIGRTN	SIGRTN	VRSRTN	VRSRTN	VRSRTN2	VRSRTN2	Yes GO to DR16. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.																
(+) PCM Connector, Harness Side	(-) CMP2 Sensor Connector, Harness Side																											
CMP2	CMP2																											
SIGRTN	SIGRTN																											
VRSRTN	VRSRTN																											
VRSRTN2	VRSRTN2																											

Camshaft Position (CMP) Sensor**DR**

Test Step		Results / Action to Take																		
DR16	CHECK FOR A SHORT IN THE HARNESS BETWEEN THE PCM AND THE CMP2 SENSOR - Measure the resistance between:<table><tr><th>(+) CMP2 Sensor Connector, Harness Side</th><th>(-) CMP2 Sensor Connector, Harness Side</th></tr><tr><td>CMP2</td><td>SIGRTN</td></tr><tr><td>CMP2</td><td>VRSRTN</td></tr><tr><td>CMP2</td><td>VRSRTN2</td></tr></table> - Measure the resistance between:<table><tr><th>(+) CMP2 Sensor Connector, Harness Side</th><th>(-) Vehicle Battery</th></tr><tr><td>CMP2</td><td>Negative terminal</td></tr><tr><td>SIGRTN</td><td>Negative terminal</td></tr><tr><td>VRSRTN</td><td>Negative terminal</td></tr><tr><td>VRSRTN2</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	VRSRTN	CMP2	VRSRTN2	(+) CMP2 Sensor Connector, Harness Side	(-) Vehicle Battery	CMP2	Negative terminal	SIGRTN	Negative terminal	VRSRTN	Negative terminal	VRSRTN2	Negative terminal	Yes GO to DR17. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) CMP2 Sensor Connector, Harness Side	(-) CMP2 Sensor Connector, Harness Side																			
CMP2	SIGRTN																			
CMP2	VRSRTN																			
CMP2	VRSRTN2																			
(+) CMP2 Sensor Connector, Harness Side	(-) Vehicle Battery																			
CMP2	Negative terminal																			
SIGRTN	Negative terminal																			
VRSRTN	Negative terminal																			
VRSRTN2	Negative terminal																			
DR17	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><th>(+) PCM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></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 DR18. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.														
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side																			
CMP	CMP2																			

Camshaft Position (CMP) Sensor**DR**

Test Step		Results / Action to Take								
DR18	CHECK THE CMP2 SENSOR OUTPUT • Key in OFF position. • Generator/regulator B+ connector connected. • CMP2 Sensor connector disconnected. • Key ON, engine running. • DMM on low voltage AC scale. • Measure the voltage between: <table><tr><th>(+) CMP2 Sensor Con- nector, Component Side</th><th>(-) CMP2 Sensor Con- nector, Component Side</th></tr><tr><td>CMP2</td><td>SIGRTN</td></tr><tr><td>CMP2</td><td>VRSRTN</td></tr><tr><td>CMP2</td><td>VRSRTN2</td></tr></table> • Run the engine at approximately 2,500 RPM. • Is the voltage greater than 0.25 V?	(+) CMP2 Sensor Con- nector, Component Side	(-) CMP2 Sensor Con- nector, Component Side	CMP2	SIGRTN	CMP2	VRSRTN	CMP2	VRSRTN2	Yes For Edge, Expedition, Explorer 4.6L, Explorer Sport Trac 4.6L, F-150 5.4L, F-Super Duty 5.4L, Fusion, Mark LT, Milan, MKX, MKZ, Mountaineer 4.6L, Mustang 4.6L, Navigator, Sable, Taurus, and Taurus X, GO to DR25 . For all others, GO to DR26 . No INSTALL a new CMP2 sensor. CLEAR the DTCs. REPEAT the self-test.
(+) CMP2 Sensor Con- nector, Component Side	(-) CMP2 Sensor Con- nector, Component Side									
CMP2	SIGRTN									
CMP2	VRSRTN									
CMP2	VRSRTN2									
DR19	CONTINUOUS MEMORY DTCS P0340 AND P0344: CHECK THE VOLTAGE TO THE CMP SENSOR • CMP Sensor connector disconnected. • Key ON, engine OFF. • Measure the voltage between: <table><tr><th>(+) CMP Sensor Con- nector, Harness Side</th><th>(-) Vehicle Battery</th></tr><tr><td>VPWR</td><td>Negative terminal</td></tr><tr><td>VBPWR</td><td>Negative terminal</td></tr></table> • Is the voltage greater than 10 V?	(+) CMP Sensor Con- nector, Harness Side	(-) Vehicle Battery	VPWR	Negative terminal	VBPWR	Negative terminal	Yes GO to DR20 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) CMP Sensor Con- nector, Harness Side	(-) Vehicle Battery									
VPWR	Negative terminal									
VBPWR	Negative terminal									

Camshaft Position (CMP) Sensor

DR

Test Step		Results / Action to Take						
DR20	CHECK THE PWRGND OR SIGRTN CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - Measure the voltage between:<table><tr><th>(+) Vehicle Battery</th><th>(-) CMP Sensor Connector, Harness Side</th></tr><tr><td>Positive terminal</td><td>PWRGND</td></tr><tr><td>Positive terminal</td><td>SIGRTN</td></tr></table> - Is the voltage greater than 10 V?	(+) Vehicle Battery	(-) CMP Sensor Connector, Harness Side	Positive terminal	PWRGND	Positive terminal	SIGRTN	Yes GO to DR21 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Vehicle Battery	(-) CMP Sensor Connector, Harness Side							
Positive terminal	PWRGND							
Positive terminal	SIGRTN							
DR21	CHECK THE CMP CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - PCM connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><th>(+) CMP Sensor Connector, Harness Side</th><th>(-) Vehicle Battery</th></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 GO to DR22 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) CMP Sensor Connector, Harness Side	(-) Vehicle Battery							
CMP	Negative terminal							
DR22	CHECK FOR AN OPEN CIRCUIT BETWEEN THE PCM AND CMP SENSOR - Key in OFF position. - CMP Sensor connector disconnected. - Measure the resistance between:<table><tr><th>(+) CMP Sensor Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>CMP</td><td>CMP</td></tr></table> - Is the resistance less than 5 ohms?	(+) CMP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	CMP	CMP	Yes GO to DR23 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) CMP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side							
CMP	CMP							
DR23	CHECK THE CMP CIRCUIT FOR A SHORT TO PWRGND OR SIGRTN 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><th>(+) CMP Sensor Connector, Harness Side</th><th>(-) CMP Sensor Connector, Harness Side</th></tr><tr><td>CMP</td><td>PWRGND</td></tr><tr><td>CMP</td><td>SIGRTN</td></tr></table> - Is the resistance greater than 10K ohms?	(+) CMP Sensor Connector, Harness Side	(-) CMP Sensor Connector, Harness Side	CMP	PWRGND	CMP	SIGRTN	Yes GO to DR24 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) CMP Sensor Connector, Harness Side	(-) CMP Sensor Connector, Harness Side							
CMP	PWRGND							
CMP	SIGRTN							

Camshaft Position (CMP) Sensor

DR

Test Step		Results / Action to Take														
DR24	CHECK THE CMP SENSOR FOR CORRECT OPERATION - PCM connector connected. - Connect a 5 amp fused jumper wire between the following:<table><tr><th>Point A CMP Sensor Connector, Harness Side</th><th>Point B CMP Sensor Connector, Component Side</th></tr><tr><td>VPWR</td><td>VPWR</td></tr><tr><td>VBPWR</td><td>VBPWR</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr><tr><td>PWRGND</td><td>PWRGND</td></tr></table> - Key ON, engine running. - DMM on low voltage DC scale. - Measure the voltage between:<table><tr><th>(+) CMP Sensor Connector, Component Side</th><th>(-) Vehicle Battery</th></tr><tr><td>CMP</td><td>Negative terminal</td></tr></table> - Does the voltage switch between LOW (less than 2 volts DC) and HIGH (greater than 8 volts DC)?	Point A CMP Sensor Connector, Harness Side	Point B CMP Sensor Connector, Component Side	VPWR	VPWR	VBPWR	VBPWR	SIGRTN	SIGRTN	PWRGND	PWRGND	(+) CMP Sensor Connector, Component Side	(-) Vehicle Battery	CMP	Negative terminal	Yes GO to DR26. No INSTALL a new CMP sensor. CLEAR the DTCs. REPEAT the self-test.
Point A CMP Sensor Connector, Harness Side	Point B CMP Sensor Connector, Component Side															
VPWR	VPWR															
VBPWR	VBPWR															
SIGRTN	SIGRTN															
PWRGND	PWRGND															
(+) CMP Sensor Connector, Component Side	(-) Vehicle Battery															
CMP	Negative terminal															
DR25	CHECK THE VARIABLE CAMSHAFT TIMING (VCT) SYSTEM Note: Only diagnose the bank indicated by the DTC. - Check the VCT system for correct operation. - Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DR26.														
DR26	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.														

DR24-DR26

Test DS: Air Conditioning Pressure (ACP) Transducer Sensor

PINPOINT TEST DS: AIR CONDITIONING PRESSURE (ACP) TRANSDUCER SENSOR

Air Conditioning Pressure (ACP) Transducer Sensor

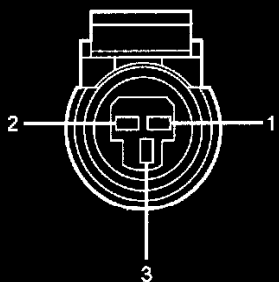
DS

This pinpoint test is intended to diagnose the following:

- ACP transducer sensor (19D594)
- harness circuits: ACP, VREF, SIGRTN
- powertrain control module (PCM) (12A650)

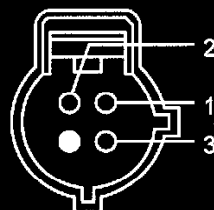
Air Conditioning Pressure (ACP) Transducer Sensor Connector

A



N0025673

B



A0077539

Vehicle	Connector	Pin	Circuit
Edge, Fusion, Milan, MKX, MKZ	A	3 1 2	ACP SIGRTN VREF
All other vehicles	B	3 1 2	ACP SIGRTN VREF

Powertrain Control Module (PCM) Connector

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

Air Conditioning Pressure (ACP) Transducer Sensor

DS

Vehicle	Connector	Pin	Circuit
Crown Victoria, Grand Marquis, Mustang, Town Car	170 Pin	B40, E57 B35 B47 B26	VREF VPWR PWRGND ACP
Expedition, Navigator	140 Pin	E57 B51 B67 B19	VREF VPWR PWRGND ACP
Explorer, Explorer Sport Trac	170 Pin	B40, E57 B35 B47 B18	VREF VPWR PWRGND ACP
F-150	190 Pin	B29, E57 B51 B67 B10	VREF VPWR PWRGND ACP
Focus	190 Pin	B52, B66, E63 B67 B69 B31	VREF VPWR PWRGND ACP
Fusion, Milan, MKZ	140 Pin	B33, E57 B51 B67 B63	VREF VPWR PWRGND ACP
All other vehicles	190 Pin	B29, B64 B51 B67 B37	VREF VPWR PWRGND ACP

Test Step		Results / Action to Take
DS1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	Yes For DTC P0533, P1461, GO to DS2 . For DTC P0532, P1462, GO to DS8 . For DTC P1463, GO to DS17 . No For symptoms without DTCs, GO to DS19 . For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
	Are DTCs P0532, P0533, P1461, P1462, or P1463 present?	

Air Conditioning Pressure (ACP) Transducer Sensor

DS

Test Step		Results / Action to Take			
DS2	DTC P0533, P1461: CHECK THE ACP PID	Yes The ACP transducer sensor voltage is now below maximum. To determine if an intermittent condition exists, GO to DS16 . No GO to DS3 .			
- Key ON, engine OFF. - Access the PCM and monitor the ACP PID. - Is the voltage less than 4.9 V?					
DS3	CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN CIRCUITS AT THE ACP TRANSDUCER SENSOR VEHICLE HARNESS CONNECTOR	Yes GO to DS4 . No GO to Pinpoint Test C.			
- Air Conditioning Pressure (ACP) Transducer Sensor connector disconnected. - Key ON, engine OFF. - Measure the voltage between: <table><tr><td>(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td><td>(-) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> - Is the voltage between 4 - 6 V?			(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	VREF
(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side				
VREF	SIGRTN				
DS4	CHECK THE ACP CIRCUIT FOR A SHORT TO VREF	Yes GO to DS5 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.			
- Key in OFF position. - PCM connector disconnected. - Measure the resistance between: <table><tr><td>(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td><td>(-) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td></tr><tr><td>ACP</td><td>VREF</td></tr></table> - Is the resistance greater than 10K ohms?			(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	ACP
(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side				
ACP	VREF				
DS5	CHECK THE ACP CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS	Yes GO to DS6 . No REPAIR the short circuit to PWR. CLEAR the DTCs. REPEAT the self-test.			
- Key ON, engine OFF. - Measure the voltage between: <table><tr><td>(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>ACP</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?			(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-)	ACP
(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-)				
ACP	Ground				

Air Conditioning Pressure (ACP) Transducer Sensor

DS

Test Step		Results / Action to Take				
DS6	CHECK FOR AN OPEN ACP CIRCUIT IN THE HARNESS - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>ACP</td><td>ACP</td></tr></table> - Is the resistance less than 5 ohms?	(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	ACP	ACP	Yes GO to DS7. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) PCM Connector, Harness Side					
ACP	ACP					
DS7	CHECK THE PCM - PCM connector connected. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td><td>Point B Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td></tr><tr><td>ACP</td><td>SIGRTN</td></tr></table> - Key ON, engine OFF. - Access the PCM and monitor the ACP PID. - Is the voltage less than 4.9 V?	Point A Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	Point B Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	ACP	SIGRTN	Yes INSTALL a new Air Conditioning Pressure (ACP) Transducer Sensor. CLEAR the DTCs. REPEAT the self-test. No GO to DS23.
Point A Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	Point B Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side					
ACP	SIGRTN					
DS8	DTC P0532, P1462: CHECK THE ACP PID - Key ON, engine OFF. - Access the PCM and monitor the ACP PID. - Is the voltage greater than 0.15 V?	Yes The ACP transducer sensor voltage is now above the minimum. To determine if an intermittent condition exists, GO to DS16. No GO to DS9.				
DS9	CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN CIRCUITS AT THE ACP TRANSDUCER SENSOR VEHICLE HARNESS CONNECTOR - Air Conditioning Pressure (ACP) Transducer Sensor connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td><td>(-) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> - Is the voltage between 4 - 6 V?	(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	VREF	SIGRTN	Yes GO to DS10. No GO to Pinpoint Test C.
(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side					
VREF	SIGRTN					

Air Conditioning Pressure (ACP) Transducer Sensor

DS

Test Step		Results / Action to Take				
DS10	SIMULATE AN OPPOSITE SIGNAL TO THE PCM - Key in OFF position. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td><td>Point B Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>ACP</td></tr></table> - Key ON, engine OFF. - Access the PCM and monitor the ACP PID. - Is the voltage greater than 4 V?	Point A Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	Point B Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	VREF	ACP	Yes INSTALL a new Air Conditioning Pressure (ACP) Transducer Sensor. CLEAR the DTCs. REPEAT the self-test. No GO to DS11 .
Point A Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	Point B Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side					
VREF	ACP					
DS11	CHECK THE ACP CIRCUIT FOR A SHORT TO GND - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td><td>(-)</td></tr><tr><td>ACP</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-)	ACP	Ground	Yes GO to DS12 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-)					
ACP	Ground					
DS12	CHECK THE ACP CIRCUIT FOR A SHORT TO SIGRTN - Measure the resistance between:<table><tr><td>(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td><td>(-) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td></tr><tr><td>ACP</td><td>SIGRTN</td></tr></table> - Is the resistance greater than 10K ohms?	(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	ACP	SIGRTN	Yes GO to DS13 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side					
ACP	SIGRTN					
DS13	CHECK THE ACP CIRCUIT(S) FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>ACP</td><td>ACP</td></tr></table> - Is the resistance less than 5 ohms?	(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	ACP	ACP	Yes GO to DS14 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) PCM Connector, Harness Side					
ACP	ACP					

Air Conditioning Pressure (ACP) Transducer Sensor

DS

Test Step		Results / Action to Take
DS14	CHECK FOR THE A/C CLUTCH TO ENGAGE	Yes GO to DS23 . No GO to DS15 .
	- PCM connector connected. - Air Conditioning Pressure (ACP) Transducer Sensor connector connected. - Key ON, engine running. - While listening for the A/C clutch to engage, turn the A/C on. Repeat if necessary. Does the A/C engage when the A/C is turned on?	
DS15	VERIFY THE A/C SYSTEM FUNCTION, INCLUDING THE REFRIGERANT CHARGE	Yes GO to DS23 . No REFER to Heating and Air Conditioning, Climate Control System and diagnose the air conditioning (A/C) is inoperative/does not operate correctly symptom.
	- Restore the vehicle. - Verify the A/C system function, including the refrigerant charge. Refer to Heating and Air Conditioning, Climate Control System. Does the A/C system have the correct refrigerant charge and if so does the A/C system function correctly?	
DS16	CHECK THE ACP CIRCUIT FOR AN INTERMITTENT CONCERN	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.
	Note: A concern is indicated by a sudden change in voltage. - Key ON, engine OFF. - Access the PCM and monitor the ACP PID. - Observe the ACP PID for an indication of a concern while carrying out the following: - Shake, wiggle, and bend the ACP, SIGRTN, and VREF wires between the ACP sensor and PCM - Lightly tap on the ACP transducer sensor to simulate road shock Is a concern present?	
DS17	DTC P1463: VERIFY THE A/C CLUTCH CAN DISENGAGE	Yes GO to DS18 . No REFER to Heating and Air Conditioning, Climate Control System and diagnose the air conditioning (A/C) is always on symptom.
	- Turn the A/C and defroster OFF. - Key ON, engine running. - Verify the A/C clutch can disengage. Is the A/C clutch disengaged?	

Air Conditioning Pressure (ACP) Transducer Sensor

DS

Test Step		Results / Action to Take
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. • Key in OFF position. • 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 voltage 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. • Connect 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, Climate Control System and diagnose the air conditioning (A/C) is inoperative/does not operate correctly symptom.
DS19	DETERMINE IF A SUFFICIENT A/C PRESSURE CHANGE CAN BE DETECTED BY THE ACP PID	
	• Key ON, engine running. • Turn the A/C and defroster OFF. • Access the PCM and monitor the ACP PID. • Turn the A/C and defroster OFF. • Five seconds after A/C clutch engagement, note the voltage. If the clutch does not engage, follow the NO answer instructions. • Does the PCM-ACP PID change more than 0.3 volt within 5 seconds of clutch engagement?	Yes The ACP transducer sensor and the PCM can detect a sufficient change in the A/C pressure. For symptom without DTC P1463, REFER to Symptom Charts. For all others, REFER to Heating and Air Conditioning, Climate Control System and diagnose the air conditioning (A/C) is inoperative/does not operate correctly symptom. No GO to DS20.

Air Conditioning Pressure (ACP) Transducer Sensor

DS

Test Step		Results / Action to Take			
DS20	CHECK THE A/C SYSTEM PRESSURE AND PRESSURE CHANGE	Yes GO to DS21 . No REFER to Heating and Air Conditioning, Climate Control System and diagnose the air conditioning (A/C) is inoperative/does not operate correctly symptom.			
• Key in OFF position. • Install an A/C system manifold gauge set and check the A/C system high pressure reading. • Turn the A/C and defroster OFF. • Key ON, engine running. • 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. • Does 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 TRANSDUCER SENSOR VEHICLE HARNESS CONNECTOR	Yes GO to DS22 . No GO to Pinpoint Test C.			
• Key in OFF position. • Air Conditioning Pressure (ACP) Transducer Sensor connector disconnected. • Key ON, engine OFF. • Measure the voltage between:<table><tr><td>(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td><td>(-) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> • Is the voltage between 4 - 6 V?			(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	VREF
(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side				
VREF	SIGRTN				
DS22	CHECK THE ACP CIRCUIT(S) FOR AN OPEN IN THE HARNESS	Yes INSTALL a new Air Conditioning Pressure (ACP) Transducer Sensor. CLEAR the DTCs. REPEAT the self-test. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.			
• PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>ACP</td><td>ACP</td></tr></table> • Is the resistance less than 5 ohms?			(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	ACP
(+) Air Conditioning Pressure (ACP) Transducer Sensor Connector, Harness Side	(-) PCM Connector, Harness Side				
ACP	ACP				

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

Test Step		Results / Action to Take
DS23	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

DS23

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

Power Steering Pressure (PSP) Sensor

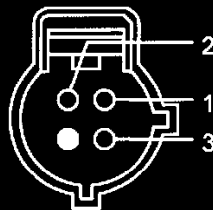
DT

 **WARNING:** Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.

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

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

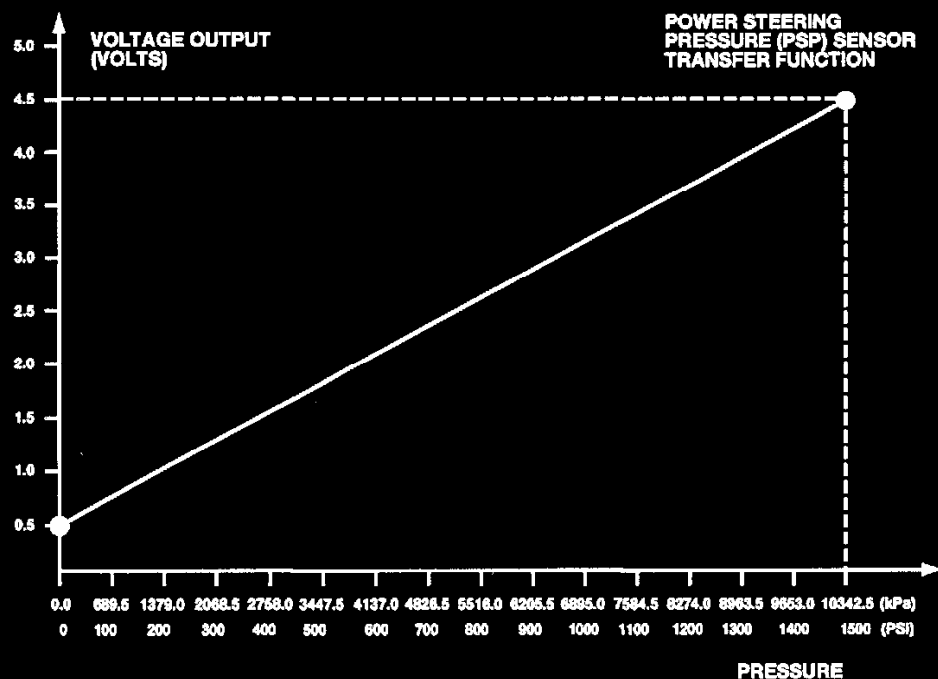
Powertrain Control Module (PCM) Connector

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

Warning, Power Steering Pressure (PSP) Sensor Connector And Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
Focus	190 Pin	T29	PSP
All other vehicles	190 Pin	E24	PSP



AA0930-C

Test Step		Results / Action to Take
DT1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTC)	
• Are DTCs P0552, P0553, or P1550 present?		Yes For KOEO and KOER DTCs P0552 or P0553, GO to DT4 . For continuous memory DTCs P0552 or P0553, GO to DT8 . For KOEO and KOER DTC P1550, GO to DT2 . No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.

DT1

Power Steering Pressure (PSP) Sensor

DT

Test Step		Results / Action to Take			
DT2	DTC P1550: MAKE SURE THE STEERING WHEEL IS TURNED	Yes If there are any symptoms with the power steering system (for example, lack of power assist), REFER to Steering System to diagnosis the lack of assist or Inconsistent assist of steering system. If no symptoms are present with the power steering system, GO to DT3. No REPEAT the KOER self-test.			
	Did you turn the steering wheel at least one half turn within 20 seconds of starting the KOER self-test?				
DT3	CHECK THE VOLTAGE BETWEEN VREF AND SIGRTN AT THE PSP SENSOR	Yes GO to DT4. No GO to Pinpoint Test C.			
	- PSP Sensor connector disconnected. - Key ON, engine OFF. - 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 - 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				
DT4	CHECK THE PSP CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to DT5. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.			
	- Key in OFF position. - 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				
DT5	CHECK THE PSP CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS	Yes GO to DT6. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.			
	- Key ON, engine OFF. - 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				

Power Steering Pressure (PSP) Sensor

DT

Test Step		Results / Action to Take												
DT6	CHECK THE PSP CIRCUIT FOR A SHORT TO VREF, SIGRTN AND GND IN THE HARNESS • Key in OFF position. • 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 DT7 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) 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													
DT7	CHECK THE 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 GO to DT9 . No INSTALL a new PSP sensor. CLEAR the DTCs. REPEAT the self-test.
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													

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

Test Step		Results / Action to Take
DT8	CONTINUOUS MEMORY DTCS P0552 OR P0553: CHECK THE POWER STEERING PRESSURE SENSOR CIRCUIT(S) FOR INTERMITTENT CONCERNS	
	• Key ON, engine OFF. • Access the PCM and monitor the PSP PID. • Observe the PSP PID for an indication of a concern while carrying out the following. (a concern 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 concern indicated?	Yes ISOLATE the concern. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.
DT9	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

DT8-DT9

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

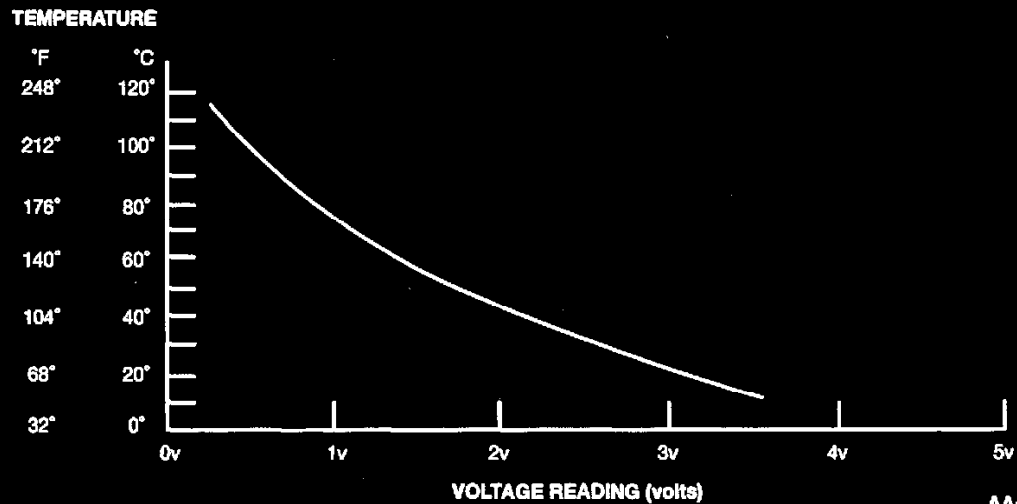
Intake Air Temperature 2 (IAT2) Sensor

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

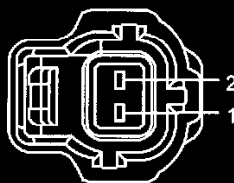
Temperature		Temperature Sensor Values	
°C	°F	Voltage	Resistance (K ohms)
120	248	0.28	1.18
110	230	0.36	1.55
100	212	0.47	2.07
90	194	0.61	2.80
80	176	0.80	3.84
70	158	1.05	5.37
60	140	1.37	7.70
50	122	1.77	10.97
40	104	2.23	16.15
30	86	2.74	24.27
20	68	3.26	37.30

(Continued)

Description, Graph And Temperature Sensor Voltage And Resistance Specifications

**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) Sensor Connector

A0077547

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

Powertrain Control Module (PCM) Connector

Connector	Pin	Circuit
170 Pin	B41, E58, T41 B40, E57 E27	SIGRTN VREF IAT2

Intake Air Temperature 2 (IAT2) Sensor

DU

Test Step		Results / Action to Take				
DU1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCS) Are DTCS P0097, P0098, P0127, P1114, or P1115 present?	Yes For DTCS P0097 or P1114, GO to DU4 . For DTCS P0098 or P1115, GO to DU2 . For DTC P0127, GO to DU6 . No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.				
DU2	CHECK FOR AN OPPOSITE SIGNAL TO THE PCM - The DTC indicates the sensor signal is greater than the self-test maximum. - IAT2 Sensor connector disconnected. - Key ON, engine OFF. - Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A IAT2 Sensor Connector, Harness Side</td><td>Point B IAT2 Sensor Connector, Harness Side</td></tr><tr><td>IAT2 - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> - Access the PCM and monitor the IAT2 PID. - Is the voltage less than 0.2 V?	Point A IAT2 Sensor Connector, Harness Side	Point B IAT2 Sensor Connector, Harness Side	IAT2 - Pin 1	SIGRTN - Pin 2	Yes INSTALL a new IAT2 sensor. CLEAR the DTCS. REPEAT the self-test. No GO to DU3 .
Point A IAT2 Sensor Connector, Harness Side	Point B IAT2 Sensor Connector, Harness Side					
IAT2 - Pin 1	SIGRTN - Pin 2					
DU3	CHECK THE SENSOR SIGNAL FOR A SHORT TO VREF - 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>IAT2 - Pin E27</td><td>VREF - Pin B40, E57</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	IAT2 - Pin E27	VREF - Pin B40, E57	Yes GO to DU10 . No REPAIR the short circuit to VREF. CLEAR the DTCS. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side					
IAT2 - Pin E27	VREF - Pin B40, E57					
DU4	DTC P1114: SIMULATE AN OPPOSITE SIGNAL TO THE PCM - The DTC indicates the sensor signal is less than the self-test minimum. - IAT2 Sensor connector disconnected. - Key ON, engine OFF. - Access the PCM and monitor the IAT2 PID. - Is the voltage greater than 4.2 V?	Yes INSTALL a new IAT2 sensor. CLEAR the DTCS. REPEAT the self-test. No GO to DU5 .				

Intake Air Temperature 2 (IAT2) Sensor

DU

Test Step		Results / Action to Take								
DU5	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>IAT2 - Pin E27</td><td>SIGRTN - Pin B41, E58, T41</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 E27</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	IAT2 - Pin E27	SIGRTN - Pin B41, E58, T41	(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery	IAT2 - Pin E27	Negative terminal	Yes GO to DU10 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
IAT2 - Pin E27	SIGRTN - Pin B41, E58, T41									
(+) PCM Connector, Harness Side	(-) 12 Volt Vehicle Battery									
IAT2 - Pin E27	Negative terminal									
DU6	DTC P0127: CHECK CHARGE AIR COOLER PUMP (CAC) OPERATION - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Does the CAC pump run?	Yes GO to DU7 . No DIAGNOSE the charge air cooler (CAC) pump. GO to KP9 .								
DU7	CHECK THE CHARGE AIR COOLER (CAC) SYSTEM - Check the CAC system for low fluid level, cracked, blocked or misrouted coolant lines, cracked or blocked heat exchanger. - Is a concern present?	Yes REFER to Cooling System, Supercharger Cooling to diagnose a loss of coolant. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DU8 .								
DU8	SIMULATE THE HIGH IAT2 SIGNAL TO THE PCM - Key ON, engine OFF. - Access the PCM and monitor the IAT2 PID. - Observe the PID while disconnecting the IAT2 sensor. - Is the voltage greater than 4.2 V?	Yes GO to DU9 . No GO to DU10 .								

Intake Air Temperature 2 (IAT2) Sensor

DU

Test Step		Results / Action to Take				
DU9	SIMULATE THE LOW IAT2 SIGNAL TO THE PCM • Key in OFF position. • IAT2 Sensor connector disconnected. • Connect a 5 amp fused jumper wire between the following: <table border="1"> <tr> <td>Point A IAT2 Sensor Connector, Harness Side</td> <td>Point B IAT2 Sensor Connector, Harness Side</td> </tr> <tr> <td>IAT2 - Pin 1</td> <td>SIGRTN - Pin 2</td> </tr> </table> • Key ON, engine OFF. • Access the PCM and monitor the IAT2 PID. • Is the voltage less than 0.2 V?	Point A IAT2 Sensor Connector, Harness Side	Point B IAT2 Sensor 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 the sensor is not in range, INSTALL a new IAT2 sensor. CLEAR the DTCs. REPEAT the self-test. No GO to DU10.
Point A IAT2 Sensor Connector, Harness Side	Point B IAT2 Sensor Connector, Harness Side					
IAT2 - Pin 1	SIGRTN - Pin 2					
DU10	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.				

DU9-DU10

Test DV: Throttle Body Assembly Electronic Throttle Control (ETC)
PINPOINT TEST DV: THROTTLE BODY ASSEMBLY ELECTRONIC THROTTLE CONTROL (ETC)

Throttle Body Assembly Electronic Throttle Control (ETC)

DV

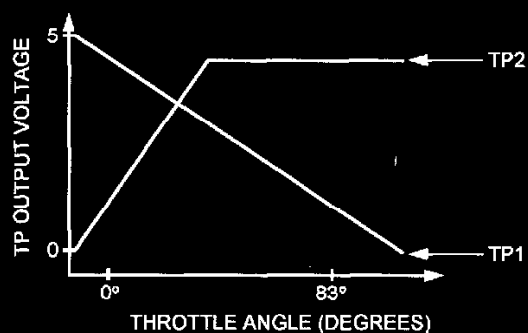
⚠ WARNING: Substantial opening and closing torque is applied by this system. To prevent injury, be careful to keep fingers away from throttle mechanism when actuated. Failure to follow these instructions may result in personal injury.

Note: The voltage of the TP2 circuit and PID reaches a limit of approximately 4.5 volts at approximately 45 degrees of throttle angle.

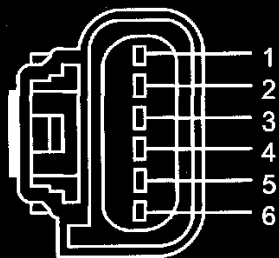
This pinpoint test is intended to diagnose the following:

- electronic throttle body (ETB) (9F991)
- electronic throttle body throttle position sensor (ETBTPS) (9E928)
- harness circuits: ETCRTN, ETCREF, TP1, TP2, TACM+, and TACM-
- powertrain control module (PCM) (12A650)

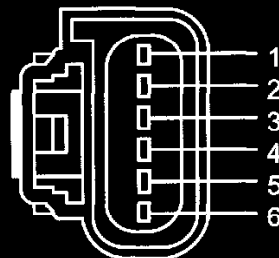
Typical TP1 and TP2 Response



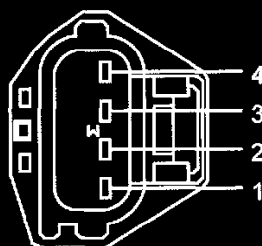
A0096020

**Throttle Body Assembly Electronic
Throttle Control (ETC)****DV****Electronic Throttle Body Throttle Position Sensor
(ETBTPS) Connector****A**

A0077520

B

A0094772

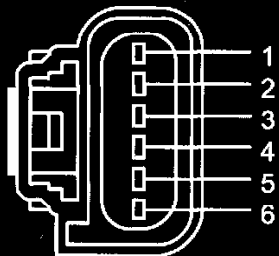
C

A0077519

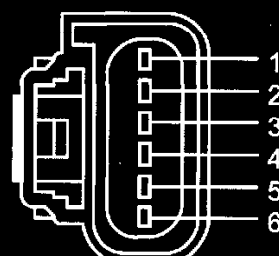
Electronic Throttle Body Throttle Position Sensor (ETBTPS) Connector

**Throttle Body Assembly Electronic
Throttle Control (ETC)****DV**

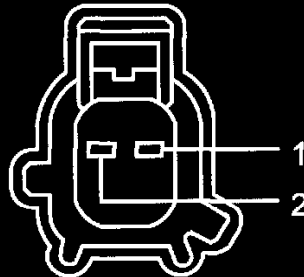
Vehicle	Connector	Pin	Circuit
E-Series 4.6L, Edge, F-150 4.2L, F-150 4.6L, Focus, MKX, MKZ, Sable, Taurus, Taurus X	A	4 1 2 3	TP2 TP1 ETCRTN ETCREF
Fusion 2.3L, Milan 2.3L	B	4 6 3 5	TP2 TP1 ETCRTN ETCREF
Fusion 3.0L, Milan 3.0L	B	6 3 4 5	TP2 TP1 ETCRTN ETCREF
All other vehicles	C	1 4 3 2	TP2 TP1 ETCRTN ETCREF

**Electronic Throttle Body Throttle Actuator Control
Motor (ETBTACM) Connector****A**

A0077520

B

A0094772

**Throttle Body Assembly Electronic
Throttle Control (ETC)****DV****C**

A0077510

Vehicle	Connector	Pin	Circuit
E-Series 4.6L, Edge, F-150 4.2L, F-150 4.6L, Focus, MKX, MKZ, Sable, Taurus, Taurus X	A	6 5	TACM- TACM+
Fusion 2.3L, Milan 2.3L	B	2 1	TACM- TACM+
Fusion 3.0L, Milan 3.0L	B	1 2	TACM- TACM+
All other vehicles	C	2 1	TACM- TACM+

Powertrain Control Module (PCM) Connector

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

Throttle Body Assembly Electronic Throttle Control (ETC)

DV

Vehicle	Connector	Pin	Circuit
Crown Victoria, Grand Marquis, Mustang, Town Car	170 Pin	B24, B4, E66 B41, B6, E59 B35 B47 E51 E34 E60 E61	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1
E-Series, F-Super Duty	170 Pin	B16, B4, E66 B18, B6, E59 B35 B47 E51 E34 E60 E61	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1
Expedition, Navigator	140 Pin	B21, B28, E66 B59, B65, E59 B51 B67 E51 E34 E60 E61	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1
Explorer, Explorer Sport Trac, Mountaineer	170 Pin	B24, B4, E66 B43, B6, E59 B35 B47 E51 E34 E60 E61	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1
F-150, Mark LT	190 Pin	B21, B28, E66 B58, B59, E59 B51 B67 E51 E34 E60 E61	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1
Focus	190 Pin	B45, B61, E59 B44, B60, E60 B67 B69 E51 E34 E45 E44	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1

(Continued)

Throttle Body Assembly Electronic Throttle Control (ETC)

DV

Vehicle	Connector	Pin	Circuit
Fusion, Milan, MKZ	140 Pin	B21, B28, E66 B59, B60, E59 B51 B67 E51 E34 E60 E61	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1
All other vehicles	190 Pin	B21, B28, E66 B59, B65, E59 B51 B67 E51 E34 E60 E61	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1

Test Step		Results / Action to Take
DV1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	
	Note: Diagnose and repair ETBTPS circuit DTCs before addressing DTC P0068. Are DTCs P0068, P0121, P0122, P0123, P0221, P0222, P0223, P1124, P2100, P2101, P2107, P2111, P2112, or P2135 present?	Yes For DTC P0068, GO to DV12. For DTCs P0121, P0122, P0123, P0221, P0222, P0223, P2111, or P2112, GO to DV3. For DTC P1124, GO to DV2. For DTC P2100, GO to DV19. For DTC P2101, GO to DV25. For DTC P2107, GO to DV18. For Fusion and Milan with DTC P2135, GO to DV6. For all others with DTC P2135, GO to DV7. No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
DV2	DTC P1124: REPEAT THE KOEO OR KOER SELF-TEST	
	Note: Make sure the accelerator pedal is not applied during the KOEO and KOER self-tests. - Key ON, engine OFF. - Carry out the self-test. - Are any DTCs present other than P1124?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to DV3.

Throttle Body Assembly Electronic Throttle Control (ETC)

DV

Test Step		Results / Action to Take									
DV3	CHECK THE THROTTLE POSITION (TP) OPEN AND CLOSED VOLTAGES • Key ON, engine OFF. • 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 border="1"><thead><tr><th>Accelerator Pedal Position</th><th>TP1</th><th>TP2</th></tr></thead><tbody><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></tbody></table> • Are both PIDs within the chart ranges?	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	Yes GO to DV17. No GO to DV4.
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									
DV4	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. Failure to follow these instructions may result in personal injury. • Key in OFF position. • Remove the inlet tube from the throttle body. • Visually inspect for throttle plate obstructions or sludge. • 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 DV5. For continuous memory DTCs P2100, P2101, P2107, P2111, or P2112 alone or together, GO to DV19. For Fusion and Milan with all other DTCs, GO to DV6. For all others, GO to DV7. No ISOLATE and REPAIR the obstruction. CLEAR the DTCs. REPEAT the self-test.									
DV5	CHECK THE VREF VOLTAGE TO TP • ETBTPS connector disconnected. • Key ON, engine OFF. • Measure the voltage between: <table border="1"><thead><tr><th>(+) ETBTPS Connector, Harness Side</th><th>(-) ETBTPS Connector, Harness Side</th></tr></thead><tbody><tr><td>ETCREF</td><td>ETCRTN</td></tr></tbody></table> • Is the voltage between 4 - 6 V?	(+) ETBTPS Connector, Harness Side	(-) ETBTPS Connector, Harness Side	ETCREF	ETCRTN	Yes For Fusion and Milan, GO to DV6. For all others, GO to DV7. No GO to Pinpoint Test C.					
(+) ETBTPS Connector, Harness Side	(-) ETBTPS Connector, Harness Side										
ETCREF	ETCRTN										

Throttle Body Assembly Electronic Throttle Control (ETC)

DV

Test Step		Results / Action to Take																																	
DV6	FUSION, MILAN: CHECK THE RESISTANCE OF THE ETBTPS																																		
Note: Do not move the throttle plate during the resistance measurement. Measure the sensor resistance with the throttle plate at the default position. • Key in OFF position. • ETBTPS connector disconnected. • For Fusion 2.3L and Milan 2.3L, measure the resistance between: <table border="1"><thead><tr><th>(+) ETBTPS Connector, Component Side</th><th>(-) ETBTPS Connector, Component Side</th><th>Minimum Resistance (ohms)</th><th>Maximum Resistance (ohms)</th></tr></thead><tbody><tr><td>ETCREF</td><td>ETCRTN</td><td>2,000</td><td>4,000</td></tr></tbody></table> • For Fusion 3.0L and Milan 3.0L, measure the resistance between: <table border="1"><thead><tr><th>(+) ETBTPS Connector, Component Side</th><th>(-) ETBTPS 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>380</td><td>987</td></tr><tr><td>TP1</td><td>ETCRTN</td><td>665</td><td>1,890</td></tr><tr><td>TP2</td><td>ETCREF</td><td>608</td><td>1,932</td></tr><tr><td>TP2</td><td>ETCRTN</td><td>390</td><td>1,187</td></tr><tr><td>ETCREF</td><td>ETCRTN</td><td>475</td><td>1,365</td></tr></tbody></table> • Are all the resistances within specifications?		(+) ETBTPS Connector, Component Side	(-) ETBTPS Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)	ETCREF	ETCRTN	2,000	4,000	(+) ETBTPS Connector, Component Side	(-) ETBTPS Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)	TP1	ETCREF	380	987	TP1	ETCRTN	665	1,890	TP2	ETCREF	608	1,932	TP2	ETCRTN	390	1,187	ETCREF	ETCRTN	475	1,365	Yes GO to DV8. No INSTALL a new ETB. CLEAR the DTCs. REPEAT the self-test.	
(+) ETBTPS Connector, Component Side	(-) ETBTPS Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)																																
ETCREF	ETCRTN	2,000	4,000																																
(+) ETBTPS Connector, Component Side	(-) ETBTPS Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)																																
TP1	ETCREF	380	987																																
TP1	ETCRTN	665	1,890																																
TP2	ETCREF	608	1,932																																
TP2	ETCRTN	390	1,187																																
ETCREF	ETCRTN	475	1,365																																

Throttle Body Assembly Electronic Throttle Control (ETC)

DV

Test Step		Results / Action to Take																								
DV7	ALL OTHERS: CHECK THE RESISTANCE OF THE ETBTPS Note: Do not move the throttle plate during the resistance measurement. Measure the sensor resistance with the throttle plate at the default position. - ETBTPS connector disconnected. - Measure the resistance between: <table><tr><th>(+) ETBTPS Connector, Component Side</th><th>(-) ETBTPS Connector, Component Side</th><th>Minimum Resistance (ohms)</th><th>Maximum Resistance (ohms)</th></tr><tr><td>TP1</td><td>ETCREF</td><td>700</td><td>1,800</td></tr><tr><td>TP1</td><td>ETCRTN</td><td>1,300</td><td>2,800</td></tr><tr><td>TP2</td><td>ETCREF</td><td>1,000</td><td>2,400</td></tr><tr><td>TP2</td><td>ETCRTN</td><td>500</td><td>1,500</td></tr><tr><td>ETCREF</td><td>ETCRTN</td><td>700</td><td>2,100</td></tr></table> - Are all the resistances within the specifications?	(+) ETBTPS Connector, Component Side	(-) ETBTPS Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)	TP1	ETCREF	700	1,800	TP1	ETCRTN	1,300	2,800	TP2	ETCREF	1,000	2,400	TP2	ETCRTN	500	1,500	ETCREF	ETCRTN	700	2,100	Yes GO to DV8 . No For E-Series 4.6L, Edge, F-150 4.2L, F-150 4.6L, Focus, MKX, MKZ, Sable, Taurus, and Taurus X. INSTALL a new ETB. CLEAR the DTCs. REPEAT the self-test. For all others, INSTALL a new ETBTPS. CLEAR the DTCs. REPEAT the self-test.
(+) ETBTPS Connector, Component Side	(-) ETBTPS Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)																							
TP1	ETCREF	700	1,800																							
TP1	ETCRTN	1,300	2,800																							
TP2	ETCREF	1,000	2,400																							
TP2	ETCRTN	500	1,500																							
ETCREF	ETCRTN	700	2,100																							
DV8	CHECK THE TP1 AND TP2 CIRCUITS FOR A SHORT TO VOLTAGE IN THE HARNESS - PCM connector disconnected. - Key ON, engine OFF. - Measure the voltage between: <table><tr><th>(+) ETBTPS 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 Connector, Harness Side	(-)	TP1	Ground	TP2	Ground	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to DV9 .																		
(+) ETBTPS Connector, Harness Side	(-)																									
TP1	Ground																									
TP2	Ground																									

Throttle Body Assembly Electronic Throttle Control (ETC)

DV

Test Step		Results / Action to Take												
DV9	CHECK THE TP1 AND TP2 CIRCUITS FOR AN OPEN IN THE HARNESS - Key in OFF position. - Measure the resistance between:<table><tr><th>(+) ETBTPS 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 Connector, Harness Side	(-) PCM Connector, Harness Side	TP1	TP1	TP2	TP2	Yes GO to DV10. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.						
(+) ETBTPS Connector, Harness Side	(-) PCM Connector, Harness Side													
TP1	TP1													
TP2	TP2													
DV10	CHECK THE TP1 AND TP2 CIRCUITS FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) ETBTPS 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 Connector, Harness Side	(-) Vehicle Battery	TP1	Negative terminal	TP2	Negative terminal	Yes GO to DV11. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.						
(+) ETBTPS Connector, Harness Side	(-) Vehicle Battery													
TP1	Negative terminal													
TP2	Negative terminal													
DV11	CHECK THE TP CIRCUITS FOR A SHORT TOGETHER - Measure the resistance between:<table><tr><th>(+) ETBTPS Connector, Harness Side</th><th>(-) ETBTPS 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 Connector, Harness Side	(-) ETBTPS Connector, Harness Side	TP1	TP2	TP1	ETCREF	TP1	ETCRTN	TP2	ETCREF	TP2	ETCRTN	Yes GO to DV14. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) ETBTPS Connector, Harness Side	(-) ETBTPS Connector, Harness Side													
TP1	TP2													
TP1	ETCREF													
TP1	ETCRTN													
TP2	ETCREF													
TP2	ETCRTN													
DV12	DTC P0068: CHECK FOR DTCS - Check for self-test DTCs. - Are DTCs P0121, P0122, P0123, P0221, P0222, P0223 or P2135 present?	Yes For DTCs P0121, P0122, P0123, P0221, P0222, and P0223, GO to DV3. For Fusion and Milan with DTC P2135, GO to DV6. For all others with DTC P2135, GO to DV7. No GO to DV13.												

**Throttle Body Assembly Electronic
Throttle Control (ETC)****DV**

Test Step		Results / Action to Take
DV13	CHECK FOR INLET AIR LEAKS	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DV14.
	• Check the air inlet system for leaks. • Listen for air noise around the mass air flow (MAF) sensor and throttle body while the engine is running. • Is a concern present?	
DV14	CHECK FOR A TP2 SIGNAL HIGH VERSUS LOAD WHILE DRIVING THE VEHICLE	Yes GO to DC5. No GO to DV15.
	• ETBTPS 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%?	
DV15	CHECK FOR A TP2 SIGNAL LOW VERSUS LOAD WHILE DRIVING THE VEHICLE	Yes GO to DV16. No GO to DV17.
	• 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 less than 0.24 volt and the LOAD PID greater than 55%?	

**Throttle Body Assembly Electronic
Throttle Control (ETC)****DV**

Test Step		Results / Action to Take
DV16	CHECK FOR SELF-TEST DTCs	
	Note: After retrieving the continuous memory DTCs, diagnose any non-ETC related DTCs before continuing. • Key ON, engine OFF. • Clear the DTCs. • Drive the vehicle while exercising the throttle. • Retrieve the continuous memory DTCs. • Are any DTCs present?	Yes For continuous memory DTC P0068, CHECK the MAF sensor and connector for damage and corrosion. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. For E-Series 4.6L, Edge, F-150 4.2L, F-150 4.6L, Focus, Fusion, Milan, MKX, MKZ, Sable, Taurus, and Taurus X with DTC P2135, INSTALL a new ETB. CLEAR the DTCs. REPEAT the self-test. For all others with DTC P2135, INSTALL a new ETBTPS. CLEAR the DTCs. REPEAT the self-test. For all others, GO to DV17. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.
DV17	CHECK THE TP CIRCUITS 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 - 4.65 V?	Yes GO to DV27. No REPAIR as necessary. If DTC P2100 or P2101 is present, GO to DV19.

Throttle Body Assembly Electronic Throttle Control (ETC)

DV

Test Step		Results / Action to Take					
DV18	DTC P2107: CHECK FOR OTHER SELF-TEST DTCs	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No For DTC P2110, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions and diagnose the DTC. For DTC P2107, GO to DV22.					
	Note: The DTC P2107 may set when a failure mode effects management (FMEM) action is taken. If the FMEM DTC P2110 is present with other DTCs, diagnose the other DTCs before diagnosing the DTC P2110. • Key ON, engine OFF. • Check for self-test DTCs. • Are any DTCs present other than P2107 and P2110?						
DV19	CHECK THE THROTTLE ACTUATOR CONTROL MOTOR (TACM) VISUALLY	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DV20.					
	Note: Make sure the TACM harness connector is properly connected. • Key in OFF position. • Inspect the TACM for damaged housing, harness connector, and harness. • Is a concern present?						
DV20	CHECK THE TACM FOR A SHORT OR OPEN	Yes GO to DV21. No INSTALL a new ETB. CLEAR the DTCs. REPEAT the self-test.					
	• ETBTACM connector disconnected. • Measure the resistance between: <table><tr><td>(+) ETBTACM Connector, Component Side</td><td>(-) ETBTACM Connector, Component Side</td></tr><tr><td>TACM+</td><td>TACM-</td></tr></table> • Is the resistance between 1 ohm - 900 ohms?		(+) ETBTACM Connector, Component Side	(-) ETBTACM Connector, Component Side	TACM+	TACM-	
(+) ETBTACM Connector, Component Side	(-) ETBTACM Connector, Component Side						
TACM+	TACM-						
DV21	CHECK THE TACM HARNESS FOR AN OPEN	Yes GO to DV22. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.					
	• PCM connector disconnected. • Measure the resistance between: <table><tr><td>(+) ETBTACM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>TACM+</td><td>TACM+</td></tr><tr><td>TACM-</td><td>TACM-</td></tr></table> • Are the resistances less than 5 ohms?		(+) ETBTACM Connector, Harness Side	(-) PCM Connector, Harness Side	TACM+	TACM+	TACM-
(+) ETBTACM Connector, Harness Side	(-) PCM Connector, Harness Side						
TACM+	TACM+						
TACM-	TACM-						

Throttle Body Assembly Electronic Throttle Control (ETC)

DV

Test Step		Results / Action to Take																		
DV22	CHECK THE HARNESS FOR A SHORT TO GND, PWR, ETCREF, AND ETCRTN - Measure the resistance between:<table><tr><th>(+) ETBTACM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>TACM+</td><td>PWRGND</td></tr><tr><td>TACM+</td><td>VPWR</td></tr><tr><td>TACM+</td><td>ETCRTN</td></tr><tr><td>TACM+</td><td>ETCREF</td></tr><tr><td>TACM-</td><td>PWRGND</td></tr><tr><td>TACM-</td><td>ETCRTN</td></tr><tr><td>TACM-</td><td>VPWR</td></tr><tr><td>TACM-</td><td>ETCREF</td></tr></table> - Are the resistances greater than 10K ohms?	(+) ETBTACM Connector, Harness Side	(-) PCM Connector, Harness Side	TACM+	PWRGND	TACM+	VPWR	TACM+	ETCRTN	TACM+	ETCREF	TACM-	PWRGND	TACM-	ETCRTN	TACM-	VPWR	TACM-	ETCREF	Yes GO to DV23. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) ETBTACM Connector, Harness Side	(-) PCM Connector, Harness Side																			
TACM+	PWRGND																			
TACM+	VPWR																			
TACM+	ETCRTN																			
TACM+	ETCREF																			
TACM-	PWRGND																			
TACM-	ETCRTN																			
TACM-	VPWR																			
TACM-	ETCREF																			
DV23	CHECK FOR TACM HARNESS CIRCUITS SHORTED TOGETHER - Measure the resistance between:<table><tr><th>(+) ETBTACM Connector, Harness Side</th><th>(-) ETBTACM Connector, Harness Side</th></tr><tr><td>TACM+</td><td>TACM-</td></tr></table> - Is the resistance greater than 10K ohms?	(+) ETBTACM Connector, Harness Side	(-) ETBTACM Connector, Harness Side	TACM+	TACM-	Yes GO to DV24. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.														
(+) ETBTACM Connector, Harness Side	(-) ETBTACM Connector, Harness Side																			
TACM+	TACM-																			
DV24	CHECK FOR SELF-TEST CODES - ETBTACM connector connected. - PCM connector connected. - Key ON, engine OFF. - Carry out the self-test. - Is DTC P2101 present?	Yes GO to DV25. No GO to DV27.																		
DV25	CHECK FOR PROPER TACM+ WIRING IN THE HARNESS CONNECTOR - Key in OFF position. - ETBTACM connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><th>(+) ETBTACM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></tr><tr><td>TACM+</td><td>TACM+</td></tr></table> - Is the resistance less than 5 ohms?	(+) ETBTACM Connector, Harness Side	(-) PCM Connector, Harness Side	TACM+	TACM+	Yes GO to DV26. No REPAIR the open circuit. WIRE the TACM harness connector per the TACM and PCM connector diagrams. CLEAR the DTCs. REPEAT the self-test.														
(+) ETBTACM Connector, Harness Side	(-) PCM Connector, Harness Side																			
TACM+	TACM+																			

Throttle Body Assembly Electronic Throttle Control (ETC)

DV

Test Step		Results / Action to Take			
DV26	CHECK FOR PROPER TACM- WIRING IN THE HARNESS CONNECTOR	Yes GO to DV28. No GO to DV27.			
- Measure the resistance between:<table><tr><td>(+) ETBTACM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>TACM-</td><td>TACM-</td></tr></table> - Is the resistance less than 5 ohms?			(+) ETBTACM Connector, Harness Side	(-) PCM Connector, Harness Side	TACM-
(+) ETBTACM Connector, Harness Side	(-) PCM Connector, Harness Side				
TACM-	TACM-				
DV27	CHECK THE REPAIR THROUGH PROCEDURE	Yes GO to DV28. No GO to Pinpoint Test Z.			
- Key ON, engine OFF. - 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?					
DV28	CHECK FOR CORRECT PCM OPERATION	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.			
- 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?					

DV26-DV28

Test DW: Heated Oxygen Sensor (HO2S)

PINPOINT TEST DW: HEATED OXYGEN SENSOR (HO2S)

Heated Oxygen Sensor (HO2S)

DW

⚠ WARNING: Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.

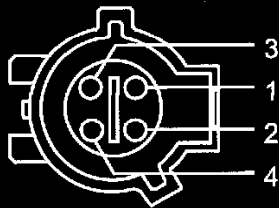
⚠ WARNING: While conducting tests on a hot engine take all safety precautions to prevent skin contact with hot engine components. Failure to follow these instructions may result in personal injury.

This pinpoint test is intended to diagnose the following:

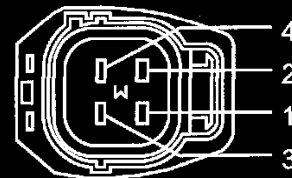
- HO2S/O2S (9F472)
- HO2S/O2S (9G444)
- harness circuits: HO2S, HO2S Heater, VPWR, and SIGRTN
- powertrain control module (PCM) (12A650)

Heated Oxygen Sensor-Front (HO2S-Front) Connector

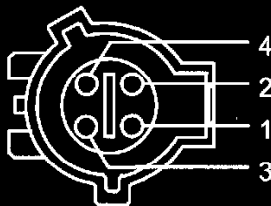
The pin numbering for the connector is in reference to the connector lock tab. Not all connector key combinations are shown.

A

A0077561

B

A0077521

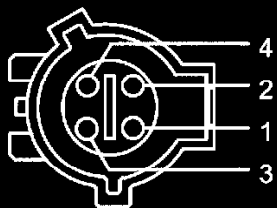
Heated Oxygen Sensor (HO2S)**DW****C**

A0077507

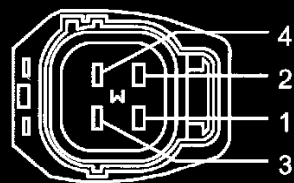
Vehicle	Connector	Pin	Circuit
Crown Victoria, F-150, Grand Marquis, Mark LT, Mustang, Ranger, Town Car	A	2 4 3 1	VPWR SIGRTN HO2S Signal HO2S Heater
Focus	B	1 3 4 2	VPWR SIGRTN HO2S Signal HO2S Heater
All other vehicles	C	1 3 4 2	VPWR SIGRTN HO2S Signal HO2S Heater

**Heated Oxygen Sensor-Rear (HO2S-Rear)
Connector**

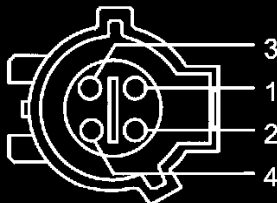
The pin numbering for the connector is in reference to the connector lock tab. Not all connector key combinations are shown.

Heated Oxygen Sensor (HO2S)**DW****A**

A0077507

B

A0077521

C

A0077561

Vehicle	Connector	Pin	Circuit
Escape/Mariner, F-150, Mark LT	A	1 3 4 2	VPWR SIGRTN HO2S Signal HO2S Heater
Focus	B	1 3 4 2	VPWR SIGRTN HO2S Signal HO2S Heater
All other vehicles	C	2 4 3 1	VPWR SIGRTN HO2S Signal HO2S Heater

Heated Oxygen Sensor-Rear (HO2S-Rear) Connector Continued

Heated Oxygen Sensor (HO2S)**DW****Powertrain Control Module (PCM) Connector**

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

Vehicle	Connector	Pin	Circuit
E-Series 6.8L, E-Series 5.4L Cutaway or stripped chassis	170 Pin	E28 E69 E29 E70 T24 T47 T25 T48 B14 B38 B35, B36 B41, E58, T41	HO2S11 HTR11 HO2S21 HTR21 HO2S12 HTR12 HO2S22 HTR22 HO2S13 HTR13 VPWR SIGRTN
Edge, MKX, Sable, Taurus, Taurus X	190 Pin	E29 E69 E28 E70 E23 E1 E24 E2 B51, B52, B53 B58, E58	HO2S11 HTR11 HO2S21 HTR21 HO2S12 HTR12 HO2S22 HTR22 VPWR SIGRTN
Escape/Mariner 3.0L	150 (50-50-50) Pin	E30 E49 E26 E48 T24 T47 T25 T48 B35, B36 B41, E41, T41	HO2S11 HTR11 HO2S21 HTR21 HO2S12 HTR12 HO2S22 HTR22 VPWR SIGRTN
Escape/Mariner 2.3L	150 (50-50-50) Pin	E30 E49 T24 T47 B35, B36 B41, E41, T41	HO2S11 HTR11 HO2S12 HTR12 VPWR SIGRTN

(Continued)

Heated Oxygen Sensor (HO2S)**DW**

Vehicle	Connector	Pin	Circuit
Expedition, Navigator	140 Pin	E29 E69 E28 E70 B39 B10 B40 B11 B51, B52, B53 B58, E58	HO2S11 HTR11 HO2S21 HTR21 HO2S12 HTR12 HO2S22 HTR22 VPWR SIGRTN
F-150, Mark LT	190 Pin	E29 E69 E28 E70 T22 T1 T21 T12 B51, B52, B53 B58, E58, T43	HO2S11 HTR11 HO2S21 HTR21 HO2S12 HTR12 HO2S22 HTR22 VPWR SIGRTN
F-Super Duty 6.8L Narrow frame	170 Pin	E28 E69 E29 E70 B14 B38 B35, B36 B41, E58, T41	HO2S11 HTR11 HO2S21 HTR21 HO2S13 HTR13 VPWR SIGRTN
Focus 2.0L PZEV	190 Pin	E11 E52 T16 T18 T7 T25 B67, B68 B58, E64, T40	HO2S11 HTR11 HO2S12 HTR12 HO2S13 HTR13 VPWR SIGRTN
Focus 2.0L	190 Pin	E11 E52 T16 T18 B67, B68 B58, E64, T40	HO2S11 HTR11 HO2S12 HTR12 VPWR SIGRTN
Fusion 3.0L, Milan 3.0L, MKZ	140 Pin	E28 E69 E29 E70 E3 E23 E4 E24 B51, B52 B58, E58	HO2S11 HTR11 HO2S21 HTR21 HO2S12 HTR12 HO2S22 HTR22 VPWR SIGRTN

(Continued)

Powertrain Control Module (PCM) Connector Continued

Heated Oxygen Sensor (HO2S)**DW**

Vehicle	Connector	Pin	Circuit
Fusion 2.3L, Milan 2.3L	140 Pin	E28 E69 E3 E23 B51, B52 B58, E58	HO2S11 HTR11 HO2S12 HTR12 VPWR SIGRTN
Fusion 2.3L PZEV, Milan 2.3L PZEV	140 Pin	E28 E69 E3 E23 E5 E25 B51, B52 B58, E58	HO2S11 HTR11 HO2S12 HTR12 HO2S13 HTR13 VPWR SIGRTN
Ranger 2.3L	170 Pin	E28 E69 T24 T47 B35, B36 B41, E58, T41	HO2S11 HTR11 HO2S12 HTR12 VPWR SIGRTN
All other vehicles	170 Pin	E28 E69 E29 E70 T24 T47 T25 T48 B35, B36 B41, E58, T41	HO2S11 HTR11 HO2S21 HTR21 HO2S12 HTR12 HO2S22 HTR22 VPWR SIGRTN

Test Step		Results / Action to Take
DW1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCS)	
	Are DTCs P0040, P0041, P0053, P0054, P0055, P0059, P0060, P0132, P0133, P0135, P0138, P0139, P0141, P0144, P0147, P0152, P0153, P0155, P0158, P0159, P0161, or P1127 present?	Yes For DTCs P0040 or P0041, GO to DW2. For DTCs P0053, P0054, P0055, P0059 or P0060, GO to DW14. For DTCs P0132, P0138, P0144, P0152 or P0158, GO to DW20. For DTCs P0133 or P0153, GO to DW3. For DTCs P0135, P0139, P0141, P0147, P0155, P0159 or P0161, GO to DW9. For DTC P1127, GO to DW19. No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.

DW1

Heated Oxygen Sensor (HO2S)

DW

Test Step		Results / Action to Take
DW2	KOER DTCS P0040 AND P0041: CROSSED SENSOR WIRES	
	- Key in OFF position. - Check the vehicle repair history. - Verify the HO2S connectors are connected to the correct engine bank. Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.
DW3	CONTINUOUS MEMORY DTCS P0133 AND P0153: CARRY OUT THE KOER SELF-TEST	
	- Engine at normal operating temperature. - Carry out the KOER self-test. Are DTCs P0040, P0041 or P1127 present?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to DW4.
DW4	CHECK THE HO2S RESPONSE TEST RESULTS	
	- Key ON, engine OFF. - Access the diagnostic monitoring test results for the HO2S11 and HO2S21. Is the indicated value greater than the minimum threshold?	Yes CLEAR the DTCs. GO to DW3. No GO to DW5.
DW5	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 mass air flow (MAF) sensor assembly — hoses connecting to the throttle body — intake manifold gasket leaks — PCV system — 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). REPEAT the self-test. No GO to DW6.

Heated Oxygen Sensor (HO2S)

DW

Test Step		Results / Action to Take						
DW6	CHECK THE HO2S CIRCUIT CONTINUITY Note: HO2S is displayed as O2S on the scan tool. - HO2S connector disconnected. - Check the connector (both halves) for any water contamination. - Connect a 5 amp fused jumper wire between the following:<table><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. - 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 INSTALL a new HO2S. CHANGE the engine oil and oil filter. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test. No GO to DW7.		
Point A HO2S Connector, Harness Side	Point B HO2S Connector, Harness Side							
HO2S Signal	VPWR							
DW7	CHECK THE HO2S CIRCUIT(S) FOR AN OPEN IN THE HARNESS Note: A vehicle hoist may be required to access the HO2S harness. - Key in OFF position. - Remove the jumper wire(s). - Visually inspect the HO2S harness for exposed wiring, water contamination, corrosion, and proper assembly. - PCM connector disconnected. - Measure the resistance between:<table><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 DW8. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side							
HO2S Signal	HO2S Signal							
SIGRTN	SIGRTN							
DW8	CHECK THE HO2S CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></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	Yes GO to DW9. No GO to DW12.		
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
HO2S Signal	VPWR							

Heated Oxygen Sensor (HO2S)

DW

Test Step		Results / Action to Take						
DW9	DTCS P0135, P0139, P0141, P0147, P0155, P0159 OR P0161: CHECK FOR A SOURCE OF POTENTIAL HO2S CONTAMINATION							
	- Investigate the following items as potential sources of HO2S contamination: — use of unapproved silicon sealers — fuel contaminated by silicon additives — excessive oil consumption — glycol leaking internally in the engine — lead-contaminated fuel — short drive cycles in cold weather — use of unapproved cleaning agents - Is a concern present?	Yes REPAIR the source of the contamination. CHANGE the engine oil and oil filter. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test. No GO to DW10.						
DW10	VISUALLY INSPECT THE HO2S HARNESS							
	- PCM connector connected. - Visually inspect the HO2S harness for exposed wiring, water contamination, corrosion, and proper assembly. - Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No For DTCs P0139 or P0159, GO to DW11. For all others, GO to DW12.						
DW11	CHECK THE EXHAUST SYSTEM FOR LEAKS AND MODIFICATIONS							
	- Check for leaks in the exhaust system. - Visually inspect the vehicle for aftermarket accessories and performance modifications. - Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DW25.						
DW12	CHECK THE HO2S AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS							
	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	SIGRTN	Yes GO to DW13. No REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side							
HO2S Signal	HO2S Signal							
SIGRTN	SIGRTN							

Heated Oxygen Sensor (HO2S)

DW

Test Step		Results / Action to Take												
DW13	CARRY OUT THE KOEO ON DEMAND SELF-TEST • Key ON, engine OFF. • Check for KOEO DTCs. • Are DTCs P0135, P0141, P0147, P0155 or P0161 present?	Yes GO to DW14. No GO to DW15.												
DW14	DTCs P0053, P0054, P0055, P0059 AND P0060: CHECK FOR VPWR IN THE HARNESS Note: If DTCs P0053, P0054, P0055, P0059, or P0060 are present, test their related circuits individually. • Key in OFF position. • HO2S connector disconnected. • Key ON, engine OFF. • 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 V?	(+) HO2S Connector, Harness Side	(-) HO2S Connector, Harness Side	VPWR	SIGRTN	Yes GO to DW15. No REPAIR the open circuit. CHECK the fuses. CLEAR the DTCs. REPEAT the self-test.								
(+) HO2S Connector, Harness Side	(-) HO2S Connector, Harness Side													
VPWR	SIGRTN													
DW15	CHECK THE HO2S HEATER FOR SHORTS IN THE HARNESS Note: If DTCs P0053, P0054, P0055, P0059, or P0060 are present, test their related circuits individually. • Key in OFF position. • HO2S connector disconnected. • PCM connector disconnected. • 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 DW16. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) 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													
DW16	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 DW17. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.								
(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side													
HO2S Heater	HO2S Heater													

Heated Oxygen Sensor (HO2S)

DW

Test Step		Results / Action to Take								
DW17	CHECK THE INTERNAL RESISTANCE OF THE HO2S HEATER - 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 - 30 ohms?	(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side	HO2S Heater	VPWR	Yes GO to DW18. No INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.				
(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side									
HO2S Heater	VPWR									
DW18	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 GO to DW25. No INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.
(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side									
HO2S Heater	SIGRTN									
(+) HO2S Connector, Component Side	(-) Vehicle Battery									
HO2S Heater	Negative terminal									
DW19	KOER DTC P1127: EXHAUST TEMPERATURE OUT OF RANGE Note: Address all other DTCs before proceeding. - Key ON, engine running. - Engine at normal operating temperature. - Access the PCM and monitor the HO2S Heater PID. - Is the PID state ON?	Yes CARRY OUT the KOER self-test. No RUN the engine until the PID indicates ON. CARRY OUT the KOER self-test.								
DW20	DTCS P0132, P0138, P0144, P0152 AND P0158: VISUALLY INSPECT THE HO2S HARNESS Note: Disconnect the suspect HO2S harness connector. Only the suspect HO2S needs to be diagnosed. - Key in OFF position. - HO2S connector disconnected. - Visually inspect the HO2S harness. — check the connector (both halves) for contamination — make sure the connector pins are fully seated - Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DW21.								

Heated Oxygen Sensor (HO2S)

DW

Test Step		Results / Action to Take			
DW21	CHECK THE HO2S SIGNAL LEVEL TOO HIGH	Yes GO to DW22. No GO to DW23.			
- HO2S connector connected. - Key ON, engine running. - Access the PCM and monitor the HO2S Signal PID. - Is the voltage less than 1.1 V?					
DW22	CARRY OUT A THOROUGH WIGGLE TEST ON THE HO2S HARNESS	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to Pinpoint Test Z.			
- Key in OFF position. - Key ON, engine OFF. - Access the PCM and monitor the HO2S Signal PID. - Carry out a thorough wiggle test on the HO2S harness. - Does the voltage change during the wiggle test?					
DW23	CHECK THE HO2S SIGNAL FOR A SHORT TO VPWR INSIDE THE SENSOR	Yes INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test. No GO to DW24.			
- Key in OFF position. - HO2S connector disconnected. - Key ON, engine running. - Access the PCM and monitor the HO2S Signal PID. - Is the voltage less than 1.1 V?					
DW24	CHECK THE HO2S CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to DW25.			
- Key in OFF position. - PCM connector disconnected. - Key ON, engine OFF. - Measure the voltage between: <table border="1"><tr><td>(+) HO2S Connector, Harness Side</td><td>(-)</td></tr><tr><td>HO2S Signal</td><td>Ground</td></tr></table> - Is any voltage present?			(+) HO2S Connector, Harness Side	(-)	HO2S Signal
(+) HO2S Connector, Harness Side	(-)				
HO2S Signal	Ground				

Heated Oxygen Sensor (HO2S)**DW**

Test Step		Results / Action to Take
DW25	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

DW25

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

Engine Coolant Temperature (ECT) Sensor

DX

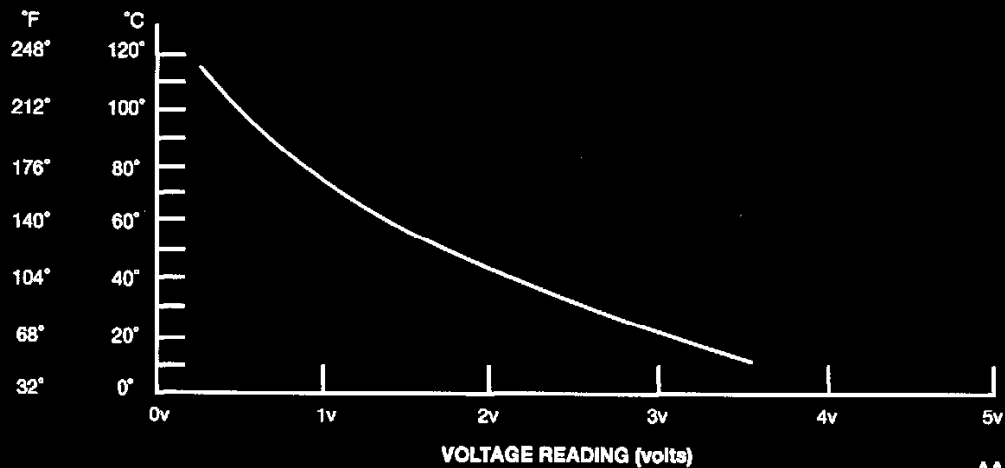
Note: Engine coolant temperature must be greater than 10°C (50°F) to pass the KOEO self-test and greater than 82°C (180°F) to pass the KOER self-test. to accomplish this, the engine must be at normal operating temperature.

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)

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

TEMPERATURE



AA4397-A

TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS

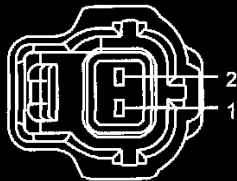
Temperature		Temperature Sensor Values	
°C	°F	Voltage	Resistance (K ohms)
120	248	0.28	1.18
110	230	0.36	1.55
100	212	0.47	2.07
90	194	0.61	2.80
80	176	0.80	3.84
70	158	1.05	5.37
60	140	1.37	7.70
50	122	1.77	10.97
40	104	2.23	16.15

(Continued)

Note, Graph And Temperature Sensor Voltage And Resistance Specifications

**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

Pin	Circuit
2	SIGRTN (Signal Return)
1	ECT (Engine Coolant Temperature)

Powertrain Control Module (PCM) Connector

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

Engine Coolant Temperature (ECT) Sensor

DX

Vehicle	Connector	Pin	Circuit
Escape/Mariner	150 (50-50-50) Pin	E40 E41 E21	VREF SIGRTN ECT
Fusion, Milan	140 Pin	E57 E58 E18	VREF SIGRTN ECT
All other vehicles	170 Pin	E57 E58 E18	VREF SIGRTN ECT

Test Step		Results / Action to Take
DX1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	
	Are DTCs P0116, P0117, P0118, P0119, P0125, P0128, P0217, P1116, or P1117 present?	Yes For continuous memory DTC P0116, GO to DX14. For KOEO and KOER DTC P0117, GO to DX12. For continuous memory DTCs P0117, P0118, P0119, or P1117, GO to DX16. For KOEO and KOER DTC P0118, GO to DX8. For continuous memory DTCs P0125, or P0128, GO to DX19. For DTC P0217, GO to DX21. For KOEO and KOER DTC P1116, GO to DX2. No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
DX2	DTC P1116: CHECK THE COOLING SYSTEM	
	 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. Failure to follow these instructions may result in personal injury. - The DTC indicates the temperature sensor is out of self-test range. The engine is not at normal operating temperature. - Check the vehicle coolant level. - Is the cooling system OK?	Yes GO to DX3. No REFER to Cooling System, Engine Cooling loss of coolant diagnosis. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.

Engine Coolant Temperature (ECT) Sensor

DX

Test Step		Results / Action to Take			
DX3	CHECK IF THE VEHICLE ENGINE STARTS	Yes GO to DX6. No GO to DX4.			
	- Attempt to start the engine. - Does the engine start and run normally?				
DX4	CHECK THE RESISTANCE OF THE ECT SENSOR WITH THE ENGINE OFF	Yes GO to DX5. No INSTALL a new ECT sensor. CLEAR the DTCs. REPEAT the self-test.			
	Note: Refer to the chart at the beginning of this test for the resistance specifications. - Key in OFF position. - ECT Sensor connector disconnected. - Measure the resistance between: <table><tr><td>(+) ECT Sensor Connector, Component Side</td><td>(-) ECT Sensor Connector, Component Side</td></tr><tr><td>ECT - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> - Is the resistance within specification?		(+) ECT Sensor Connector, Component Side	(-) ECT Sensor Connector, Component Side	ECT - Pin 1
(+) ECT Sensor Connector, Component Side	(-) ECT Sensor Connector, Component Side				
ECT - Pin 1	SIGRTN - Pin 2				
DX5	CHECK THE CIRCUIT FROM THE MODULE TO THE COMPONENT	Yes RETURN to Symptom Charts for further direction. No GO to DX10.			
	Note: Refer to the chart at the beginning of this test for the resistance specifications. - ECT Sensor connector connected. - Key ON, engine OFF. - Access the PCM and monitor the ECT 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. - Does the measured value at the sensor agree with the measured PID voltage value at the PCM?				
DX6	CHECK THE ECT SENSOR OPERATION	Yes GO to DX7. No The engine temperature was not stabilized. REPAIR any other DTCs as necessary.			
	- Run the engine until the engine temperature stabilizes. - Verify the upper radiator hose is hot and the cooling system is pressurized. - Repeat the KOER self-test. - Is DTC P1116 present?				

Engine Coolant Temperature (ECT) Sensor

DX

Test Step		Results / Action to Take						
DX7	CHECK THE RESISTANCE OF THE ECT SENSOR Note: Refer to the chart at the beginning of this test for the resistance specifications. • The vehicle must be at normal operating temperature. • Key in OFF position. • ECT Sensor connector disconnected. • 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 - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> • Is the resistance within specification?	(+) ECT Sensor Con- nector, Component Side	(-) ECT Sensor Con- nector, Component Side	ECT - Pin 1	SIGRTN - Pin 2	Yes GO to DX25 . No INSTALL a new ECT sensor. CLEAR the DTCs. REPEAT the self-test.		
(+) ECT Sensor Con- nector, Component Side	(-) ECT Sensor Con- nector, Component Side							
ECT - Pin 1	SIGRTN - Pin 2							
DX8	DTC P0118: CHECK THE ECT SIGNAL CIRCUIT • The DTC indicates the sensor signal is greater than the self-test maximum. • ECT Sensor connector disconnected. • Key ON, engine OFF. • Measure the voltage between:<table><tr><td>(+) ECT Sensor Con- nector, Harness Side</td><td>(-) ECT Sensor Con- nector, Harness Side</td></tr><tr><td>ECT - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> • Is the voltage between 4.5 - 5.5 V?	(+) ECT Sensor Con- nector, Harness Side	(-) ECT Sensor Con- nector, Harness Side	ECT - Pin 1	SIGRTN - Pin 2	Yes GO to DX9 . No GO to DX10 .		
(+) ECT Sensor Con- nector, Harness Side	(-) ECT Sensor Con- nector, Harness Side							
ECT - Pin 1	SIGRTN - Pin 2							
DX9	CHECK THE RESISTANCE OF THE ECT SENSOR WITH THE ENGINE OFF Note: Refer to the chart at the beginning of this test for the resistance specifications. • Key in OFF position. • ECT Sensor connector disconnected. • 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 - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> • Is the resistance within specification?	(+) ECT Sensor Con- nector, Component Side	(-) ECT Sensor Con- nector, Component Side	ECT - Pin 1	SIGRTN - Pin 2	Yes GO to DX11 . No INSTALL a new ECT sensor. CLEAR the DTCs. REPEAT the self-test.		
(+) ECT Sensor Con- nector, Component Side	(-) ECT Sensor Con- nector, Component Side							
ECT - Pin 1	SIGRTN - Pin 2							
DX10	CHECK THE SIGNAL AND SIGRTN CIRCUITS 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>(-) ECT Sensor Con- nector, Harness Side</td></tr><tr><td>ECT</td><td>ECT - 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	(-) ECT Sensor Con- nector, Harness Side	ECT	ECT - Pin 1	SIGRTN	SIGRTN - Pin 2	Yes GO to DX25 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) ECT Sensor Con- nector, Harness Side							
ECT	ECT - Pin 1							
SIGRTN	SIGRTN - Pin 2							

Engine Coolant Temperature (ECT) Sensor

DX

Test Step		Results / Action to Take								
DX11	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 GO to DX25 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.				
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
ECT	VREF									
DX12	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 ON, engine OFF. • Access the PCM and monitor the ECT PID. • Is the voltage greater than 4.2 V?	Yes INSTALL a new ECT sensor. CLEAR the DTCs. REPEAT the self-test. No GO to DX13 .								
DX13	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 GO to DX25 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) 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				
DX14	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 Powertrain DTC Charts and Descriptions, Diagnostic Trouble Code (DTC) Charts and Descriptions for information concerning P0116. Note: Refer to the chart at the beginning of this test for the resistance specifications. • Key in OFF position. • ECT Sensor connector disconnected. • Measure the resistance between:<table><tr><td>(+) ECT Sensor Connector, Component Side</td><td>(-) ECT Sensor Connector, Component Side</td></tr><tr><td>ECT - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> • Is the resistance within specification?	(+) ECT Sensor Connector, Component Side	(-) ECT Sensor Connector, Component Side	ECT - Pin 1	SIGRTN - Pin 2	Yes GO to DX15 . No INSTALL a new ECT sensor. CLEAR the DTCs. REPEAT the self-test.
(+) ECT Sensor Connector, Component Side	(-) ECT Sensor Connector, Component Side					
ECT - Pin 1	SIGRTN - Pin 2					
DX15	DTC P0116: CHECK THE RESISTANCE OF THE ECT SENSOR Note: Refer to the chart at the beginning of this test for the resistance specifications. Note: Verify the engine is at operating temperature before taking the ECT reading. • ECT Sensor connector connected. • Run the engine until the engine temperature stabilizes. • Key in OFF position. • ECT Sensor connector disconnected. • Measure the resistance between:<table><tr><td>(+) ECT Sensor Connector, Component Side</td><td>(-) ECT Sensor Connector, Component Side</td></tr><tr><td>ECT - Pin 1</td><td>SIGRTN - Pin 2</td></tr></table> • Is the resistance within specification?	(+) ECT Sensor Connector, Component Side	(-) ECT Sensor Connector, Component Side	ECT - Pin 1	SIGRTN - Pin 2	Yes The concern 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. CLEAR the DTCs. REPEAT the self-test.
(+) ECT Sensor Connector, Component Side	(-) ECT Sensor Connector, Component Side					
ECT - Pin 1	SIGRTN - Pin 2					
DX16	DTCS P0117, P0118, P0119 OR P1117: INTERMITTENT CHECK • Key ON, engine OFF. • Access the PCM and monitor the ECT 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. CLEAR the DTCs. REPEAT the self-test. No GO to DX17 .				

Engine Coolant Temperature (ECT) Sensor

DX

Test Step		Results / Action to Take
DX17	CHECK THE ELECTRONIC ENGINE CONTROL (EEC) WIRING HARNESS	
	- Access the PCM and monitor the ECT PID. - While observing the PID, 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 concern. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DX18.
DX18	CHECK THE PCM AND VEHICLE HARNESS CONNECTORS	
	- Key in OFF position. - PCM connector disconnected. - ECT Sensor connector disconnected. Are the connectors and terminals OK?	Yes The concern is not present at this time. DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
DX19	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. Failure to follow these instructions may result in personal injury. - The 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 DX20. No REFER to Cooling System, Engine Cooling, for loss of coolant diagnosis. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.

Engine Coolant Temperature (ECT) Sensor

DX

Test Step		Results / Action to Take
DX20	CHECK THE SENSOR OPERATION	Yes The test is complete. DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No REFER to Cooling System, Engine Cooling for cooling system diagnosis. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
	- Run the engine until the engine temperature stabilizes. - Verify the radiator hoses are 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)?	
DX21	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. Failure to follow these instructions may result in personal injury. - Check the engine coolant level. - Is the engine coolant fill level correct?	Yes REFER to Cooling System, Engine Cooling to diagnose the overheating condition. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No REFER to Cooling System, Engine Cooling to diagnose the loss of coolant. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
DX22	DTC P0298: ENGINE OIL OVER TEMPERATURE CONDITION	
	Note: The engine oil temperature protection strategy in the PCM is 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 concern. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DX23.

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

Test Step		Results / Action to Take
DX23	CHECK FOR ECT DTCS • Check for self-test DTCS. • Are DTCS P0117, P0118, P1116 or P1117 present?	Yes DISREGARD the engine oil temperature (EOT) diagnostic trouble code (DTC) at this time. ADDRESS the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to DX24 .
DX24	ROAD TEST THE VEHICLE AND MONITOR FOR ENGINE OVER TEMPERATURE • Access the freeze frame data (if available) and record the DTC concern conditions. • Access the PCM and monitor the ECT PID. • Test drive the vehicle and allow the engine to reach normal operating temperature. • Observe the ECT PID. • Does the engine overheat?	Yes REFER to Cooling System, Engine Cooling to diagnose the overheat symptom. REPAIR as necessary. CLEAR the DTCS. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. CLEAR the DTCS. REPEAT the self-test.
DX25	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

DX23-DX25

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

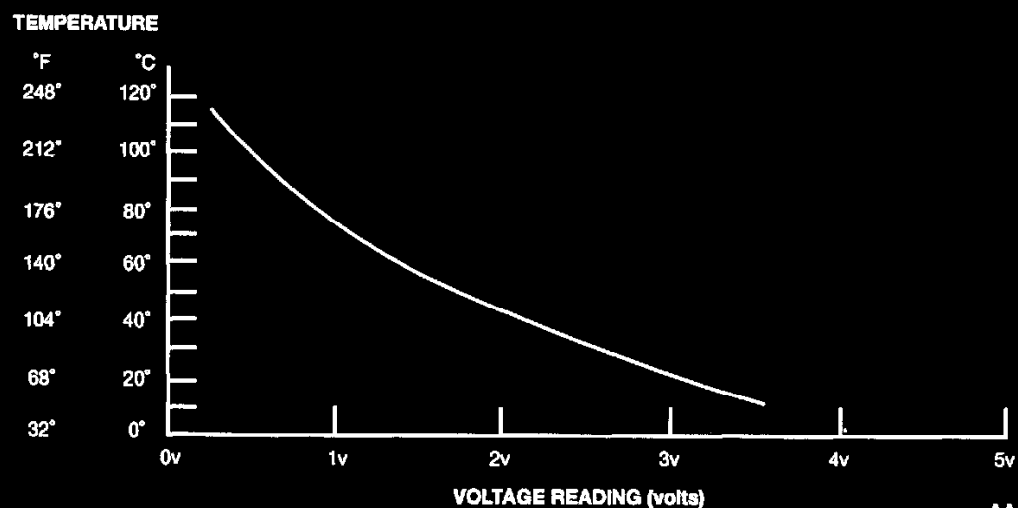
Engine Oil Temperature (EOT) Sensor**DY**

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.



AA4397-A

TEMPERATURE SENSOR VOLTAGE AND RESISTANCE SPECIFICATIONS

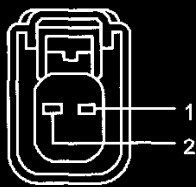
Temperature		Temperature Sensor Values	
°C	°F	Voltage	Resistance (K ohms)
120	248	0.28	1.18
110	230	0.36	1.55
100	212	0.47	2.07
90	194	0.61	2.80
80	176	0.80	3.84
70	158	1.05	5.37
60	140	1.37	7.70
50	122	1.77	10.97
40	104	2.23	16.15
30	86	2.74	24.27

(Continued)

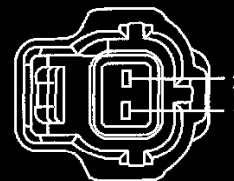
Description, Graph And Temperature Sensor Voltage And Resistance Specifications

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****B**

A0077578



A0077548

Vehicle	Connector	Pin	Circuit
Mustang	A	2 1	SIGRTN EOT
All other vehicles	B	2 1	SIGRTN EOT

Powertrain Control Module (PCM) Connector

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

Engine Oil Temperature (EOT) Sensor

DY

Connector	Pin	Circuit
170 Pin	E58 B35 E57 E27	SIGRTN VPWR VREF EOT

Test Step		Results / Action to Take
DY1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	
	Are DTCs P0196, P0197, P0198, P0298, or P1184 present?	Yes For DTCs P0196 or P1184, GO to DY2. For DTCs P0197 or P0198, GO to DY3. For continuous memory DTC P0298, GO to DY14. No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
DY2	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 radiator hoses are hot and the cooling system is pressurized. - Carry out the self-test. - Are DTCs P0196 or P1184 present?	Yes GO to DY3. No The engine temperature was not stabilized. REPAIR any other DTCs as necessary.
DY3	DTCS P0196, P0197, P0198, P1184 OR P0298: CHECK THE TEMPERATURE SENSOR SIGNAL	
	- Key ON, engine OFF. - Access the PCM and monitor the EOT PID. - Is the voltage less than 0.3 V?	Yes GO to DY4. No GO to DY6.
DY4	SIMULATE AN OPPOSITE SIGNAL TO THE PCM	
	- Key ON, engine OFF. - EOT Sensor connector disconnected. - Access the PCM and monitor the EOT PID. - Is the voltage greater than 4.2 V?	Yes INSTALL a new EOT sensor. CLEAR the DTCs. REPEAT the self-test. No GO to DY5.

DY1-DY4

Engine Oil Temperature (EOT) Sensor

DY

Test Step		Results / Action to Take								
DY5	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 GO to DY18. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) EOT Sensor Connector, Harness Side	(-) EOT Sensor Connector, Harness Side									
EOT	SIGRTN									
(+) EOT Sensor Connector, Harness Side	(-) Vehicle Battery									
EOT	Negative terminal									
DY6	CHECK FOR HIGH EOT SENSOR VOLTAGE - Access the PCM and monitor the EOT PID. - Is the voltage greater than 4.2 V?	Yes GO to DY7. No GO to DY11.								
DY7	CHECK THE EOT CIRCUIT VOLTAGE - EOT Sensor connector disconnected. - Key ON, engine OFF. - 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 GO to DY8. No GO to DY10.				
(+) EOT Sensor Connector, Harness Side	(-) EOT Sensor Connector, Harness Side									
EOT	SIGRTN									
DY8	CHECK THE RESISTANCE OF THE EOT SENSOR WITH THE ENGINE OFF - Key in OFF position. - 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 the resistance specifications. - Is the resistance within specification?	(+) EOT Sensor Connector, Component Side	(-) EOT Sensor Connector, Component Side	EOT	SIGRTN	Yes GO to DY9. No INSTALL a new EOT sensor. CLEAR the DTCs. REPEAT the self-test.				
(+) EOT Sensor Connector, Component Side	(-) EOT Sensor Connector, Component Side									
EOT	SIGRTN									

Engine Oil Temperature (EOT) Sensor

DY

Test Step		Results / Action to Take						
DY9	CHECK THE SENSOR SIGNAL CIRCUIT FOR SHORTS TO PWR • 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>EOT - Pin E27</td><td>VREF - Pin E57</td></tr><tr><td>EOT - Pin E27</td><td>VPWR - Pin B35</td></tr></table> • Are the resistances greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	EOT - Pin E27	VREF - Pin E57	EOT - Pin E27	VPWR - Pin B35	Yes GO to DY18 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
EOT - Pin E27	VREF - Pin E57							
EOT - Pin E27	VPWR - Pin B35							
DY10	CHECK THE SIGNAL AND SIGRTN CIRCUITS 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>(-) EOT Sensor Connector, Harness Side</td></tr><tr><td>EOT - Pin E27</td><td>EOT</td></tr><tr><td>SIGRTN - Pin E58</td><td>SIGRTN</td></tr></table> • Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) EOT Sensor Connector, Harness Side	EOT - Pin E27	EOT	SIGRTN - Pin E58	SIGRTN	Yes GO to DY18 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) EOT Sensor Connector, Harness Side							
EOT - Pin E27	EOT							
SIGRTN - Pin E58	SIGRTN							
DY11	INTERMITTENT CHECK • Key ON, engine OFF. • Access the PCM and monitor the EOT 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. REPAIR as necessary. If OK, INSTALL a new EOT sensor. CLEAR the DTCs. REPEAT the self-test. No GO to DY12 .						
DY12	CHECK THE ELECTRONIC ENGINE CONTROL (EEC) WIRING HARNESS • Access the PCM and monitor the EOT PID. • While observing the PID, 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 concern. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DY13 .						

Engine Oil Temperature (EOT) Sensor

DY

Test Step		Results / Action to Take				
DY13	CHECK THE RESISTANCE OF THE EOT SENSOR WITH THE ENGINE RUNNING Note: Refer to the chart at the beginning of this test for the resistance specifications. - Run the engine until the engine temperature stabilizes. - Verify the radiator hoses are 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> - Is the resistance within specification for the given engine temperature?	(+) EOT Sensor Con- nector, Component Side	(-) EOT Sensor Con- nector, Component Side	EOT	SIGRTN	Yes The concern is not present at this time. GO to Pinpoint Test Z. No INSTALL a new EOT sensor. CLEAR the DTCs. REPEAT the self-test.
(+) EOT Sensor Con- nector, Component Side	(-) EOT Sensor Con- nector, Component Side					
EOT	SIGRTN					
DY14	DTC P0298: ENGINE OIL OVER TEMPERATURE CONDITION Note: The 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 concern. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DY15.				
DY15	CHECK FOR EOT SENSOR HARDWARE - The engine oil temperature protection strategy in the PCM can be activated with or without an EOT sensor. - Does the vehicle have a EOT sensor?	Yes GO to DY3. No GO to DY16.				
DY16	IDENTIFY THE CUSTOMER'S DRIVING HABITS - Identify the customer's driving habits. - Access the freeze frame data (if available) and record the DTC concern conditions. - Does the vehicle appear to have been driven in an incorrect transmission gear or at high RPM for an extended period?	Yes ADVISE the customer that improper transmission gear selection and high RPM for an extended period initializes the engine protection strategy. CLEAR the DTCs. REPEAT the self-test. No GO to DY17.				

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

Test Step		Results / Action to Take
DY17	TYPE OF ENGINE COOLANT SENSOR	Yes GO to DL26. No GO to DX22.
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?		
DY18	CHECK FOR CORRECT PCM OPERATION	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.
• 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?		

DY17-DY18

Test DZ: Universal Heated Oxygen Sensor (HO2S)
PINPOINT TEST DZ: UNIVERSAL HEATED OXYGEN SENSOR (HO2S)

Universal Heated Oxygen Sensor (HO2S)

DZ

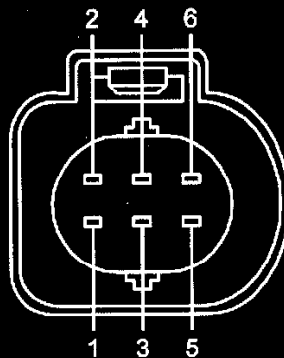
⚠ WARNING: While conducting tests on a hot engine take all safety precautions to prevent skin contact with hot engine components. Failure to follow these instructions may result in personal injury.

Note: Only diagnose the suspect universal HO2S indicated by the DTC.

This pinpoint test is intended to diagnose the following:

- universal HO2S (9Y460)
- harness circuits: UO2S, UO2SGREF, UO2SHTR, UO2SPC, UO2SPCT, and VPWR
- powertrain control module (PCM) (12A650)

Universal HO2S Connector



N0048502

Pin	Circuit
5	UO2SPCT (Universal Oxygen Sensor Pumping Current Trim)
1	UO2SPC (Universal Oxygen Sensor Pumping Current)
4	VPWR (Vehicle Power)
2	UO2SGREF (Universal Oxygen Sensor Ground Reference)
6	UO2S (Universal Oxygen Sensor)
3	UO2SHTR (Universal Oxygen Sensor Heater)

Warning And Universal HO2S Connector

Universal Heated Oxygen Sensor (HO2S)

DZ

Powertrain Control Module (PCM) Connector

Pin	Circuit
E18	UO2S11 (Universal Oxygen Sensor Bank 1, Sensor 1)
E20	UO2S21 (Universal Oxygen Sensor Bank 2, Sensor 1)
E19	UO2SGREF11 (Universal Oxygen Sensor Ground Reference Bank 1, Sensor 1)
E21	UO2SGREF21 (Universal Oxygen Sensor Ground Reference Bank 2, Sensor 1)
E69	UO2SHTR11 (Universal Oxygen Sensor Heater Bank 1, Sensor 1)
E70	UO2SHTR21 (Universal Oxygen Sensor Heater Bank 2, Sensor 1)
E4	UO2SPC11 (Universal Oxygen Sensor Pumping Current Bank 1, Sensor 1)
E6	UO2SPC21 (Universal Oxygen Sensor Pumping Current Bank 2, Sensor 1)
E5	UO2SPCT11 (Universal Oxygen Sensor Pumping Current Trim Bank 1, Sensor 1)
E7	UO2SPCT21 (Universal Oxygen Sensor Pumping Current Trim Bank 2, Sensor 1)

Test Step		Results / Action to Take
DZ1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCS)	
	Are DTCs P0030, P0040, P0050, P0053, P0059, P0130, P0133, P0134, P0135, P0150, P0153, P0154, P0155, P1127, P2096, P2097, P2098, or P2099 present?	Yes For DTCs P0030 or P0050, GO to DZ2. For DTC P0040, GO to DZ5. For DTCs P0053, P0059, P0135 or P0155, GO to DZ6. For DTCs P0130 or P0150, GO to DZ11. For DTCs P0133 or P0153, GO to DZ15. For DTCs P0134 or P0154, GO to DZ18. For DTC P1127, GO to DZ19. For DTCs P2096, P2097, P2098 or P2099, GO to DZ20. No For symptoms without DTCs, GO to DZ23. For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.

Universal Heated Oxygen Sensor (HO2S)

DZ

Test Step		Results / Action to Take								
DZ2	DTCS P0030 AND P0050: CHECK FOR MISFIRE CONCERNS AND AFTERMARKET EQUIPMENT • Key in OFF position. • Check for the following: — misfire concern — non-factory or aftermarket equipment that may increase the exhaust temperature • Universal HO2S connector disconnected. • Check the universal HO2S connector for damage or corrosion. • Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DZ3.								
DZ3	CHECK THE UO2SHTR CIRCUIT FOR A SHORT TO VOLTAGE • PCM connector disconnected. • Key ON, engine OFF. • Measure the voltage between:<table><tr><td>(+) Universal HO2S Connector, Harness Side</td><td>(-)</td></tr><tr><td>UO2SHTR - Pin 3</td><td>Ground</td></tr></table> • Is any voltage present?	(+) Universal HO2S Connector, Harness Side	(-)	UO2SHTR - Pin 3	Ground	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to DZ4.				
(+) Universal HO2S Connector, Harness Side	(-)									
UO2SHTR - Pin 3	Ground									
DZ4	CHECK THE UO2S, UO2SGREF, UO2SHTR CIRCUITS FOR AN OPEN IN THE HARNESS • Key in OFF position. • Measure the resistance between:<table><tr><td>(+) Universal HO2S Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>UO2S - Pin 6</td><td>UO2S</td></tr><tr><td>UO2SGREF - Pin 2</td><td>UO2SGREF</td></tr><tr><td>UO2SHTR - Pin 3</td><td>HO2S Heater</td></tr></table> • Are the resistances less than 5 ohms?	(+) Universal HO2S Connector, Harness Side	(-) PCM Connector, Harness Side	UO2S - Pin 6	UO2S	UO2SGREF - Pin 2	UO2SGREF	UO2SHTR - Pin 3	HO2S Heater	Yes INSTALL a new Universal HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Universal HO2S Connector, Harness Side	(-) PCM Connector, Harness Side									
UO2S - Pin 6	UO2S									
UO2SGREF - Pin 2	UO2SGREF									
UO2SHTR - Pin 3	HO2S Heater									
DZ5	DTC P0040: CROSSED SENSOR WIRES • Key in OFF position. • Check the vehicle repair history. • Verify the connectors are connected to the correct engine bank. • Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.								

Universal Heated Oxygen Sensor (HO2S)

DZ

Test Step		Results / Action to Take																
DZ6	DTCs P0053, P0059, P0135 AND P0155: CHECK FOR VPWR IN THE HARNESS	Yes GO to DZ7. No REPAIR the open circuit. CHECK the fuses. CLEAR the DTCs. REPEAT the self-test.																
- Key in OFF position. - Universal HO2S connector disconnected. - Key ON, engine OFF. - Measure the voltage between: <table><tr><td>(+) Universal HO2S Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 4</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?			(+) Universal HO2S Connector, Harness Side	(-)	VPWR - Pin 4	Ground												
(+) Universal HO2S Connector, Harness Side	(-)																	
VPWR - Pin 4	Ground																	
DZ7	CHECK THE UO2SHTR CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to DZ8. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.																
- Key in OFF position. - Universal HO2S connector disconnected. - PCM connector disconnected. - Measure the resistance between: <table><tr><td>(+) Universal HO2S Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>UO2SHTR - Pin 3</td><td>UO2SHTR</td></tr></table> - Is the resistance less than 5 ohms?			(+) Universal HO2S Connector, Harness Side	(-) PCM Connector, Harness Side	UO2SHTR - Pin 3	UO2SHTR												
(+) Universal HO2S Connector, Harness Side	(-) PCM Connector, Harness Side																	
UO2SHTR - Pin 3	UO2SHTR																	
DZ8	CHECK THE UO2SHTR CIRCUIT FOR A SHORT IN THE HARNESS	Yes GO to DZ9. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.																
- Measure the resistance between: <table><tr><td>(+) Universal HO2S Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>UO2SHTR - Pin 3</td><td>Negative terminal</td></tr></table> - Measure the resistance between: <table><tr><td>(+) Universal HO2S Connector, Harness Side</td><td>(-) Universal HO2S Connector, Harness Side</td></tr><tr><td>UO2SHTR - Pin 3</td><td>UO2S - Pin 6</td></tr><tr><td>UO2SHTR - Pin 3</td><td>UO2SGREF - Pin 2</td></tr><tr><td>UO2SHTR - Pin 3</td><td>UO2SPC - Pin 1</td></tr><tr><td>UO2SHTR - Pin 3</td><td>UO2SPCT - Pin 5</td></tr><tr><td>UO2SHTR - Pin 3</td><td>VPWR - Pin 4</td></tr></table> - Are the resistances greater than 10K ohms?			(+) Universal HO2S Connector, Harness Side	(-) Vehicle Battery	UO2SHTR - Pin 3	Negative terminal	(+) Universal HO2S Connector, Harness Side	(-) Universal HO2S Connector, Harness Side	UO2SHTR - Pin 3	UO2S - Pin 6	UO2SHTR - Pin 3	UO2SGREF - Pin 2	UO2SHTR - Pin 3	UO2SPC - Pin 1	UO2SHTR - Pin 3	UO2SPCT - Pin 5	UO2SHTR - Pin 3	VPWR - Pin 4
(+) Universal HO2S Connector, Harness Side	(-) Vehicle Battery																	
UO2SHTR - Pin 3	Negative terminal																	
(+) Universal HO2S Connector, Harness Side	(-) Universal HO2S Connector, Harness Side																	
UO2SHTR - Pin 3	UO2S - Pin 6																	
UO2SHTR - Pin 3	UO2SGREF - Pin 2																	
UO2SHTR - Pin 3	UO2SPC - Pin 1																	
UO2SHTR - Pin 3	UO2SPCT - Pin 5																	
UO2SHTR - Pin 3	VPWR - Pin 4																	

Universal Heated Oxygen Sensor (HO2S)

DZ

Test Step		Results / Action to Take						
DZ9	CHECK THE INTERNAL RESISTANCE OF THE UNIVERSAL HO2S HEATER - Measure the resistance between:<table><tr><td>(+) Universal HO2S Connector, Component Side</td><td>(-) Universal HO2S Connector, Component Side</td></tr><tr><td>VPWR - Pin 4</td><td>UO2SHTR - Pin 3</td></tr></table> - Is the resistance between 1.8 - 9 ohms?	(+) Universal HO2S Connector, Component Side	(-) Universal HO2S Connector, Component Side	VPWR - Pin 4	UO2SHTR - Pin 3	Yes GO to DZ10 . No INSTALL a new Universal HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.		
(+) Universal HO2S Connector, Component Side	(-) Universal HO2S Connector, Component Side							
VPWR - Pin 4	UO2SHTR - Pin 3							
DZ10	CHECK THE UO2SHTR CIRCUIT FOR AN INTERNAL SHORT TO GROUND - Measure the resistance between:<table><tr><td>(+) Universal HO2S Connector, Component Side</td><td>(-)</td></tr><tr><td>UO2SHTR - Pin 3</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) Universal HO2S Connector, Component Side	(-)	UO2SHTR - Pin 3	Ground	Yes GO to DZ25 . No INSTALL a new Universal HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.		
(+) Universal HO2S Connector, Component Side	(-)							
UO2SHTR - Pin 3	Ground							
DZ11	DTCS P0130 AND P0150: CHECK THE UO2S AND UO2SGREF CIRCUITS FOR AN OPEN IN THE HARNESS - Key in OFF position. - Universal HO2S connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) Universal HO2S Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>UO2S - Pin 6</td><td>UO2S</td></tr><tr><td>UO2SGREF - Pin 2</td><td>UO2SGREF</td></tr></table> - Are the resistances less than 5 ohms?	(+) Universal HO2S Connector, Harness Side	(-) PCM Connector, Harness Side	UO2S - Pin 6	UO2S	UO2SGREF - Pin 2	UO2SGREF	Yes GO to DZ12 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Universal HO2S Connector, Harness Side	(-) PCM Connector, Harness Side							
UO2S - Pin 6	UO2S							
UO2SGREF - Pin 2	UO2SGREF							

Universal Heated Oxygen Sensor (HO2S)

DZ

Test Step		Results / Action to Take										
DZ12	CHECK THE UO2S, UO2SGREF, UO2SPC, AND UO2SPCT CIRCUITS FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) Universal HO2S Connector, Harness Side</th><th>(-)</th></tr><tr><td>UO2S - Pin 6</td><td>Ground</td></tr><tr><td>UO2SGREF - Pin 2</td><td>Ground</td></tr><tr><td>UO2SPC - Pin 1</td><td>Ground</td></tr><tr><td>UO2SPCT - Pin 5</td><td>Ground</td></tr></table> - Are the resistances greater than 10K ohms?	(+) Universal HO2S Connector, Harness Side	(-)	UO2S - Pin 6	Ground	UO2SGREF - Pin 2	Ground	UO2SPC - Pin 1	Ground	UO2SPCT - Pin 5	Ground	Yes GO to DZ13 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Universal HO2S Connector, Harness Side	(-)											
UO2S - Pin 6	Ground											
UO2SGREF - Pin 2	Ground											
UO2SPC - Pin 1	Ground											
UO2SPCT - Pin 5	Ground											
DZ13	CHECK THE UO2S, UO2SGREF, UO2SPC, AND UO2SPCT CIRCUITS FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - Measure the voltage between:<table><tr><th>(+) Universal HO2S Connector, Harness Side</th><th>(-)</th></tr><tr><td>UO2S - Pin 6</td><td>Ground</td></tr><tr><td>UO2SGREF - Pin 2</td><td>Ground</td></tr><tr><td>UO2SPC - Pin 1</td><td>Ground</td></tr><tr><td>UO2SPCT - Pin 5</td><td>Ground</td></tr></table> - Is any voltage present?	(+) Universal HO2S Connector, Harness Side	(-)	UO2S - Pin 6	Ground	UO2SGREF - Pin 2	Ground	UO2SPC - Pin 1	Ground	UO2SPCT - Pin 5	Ground	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to DZ14 .
(+) Universal HO2S Connector, Harness Side	(-)											
UO2S - Pin 6	Ground											
UO2SGREF - Pin 2	Ground											
UO2SPC - Pin 1	Ground											
UO2SPCT - Pin 5	Ground											
DZ14	CHECK THE UO2SGREF CIRCUIT FOR VOLTAGE - Key in OFF position. - PCM connector connected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><th>(+) Universal HO2S Connector, Harness Side</th><th>(-)</th></tr><tr><td>UO2SGREF - Pin 2</td><td>Ground</td></tr></table> - Is the voltage between 2.4 - 2.6 V?	(+) Universal HO2S Connector, Harness Side	(-)	UO2SGREF - Pin 2	Ground	Yes INSTALL a new Universal HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test. No GO to DZ25 .						
(+) Universal HO2S Connector, Harness Side	(-)											
UO2SGREF - Pin 2	Ground											

Universal Heated Oxygen Sensor (HO2S)

DZ

Test Step		Results / Action to Take
DZ15	DTCS P0133 AND P0153: CARRY OUT THE KOER SELF-TEST	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to DZ16 .
	- Engine at normal operating temperature. - Carry out the KOER self-test. - Are any DTCs present other than P0133 or P0153?	
DZ16	CHECK FOR A SOURCE OF POTENTIAL CONTAMINATION	Yes REPAIR the source of the contamination. CHANGE the engine oil and oil filter. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test. No GO to DZ17 .
	- Investigate the following items as potential sources of universal HO2S contamination: — use of unapproved silicon sealers — fuel contaminated by silicon additives — excessive oil consumption — glycol leaking internally in the engine — lead-contaminated fuel — short drive cycles in cold weather — use of unapproved cleaning agents - Is a concern present?	
DZ17	CHECK THE UNIVERSAL HO2S RESPONSE TEST RESULTS	Yes Unable to duplicate or identify the concern at this time. CLEAR the DTCs. REPEAT the self-test. No INSTALL a new Universal HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.
	- Key ON, engine OFF. - Access the diagnostic monitoring test results for the HO2S11 and HO2S21. - Is the indicated value greater than the minimum threshold?	

Universal Heated Oxygen Sensor (HO2S)

DZ

Test Step		Results / Action to Take				
DZ18	DTCS P0134 AND P0154: CHECK THE UO2SPC CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - Universal HO2S connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) Universal HO2S Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>UO2SPC - Pin 1</td><td>UO2SPC</td></tr></table> - Is the resistance less than 5 ohms?	(+) Universal HO2S Connector, Harness Side	(-) PCM Connector, Harness Side	UO2SPC - Pin 1	UO2SPC	Yes INSTALL a new Universal HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory(KAM). REPEAT the self-test. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Universal HO2S Connector, Harness Side	(-) PCM Connector, Harness Side					
UO2SPC - Pin 1	UO2SPC					
DZ19	KOER DTC P1127: EXHAUST TEMPERATURE OUT OF RANGE Note: Address all other DTCs before proceeding. - Key ON, engine running. - Engine at normal operating temperature. - Access the PCM and monitor the HO2S Heater PID. - Is the PID state ON?	Yes CARRY OUT the KOER self-test. No RUN the engine until the PID indicates ON. CARRY OUT the KOER self-test.				
DZ20	DTCS P2096, P2097, P2098 AND P2099: VISUALLY INSPECT THE UPSTREAM AND DOWNSTREAM HO2S CONNECTORS - Key in OFF position. - HO2S connector disconnected. - Universal HO2S connector disconnected. - Check for a loose connection, and damaged or corroded terminals. - Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DZ21.				
DZ21	CHECK FOR LEAKS IN THE EXHAUST SYSTEM - Visually inspect the exhaust system for the following: - exhaust leaks at flanges and gaskets - HO2Ss not tightened to specification - physical exhaust system concerns - aftermarket exhaust - punctures or cracks in the catalytic converter - Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to DZ22.				

Universal Heated Oxygen Sensor (HO2S)

DZ

Test Step		Results / Action to Take			
DZ22	CHECK FOR POTENTIAL SENSOR CONTAMINATION CONCERNS	Yes REPAIR the source of the contamination. CHANGE the engine oil and oil filter. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Alive Memory (KAM). REPEAT the self-test. No GO to DZ25 .			
	- Investigate the following items as potential sources of universal HO2S contamination: — use of unapproved silicon sealers — fuel contaminated by silicon additives — excessive oil consumption — glycol leaking internally in the engine — lead-contaminated fuel — short drive cycles in cold weather — use of unapproved cleaning agents - Is a concern present?				
DZ23	CHECK THE UO2SPCT CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to DZ24 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.			
	- Key in OFF position. - Universal HO2S connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) Universal HO2S Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>UO2SPCT - Pin 5</td><td>UO2SPCT</td></tr></table> - Is the resistance less than 5 ohms?		(+) Universal HO2S Connector, Harness Side	(-) PCM Connector, Harness Side	UO2SPCT - Pin 5
(+) Universal HO2S Connector, Harness Side	(-) PCM Connector, Harness Side				
UO2SPCT - Pin 5	UO2SPCT				
DZ24	CHECK THE RESISTANCE OF THE CURRENT TRIM RESISTOR IN THE UNIVERSAL HO2S	Yes The concern is elsewhere. RETURN to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index for further direction. No INSTALL a new Universal HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.			
	- Measure the resistance between:<table><tr><td>(+) Universal HO2S Connector, Component Side</td><td>(-) Universal HO2S Connector, Component Side</td></tr><tr><td>UO2SPCT - Pin 5</td><td>UO2SPC - Pin 1</td></tr></table> - Is the resistance between 25 - 330 ohms?		(+) Universal HO2S Connector, Component Side	(-) Universal HO2S Connector, Component Side	UO2SPCT - Pin 5
(+) Universal HO2S Connector, Component Side	(-) Universal HO2S Connector, Component Side				
UO2SPCT - Pin 5	UO2SPC - Pin 1				

**Universal Heated Oxygen Sensor
(HO2S)****DZ**

Test Step		Results / Action to Take
DZ25	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

DZ25

Test EM: Emission Compliance
PINPOINT TEST EM: EMISSION COMPLIANCE

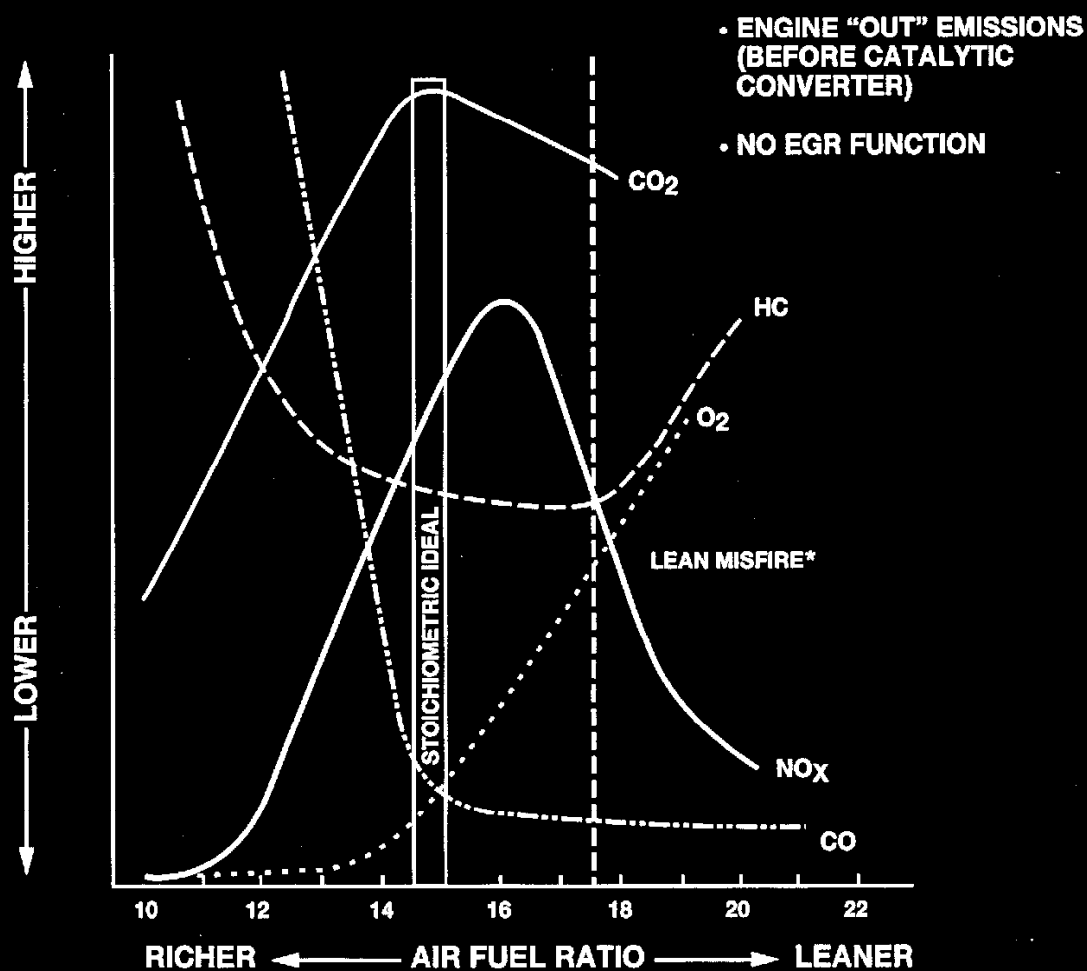
Emission Compliance**EM**

 **WARNING:** Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.

Note: Canada and some states or metropolitan areas in the United States require periodic emission, or inspection/maintenance (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.

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).

Exhaust Gas Analysis Chart

Emission Compliance

EM

Example:

- The actual HC produced by a vehicle is 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?	
EM2	EVAP SYSTEM LEAK OR PURGE FLOW TEST (IF THESE TESTS WERE CARRIED OUT)	
	• Does the vehicle fail only an EVAP system leak or purge flow test (if these tests are carried out)?	
EM3	BASELINE THE VEHICLE	
	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?	

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. REFER to Symptom Charts, QT: Step 1: Powertrain Control Module (PCM) Quick Test. 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 for leaks and blockages — electrical connections — proper scheduled maintenance — Ford authorized emission controls and components installed on the 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, refer to Symptom Charts, GO to Pinpoint Test QT. • 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 .

Emission Compliance

EM

Test Step		Results / Action to Take
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 .
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	
	- For ignition coil on plug (COP) equipped vehicles, GO to JB2 and follow the pinpoint test direction. - For ignition coil pack equipped vehicles, GO to JC2 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 .

Emission Compliance

EM

Test Step		Results / Action to Take
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)	Yes FOLLOW the pinpoint test direction. After any repair, GO to EM26 . No GO to EM14 .
	- GO to HG2 and follow the pinpoint test direction. - Is a concern present?	
EM14	CHECK THE EXHAUST SYSTEM	Yes FOLLOW the pinpoint test direction. After any repair, GO to EM26 . No GO to EM15 .
	- GO to HF2 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 System. - 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 .
	- For ignition coil on plug (COP) equipped vehicles, GO to JB2 and follow the pinpoint test direction. - For ignition coil pack equipped vehicles, GO to JC2 and follow the pinpoint test direction. - Is a concern present?	

Emission Compliance

EM

Test Step		Results / Action to Take
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 HG2 and follow the pinpoint test direction. - Is a concern present?	
EM19	CHECK THE BASE ENGINE	Yes REPAIR as necessary. After any repair, GO to EM26 . No GO to EM27 .
	- Check for base engine concerns such as intake manifold leaks, improper compression, or valvetrain or camshaft damage. Refer to Engine System to carry out the Intake manifold vacuum test, compression test, and valve train analysis. - Is a concern present?	
EM20	HIGH NOX WITH NORMAL TO LOW HC AND CO LEVELS: CHECK THE BASE ENGINE	Yes REPAIR as necessary. After any repair, GO to EM26 . No GO to EM21 .
	- Check for base engine concerns such as excessive carbon build up in the combustion chamber. Refer to Engine System to diagnose the abnormal combustion. - Is a concern present?	
EM21	ADDITIONAL CHECKS	Yes REPAIR as necessary. After any repair, GO to EM26 . No GO to EM27 .
	- 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?	
EM22	EVAP SYSTEM CONCERN: PRELIMINARY CHECKS	Yes REPAIR as necessary. After any repair, GO to EM25 . No GO to EM23 .
	- Analyze the I/M test report to determine when the concern is present. Attempt to verify the concern. - Check the following: - fuel filler cap - capless fuel tank filler pipe (if equipped) - EVAP system lines/hoses for proper connections, damage or blockage - fuel vapor storage canister damage - Is a concern present?	

Emission Compliance**EM**

Test Step		Results / Action to Take
EM23	CARRY OUT THE PCM QUICK TEST - Carry out the PCM Quick Test to access any PCM DTCs. For the procedure information, refer to Symptom Charts, GO to Pinpoint Test QT. - Is a concern present?	Yes FOLLOW Symptom Charts, Quick Test direction. After any repair, GO to EM25 . No GO to EM24 .
EM24	EVAP SYSTEM CHECK - Check the EVAP system for leaks. Refer to Evaporative Emissions System, Evaporative Emissions to carry out the evaporative emission system leak test. - 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 Pinpoint Test Z. 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, refer to Symptom Charts, GO to Pinpoint Test QT. - 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	
Note: If the vehicle needs to be driven for the baseline test, it may be necessary to drive the vehicle first up to 8 km (5 miles) 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. • Confirm the vehicle repair. • Reset the keep alive memory (KAM). Refer to Diagnostic Methods, Resetting The Keep Alive Memory (KAM) 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, refer to Symptom Charts, GO to Pinpoint Test QT. Repair any other DTCs. • Carry out the baseline test using the exhaust gas analyzer. • 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. • 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) and the IAC (if equipped). CLEAR the DTCs. VERIFY the test step results. If all test steps are OK, GO to Pinpoint Test Z. 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)

Powertrain Control Module (PCM) Connector

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

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

Test Step		Results / Action to Take
FB1	PTO INDICATOR LAMP • Did you come to this pinpoint test for an always on/ never on PTO indicator?	Yes GO to FB7 . No GO to FB2 .
FB2	PTO NOT WORKING CORRECTLY: CHECK THE PTO INDICATOR LAMP OPERATION Note: The following conditions must be met before the PTO engages: — 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 indicator illuminate?	Yes GO to the aftermarket PTO mechanical manual. No GO to FB3 .

Power Take Off (PTO)**FB**

Test Step		Results / Action to Take
FB3	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 FB4. No REPAIR the PTO circuit or switch as necessary. CLEAR the DTCs. REPEAT the self-test.
FB4	CHECK THE PTO LOAD PID STATE IN THE PCM	
	- Access the PCM and monitor the PTOLOAD PID. - Cycle the PTO switch, Does the PTO LOAD PID change state?	Yes GO to FB5. No REPAIR the PTO ENG circuit or switch as necessary. CLEAR the DTCs. REPEAT the self-test.
FB5	CHECK THE PTOIR_V PID STATE IN THE PCM	
	Note: The PTOIR_V PID represents an analog input which reflects the user requested engine speed. - Access the PCM and monitor the PTOIR_V PID. - Cycle the PTO switch, Does the PTOIR_V PID change state?	Yes GO to FB6. No REPAIR the PTO RPM circuit or switch as necessary. CLEAR the DTCs. REPEAT the self-test.
FB6	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 FB7. No VERIFY no DTCs are present. VERIFY the vehicle conditions in step FB2 are correct for PTO operation.
FB7	PTO INDICATOR LAMP ALWAYS OFF OR ON: CHECK THE PTOIL_F PID	
	- Access the PCM and monitor the PTOIL_F PID. Is a concern present?	Yes REPAIR the circuit as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to the aftermarket PTO mechanical manual.

FB3-FB7

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) (9F924), (9C872)
- harness circuits: B+, BPP, BPS
- powertrain control module (PCM) (12A650)

Refer to Vehicle/Diagrams 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	Pin	Circuit
Crown Victoria, Grand Marquis, Town Car	170 Pin	B9	BPS
E-Series, F-Super Duty	170 Pin	E65 B8	BPS BPP
Escape/Mariner	150 (50-50-50) Pin	B8	BPP
Expedition, Fusion, Milan, MKZ, Navigator	140 Pin	B47 B46	BPS BPP
Explorer, Explorer Sport Trac, Mountaineer, Mustang	170 Pin	B9 B8	BPS BPP
Focus	190 Pin	B46 B13	BPS BPP
Ranger	170 Pin	B8	BPP
All other vehicles	190 Pin	B47 B46	BPS BPP

Description And Powertrain Control Module (PCM) Connector

Brake Pedal Inputs**FD**

Test Step		Results / Action to Take
FD1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTC) Are DTCs P0504, P0572, P0573, P0703, P1572, or P1703 present?	Yes For KOEO or continuous memory DTCs P0504, P0572, P0573, P0703, P1703 and continuous memory DTC P1572, GO to FD3 . For KOER DTCs P0703, or P1703, GO to FD2 . No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
FD2	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 FD3 . No REPEAT the KOER self-test. APPLY and RELEASE the brake pedal during the KOER test. CLEAR the DTCs. REPEAT the self-test.
FD3	DTCS P0572, P0573, P0703, P1572 AND P1703: CHECK THE OPERATION OF THE STOPLAMPS - Key ON, engine OFF. - Apply and release the brake pedal and check the stop lamp operation. - Do the stoplamps operate correctly?	Yes GO to FD4 . No REFER to Exterior Lighting to diagnose the inoperative stoplamps. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
FD4	CHECK THE SPEED CONTROL OPERATION - Check for correct speed control operation (if equipped). - Does the speed control operate correctly?	Yes GO to FD5 . No REFER to Cruise Control, Speed Control to diagnose the inoperative speed control. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.

Brake Pedal Inputs

FD

Test Step		Results / Action to Take				
FD5	CHECK FOR A BPP NETWORK MESSAGE - Is the vehicle one of the following: — Crown Victoria — Grand Marquis — Sable — Taurus — Taurus X — Town Car - Is the vehicle listed above?	Yes GO to FD6 . No GO to FD7 .				
FD6	CHECK THE BRAKE SWITCH OPERATION - Key ON, engine OFF. - 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 For vehicles with BPS, GO to FD8 . For vehicles without BPS, GO to FD10 . No REFER to Information Bus (Module Communications Network), Module Communications Network to diagnose the powertrain control module (PCM) not responding to the scan tool. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.				
FD7	CHECK FOR BPP CIRCUIT CYCLING - Key in OFF position. - PCM connector disconnected. - Key ON, engine OFF. - Apply and release the brake pedal while monitoring the voltage. - Measure the voltage between:<table border="1"><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 FD8 . For vehicles without BPS, GO to FD10 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
BPP	Ground					

Brake Pedal Inputs

FD

Test Step		Results / Action to Take				
FD8	CHECK FOR BPS CIRCUIT CYCLING • Key in OFF position. • PCM connector disconnected. • Key ON, engine OFF. • Apply and release the brake pedal while monitoring the voltage. • Measure the voltage between:<table border="1"><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 GO to FD10. No GO to FD9.
(+) PCM Connector, Harness Side	(-)					
BPS	Ground					
FD9	CHECK THE BPS CIRCUIT VOLTAGE • Measure the voltage between:<table border="1"><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 volts?	(+) PCM Connector, Harness Side	(-)	BPS	Ground	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
BPS	Ground					
FD10	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.				

FD8-FD10

Test FF: Power Steering Pressure (PSP) Switch

PINPOINT TEST FF: POWER STEERING PRESSURE (PSP) SWITCH

Power Steering Pressure (PSP) Switch

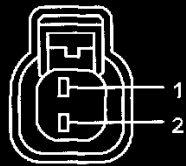
FF

 **WARNING:** Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.

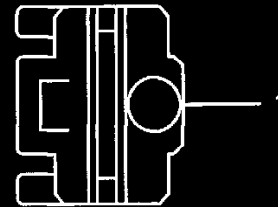
This pinpoint test is intended to diagnose the following:

- power steering pressure (PSP) Switch (3N824)
- harness circuits: PPSW and SIGRTN
- powertrain control module (PCM) (12A650)

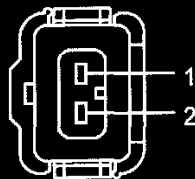
Power Steering Pressure (PSP) Switch Connector

A

A0077564

B

N0027701

C

A0077534

Warning And Power Steering Pressure (PSP) Switch Connector

Power Steering Pressure (PSP) Switch

FF

Vehicle	Connector	Pin	Circuit
Crown Victoria, Fusion 3.0L, Grand Marquis, Milan 3.0L, Town Car	A	2 1	SIGRTN PSPSW
Edge, Fusion 2.3L, Milan 2.3L, MKX, MKZ	B	1	PSPSW
Ranger	C	2 1	SIGRTN PSPSW
All other vehicles	C	1 2	SIGRTN PSPSW

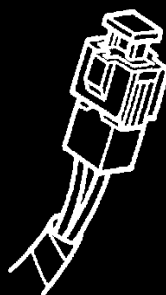
The PSP and SIGRTN circuits may be reversed in the harness connector. Refer to Vehicle/Diagrams for schematic and connector information.

Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
Edge, MKX	190 Pin	B17	PSPSW
Explorer, Explorer Sport Trac, Mountaineer	170 Pin	B41 B27	SIGRTN PSPSW
Fusion 3.0L, Milan 3.0L	140 Pin	E58 E65	SIGRTN PSPSW
Fusion 2.3L, Milan 2.3L, MKZ	140 Pin	E65	PSPSW
Ranger	170 Pin	B41 B34	SIGRTN PSPSW
Sable, Taurus, Taurus X	190 Pin	E41 B17	SIGRTN PSPSW
All other vehicles	170 Pin	E58 B34	SIGRTN PSPSW

Power Steering Pressure (PSP) Switch Connector And Powertrain Control Module (PCM) Connector

Power Steering Pressure (PSP) Switch**FF****Shorting Bar for Harness Circuit without PSP Switch (typical)**

A24595-A

Test Step		Results / Action to Take
FF1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTC) Are DTCs P1650 or P1651 present?	Yes For KOEO DTC P1650, GO to FF3. For KOER DTC P1650, GO to FF2. For continuous memory DTC P1651, GO to FF7. No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
FF2	KOER DTC P1650: CARRY OUT TURNING THE STEERING WHEEL ONE HALF TURN Did you turn the steering wheel at least one half turn within 20 seconds of starting the KOER self-test?	Yes GO to FF3. No CARRY OUT the KOER self-test.
FF3	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 FF7. No GO to FF4.

Power Steering Pressure (PSP) Switch

FF

Test Step		Results / Action to Take								
FF4	CHECK THE PSP CIRCUITS TO THE PSP SWITCH FOR CYCLING • Key in OFF position. • PSP Switch connector disconnected. • Key ON, engine OFF. • Access the PCM and monitor the PSP PID. • For Fusion/Milan 2.3L, Edge/MKX or MKZ, • Connect a 5 amp fused jumper wire between the following: <table><tr><td>Point A PSP Switch Connector, Harness Side</td><td>Point B</td></tr><tr><td>PSPSW</td><td>Ground</td></tr></table> • For all others, • 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>PSPSW</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	PSPSW	Ground	Point A PSP Switch Connector, Harness Side	Point B PSP Switch Connector, Harness Side	PSPSW	SIGRTN	Yes INSTALL a new PSP switch. CLEAR the DTCs. REPEAT the self-test. No GO to FF5.
Point A PSP Switch Connector, Harness Side	Point B									
PSPSW	Ground									
Point A PSP Switch Connector, Harness Side	Point B PSP Switch Connector, Harness Side									
PSPSW	SIGRTN									
FF5	CHECK THE PSP AND SIGRTN 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>(-) PSP Switch Connector, Harness Side</td></tr><tr><td>PSPSW</td><td>PSPSW</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	PSPSW	PSPSW	SIGRTN	SIGRTN	Yes GO to FF6. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) PCM Connector, Harness Side	(-) PSP Switch Connector, Harness Side									
PSPSW	PSPSW									
SIGRTN	SIGRTN									

Power Steering Pressure (PSP) Switch

FF

Test Step		Results / Action to Take								
FF6	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>PSPSW</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>PSPSW</td><td>SIGRTN</td></tr></table> - Are the resistances greater than 10K ohms?	(+) PSP Switch Connector, Harness Side	(-)	PSPSW	Ground	(+) PSP Switch Connector, Harness Side	(-) PSP Switch Connector, Harness Side	PSPSW	SIGRTN	Yes GO to FF8. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PSP Switch Connector, Harness Side	(-)									
PSPSW	Ground									
(+) PSP Switch Connector, Harness Side	(-) PSP Switch Connector, Harness Side									
PSPSW	SIGRTN									
FF7	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 ON, engine OFF. - Access the PCM and monitor the PSP PID. - Check for open circuits while carrying out the following (a concern is 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 a short to ground. Shake, wiggle and bend the PSP circuits. - Is a concern present?	Yes ISOLATE the concern. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No CONNECT the PSP switch. Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.								
FF8	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.								

FF6-FF8

Test H: Fuel Control

PINPOINT TEST H: FUEL CONTROL

Fuel Control

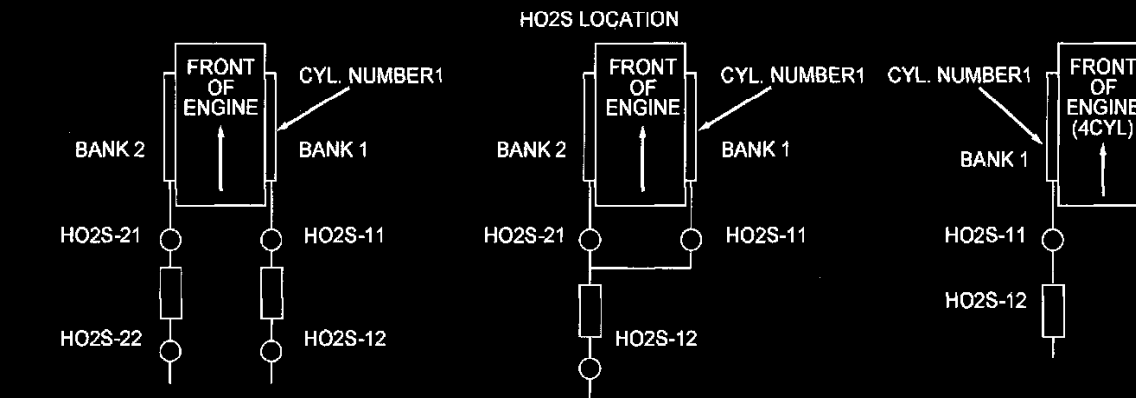
H

⚠ WARNING: Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.

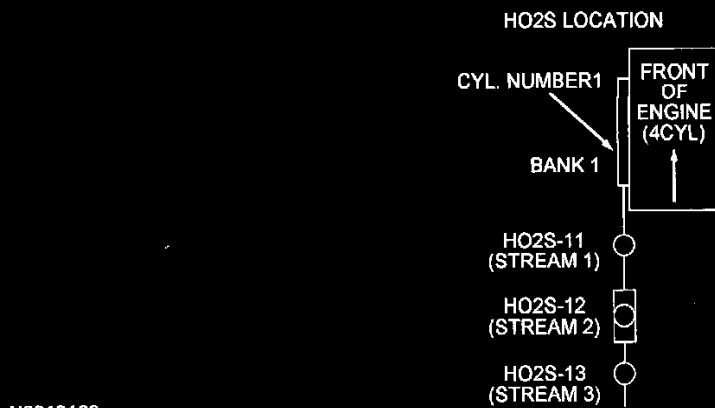
⚠ WARNING: While conducting tests on a hot engine take all safety precautions to prevent skin contact with hot engine components. Failure to follow these instructions may result in personal injury.

This pinpoint test is intended to diagnose the following:

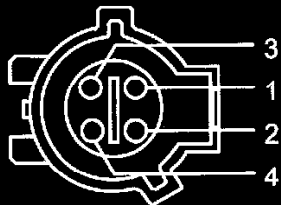
- HO2S/O2S (9F472)
- HO2S/O2S (9G444)
- fuel injector(s) (9F593)
- harness circuits: HO2S, HO2S Heater, VPWR, and SIGRTN
- vacuum systems
- powertrain control module (PCM) (12A650)



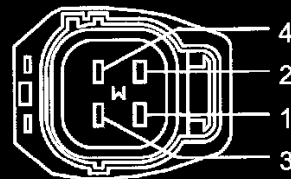
N0013163

Fuel Control**H****Heated Oxygen Sensor-Front (HO2S-Front) Connector**

The pin numbering for the connector is in reference to the connector lock tab. Not all connector key combinations are shown.

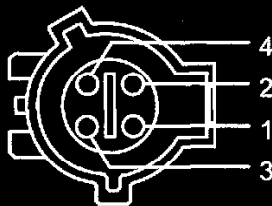
A

A0077561

B

A0077521

Schematic And Heated Oxygen Sensor-Front (HO2S-Front) Connector

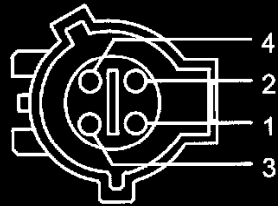
Fuel Control**H****C**

A0077507

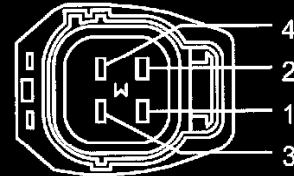
Vehicle	Connector	Pin	Circuit
Crown Victoria, F-150, Grand Marquis, Mark LT, Mustang, Ranger, Town Car	A	2 4 3 1	VPWR SIGRTN HO2S Signal HO2S Heater
Focus	B	1 3 4 2	VPWR SIGRTN HO2S Signal HO2S Heater
All other vehicles	C	1 3 4 2	VPWR SIGRTN HO2S Signal HO2S Heater

**Heated Oxygen Sensor-Rear (HO2S-Rear)
Connector**

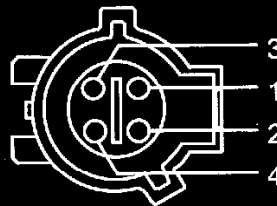
The pin numbering for the connector is in reference to the connector lock tab. Not all connector key combinations are shown.

Fuel Control**H****A**

A0077507

B

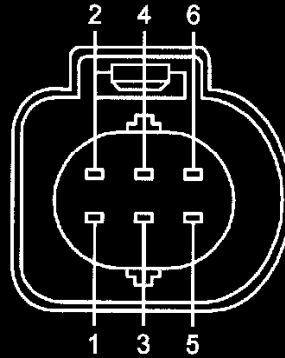
A0077521

C

A0077561

Vehicle	Connector	Pin	Circuit
Escape/Mariner, F-150, Mark LT	A	1 3 4 2	VPWR SIGRTN HO2S Signal HO2S Heater
Focus	B	1 3 4 2	VPWR SIGRTN HO2S Signal HO2S Heater
All other vehicles	C	2 4 3 1	VPWR SIGRTN HO2S Signal HO2S Heater

Heated Oxygen Sensor-Rear (HO2S-Rear) Connector Continued

Fuel Control**H****Universal HO2S Connector**

N0048502

Pin	Circuit
1	UO2SPC (Universal Oxygen Sensor Pumping Current)

Powertrain Control Module (PCM) Connector

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

Universal HO2S Connector And Powertrain Control Module (PCM) Connector

Fuel Control**H**

Vehicle	Connector	Pin	Circuit
E-Series 6.8L, E-Series 5.4L Cutaway or stripped chassis	170 Pin	T48 E70 B38 T47 E69 T25 E29 B14 T24 E28 B35 B41, E58, T41	HTR22 HTR21 HTR13 HTR12 HTR11 HO2S22 HO2S21 HO2S13 HO2S12 HO2S11 VPWR SIGRTN
Edge, MKX, Sable, Taurus, Taurus X	190 Pin	E2 E70 E1 E69 E24 E28 E23 E29 B51 B58, E58	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 VPWR SIGRTN
Escape/Mariner 3.0L	150 (50-50-50) Pin	T48 E48 T47 E49 T25 E26 T24 E30 B35 B41, E41, T41	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 VPWR SIGRTN
Escape/Mariner 2.3L	150 (50-50-50) Pin	T47 E49 T24 E30 B35 B41, E41, T41	HTR12 HTR11 HO2S12 HO2S11 VPWR SIGRTN
Expedition, Navigator	140 Pin	B11 E70 B10 E69 B40 E28 B39 E29 B51 B58, E58	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 VPWR SIGRTN

(Continued)

Fuel Control**H**

Vehicle	Connector	Pin	Circuit
F-150, Mark LT	190 Pin	T12 E70 T1 E69 T21 E28 T22 E29 B51 B58, E58, T43	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 VPWR SIGRTN
F-Super Duty 6.8L Narrow frame	170 Pin	E70 B38 E69 E29 B14 E28 B35 B41, E58, T41	HTR21 HTR13 HTR11 HO2S21 HO2S13 HO2S11 VPWR SIGRTN
Focus 2.0L PZEV	190 Pin	T25 T18 E52 T7 T16 E11 B67 B58, E64, T40	HTR13 HTR12 HTR11 HO2S13 HO2S12 HO2S11 VPWR SIGRTN
Focus 2.0L	190 Pin	T18 E52 T16 E11 B67 B58, E64, T40	HTR12 HTR11 HO2S12 HO2S11 VPWR SIGRTN
Fusion 3.0L, Milan 3.0L, MKZ	140 Pin	E24 E70 E23 E69 E4 E29 E3 E28 B51 B58, E58	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 VPWR SIGRTN
Fusion 2.3L, Milan 2.3L	140 Pin	E23 E69 E3 E28 B51 B58, E58	HTR12 HTR11 HO2S12 HO2S11 VPWR SIGRTN

(Continued)

Fuel Control**H**

Vehicle	Connector	Pin	Circuit
Fusion 2.3L PZEV, Milan 2.3L PZEV	140 Pin	E25 E23 E69 E5 E3 E28 B51 B58, E58	HTR13 HTR12 HTR11 HO2S13 HO2S12 HO2S11 VPWR SIGRTN
Ranger 2.3L	170 Pin	T47 E69 T24 E28 B35 B41, E58, T41	HTR12 HTR11 HO2S12 HO2S11 VPWR SIGRTN
Sable PZEV, Taurus PZEV, Taurus X PZEV	190 Pin	E6 E4 B51 B58, E58	UO2SPC21 UO2SPC11 VPWR SIGRTN
All other vehicles	170 Pin	T48 E70 T47 E69 T25 E29 T24 E28 B35 B41, E58, T41	HTR22 HTR21 HTR12 HTR11 HO2S22 HO2S21 HO2S12 HO2S11 VPWR SIGRTN

Test Step		Results / Action to Take
H1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	
	Are DTCs P0171, P0172, P0174, P0175, P2195, P2196, P2197, P2198, P2270, P2271, P2272, P2273, P2274, or P2275 present?	Yes For DTCs P2270, P2271, P2272, P2273, P2274 or P2275, GO to H32. For DTCs P0171, P0174, P2195 or P2197, GO to H2. For DTCs P0172, P0175, P2196 or P2198, GO to H7. No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.

Fuel Control**H**

Test Step		Results / Action to Take
H2	DTCS P0171, P0174, P2195 OR P2197: LEAN SYSTEM DTCS	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to H3.
	Note: Do not clear the DTCS or reset the keep alive memory (KAM). • Access the PCM and record the engine coolant temperature (ECT) PID from the freeze frame data. The freeze frame data is used to recreate the concern. • Retrieve and record the self-test DTCS. • Are any DTCS present other than the following: P0171, P0174, P2195 or P2197?	
H3	CARRY OUT A VISUAL INSPECTION ON THE INTAKE AIR SYSTEM AND ALL VACUUM HOSES	Yes GO to H6. No GO to H4.
	• Key in OFF position. • 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?	

Fuel Control

H

Test Step		Results / Action to Take
H4	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: When calculating the total fuel correction in the following steps, if LONGFT1 equals +13% and SHRTFT1 equals +23%, the total fuel correction for bank 1 equals +36%. If LONGFT2 equals +24% and SHRTFT2 equals -3% the total fuel correction for bank 2 equals +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. • Mathematically 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. • Mathematically 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 difference, between idle and 2,500 RPM, less than 15 percent?		Yes No vacuum leak is present. For DTCs P0171 or P0174, GO to H16. For Sable, Taurus, and Taurus X PZEVs with DTCs P2195 or P2197, GO to H15. For all other vehicles with DTCs P2195 or P2197, GO to H9. No GO to H5.

Fuel Control

H

Test Step		Results / Action to Take
H5	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: When monitoring for a decrease in the SHRTFT PIDs in the following steps, if SHRTFT1 equals +15% and the hose is restricted, SHRTFT1 decreases to -7%. The total decrease in the SHRTFT PIDs equals 22%. • 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 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 H6. 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 H6.
H6	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 RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test. No A vacuum leak is still present. GO to H5.

Fuel Control

H

Test Step		Results / Action to Take					
H7	DTCS P0172, P0175, P2196 OR P2198: RICH SYSTEM DTCS	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to H8.					
	Note: Do not clear the DTCs or reset the keep alive memory (KAM). - Access the PCM and record the freeze frame data. - Retrieve and record the self-test DTCs. Are any DTCs present other than the following: P0172, P0175, P2196 or P2198?						
H8	INSPECT THE ENTIRE INTAKE AIR SYSTEM FOR DEBRIS, BLOCKAGE OR OTHER DAMAGE	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No For DTCs P0172 or P0175, GO to H16. For Sable, Taurus, and Taurus X PZEVs with DTCs P2196 or P2198, GO to H15. For all other vehicles with DTCs P2196 or P2198, GO to H13.					
	- Check the intake air system for obstructions, restrictions, and damage. - Check the throttle plate for obstructions or sludge. - Check the air filter element and housing for blockage. Is a concern present?						
H9	CHECK THE HO2S AND SIGRTN CIRCUIT(S) FOR AN OPEN IN THE HARNESS	Yes GO to H10. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.					
	- 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						
H10	CHECK THE HO2S CIRCUIT FOR A SHORT TO SIGRTN IN THE HARNESS	Yes GO to H11. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.					
	- 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	
(+) HO2S Connector, Harness Side	(-) HO2S Connector, Harness Side						
HO2S Signal	SIGRTN						

Fuel Control

H

Test Step		Results / Action to Take						
H11	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 H12. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) HO2S Connector, Harness Side	(-)							
HO2S Signal	Ground							
H12	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 ON, engine OFF. - 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 GO to H16. No GO to H42.		
Point A HO2S Connector, Harness Side	Point B HO2S Connector, Harness Side							
HO2S Signal	VPWR							
H13	HO2S CIRCUIT TEST (WITH RICH DTCS) - Disconnect the HO2S related to the current DTC. - Key ON, engine OFF. - Access the PCM and monitor the HO2S Signal PID. - Is the voltage less than 0.2 V?	Yes GO to H16. No GO to H14.						
H14	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 GO to H42. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
HO2S Signal	HO2S Heater							
HO2S Signal	VPWR							

Fuel Control

H

Test Step		Results / Action to Take				
H15	CHECK THE UO2SPC CIRCUIT FOR AN OPEN IN THE HARNESS Note: Only the suspect UO2S needs to be diagnosed. • Key in OFF position. • Universal HO2S connector disconnected. • PCM connector disconnected. • Measure the resistance between:<table><tr><td>(+) Universal HO2S Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>UO2SPC - Pin 1</td><td>UO2SPC</td></tr></table> • Is the resistance less than 5 ohms?	(+) Universal HO2S Connector, Harness Side	(-) PCM Connector, Harness Side	UO2SPC - Pin 1	UO2SPC	Yes GO to H16. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Universal HO2S Connector, Harness Side	(-) PCM Connector, Harness Side					
UO2SPC - Pin 1	UO2SPC					
H16	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. Failure to follow these instructions may result in personal injury. Note: For vehicle specific fuel pressure ranges, refer to the Fuel System Specification Chart in pinpoint test HC. • Remove the jumper wire(s). • HO2S connector connected. • Relieve the fuel pressure. Refer to Fuel Delivery and Air Induction, Fuel System for the Fuel System Pressure Release procedure. • Mechanical fuel pressure gauge connected. • Pressurize the fuel system. Refer to Fuel Delivery and Air Induction, Fuel System for the Fuel System Pressure Release procedure to pressurize the fuel system. • Key ON, engine running. • Allow the fuel pressure to stabilize. • Key in OFF position. • Key ON, engine running. • Access the PCM and control the FP PID. • Run the fuel pump to obtain maximum fuel pressure. • Is the fuel pressure within range for the vehicle being diagnosed?	Yes GO to H17. No GO to Pinpoint Test HC.				

Fuel Control**H**

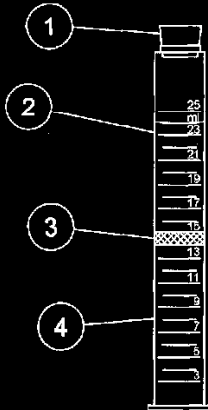
Test Step		Results / Action to Take
H17	CHECK THE FUEL SYSTEM FOR PRESSURE STABILITY - FAST LEAKDOWN	
	Note: When the fuel pump is commanded off, the fuel pressure may substantially decrease and then stabilize. Note: During output state control, the fuel pump stays commanded on for only about 5 seconds. • Key in OFF position. • Key ON, engine OFF. • Access the PCM and control the FP PID. • Run the fuel pump to obtain maximum fuel pressure. • Command the fuel pump off. • Allow the fuel pressure to stabilize. • Record the stabilized reading. • Monitor the fuel pressure for 10 seconds. • Does the fuel pressure remain within 34 kPa (5 psi) of the recorded reading after 10 seconds?	Yes GO to H19. No GO to H18.
H18	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. CLEAR the DTCs. REPEAT the self-test. No GO to H26.
H19	CHECK THE FUEL SYSTEM FOR PRESSURE STABILITY - SLOW LEAKDOWN	
	• Continue to monitor the fuel pressure for 1 minute. • Does the fuel pressure remain within 34 kPa (5 psi) of the recorded reading (MRFS) or greater than 275 kPa (40 psi) (ERFS) after 1 minute?	Yes GO to H20. No GO to HC13.

Fuel Control**H**

Test Step		Results / Action to Take
H20	CHECK THE SEPARATION LEVEL OF THE ETHANOL/WATER MIXTURE AND GASOLINE IN THE FUEL	
Note: This step requires the use of a locally obtained 200 ml beaker and a 25 ml graduated cylinder. Note: After approximately 3 minutes of standing, the ethanol and water mixes together and settles to the bottom of the 25 ml graduated cylinder. The gasoline rises to the top. • Fill the 200 ml beaker with 5 ml of clean water. • Use the pressure relief valve on the mechanical fuel gauge to drain 22 ml of fuel into an approved clean container. • Pour 20 ml of fuel from the approved clean container into the 25 ml graduated cylinder. • Add enough water from the 200 ml beaker to the 25 ml graduated cylinder to bring the total volume of liquid to 24 ml. • Insert a stopper plug in the opening of the 25 ml graduated cylinder. • Firmly hold the stopper in place and shake the 25 ml graduated cylinder to mix the water and fuel. • Allow the liquid to stand and separate for approximately 3 minutes. • Record the separation level from the 25 ml graduated cylinder where the ethanol/water mixture and gasoline meet. • Did the ethanol/water mixture and gasoline separate?		Yes GO to H21. No COMPLETE all steps before continuing. The ethanol/water mixture will separate from the gasoline. If the fuel does not appear to separate, then the fuel is either 100% ethanol or a mixture of ethanol and water.

Fuel Control

H

Test Step		Results / Action to Take										
H21	CALCULATE THE PERCENTAGE OF ETHANOL IN THE FUEL Note: Use the illustration as an example for calculating the percentage of ethanol in the following steps. If the separation level is at 14 ml the calculation becomes; 14 minus 4, then multiply by 5 to equal 50. The percentage of ethanol in the fuel is 50%. • Key in OFF position. • Take the recorded separation level from the previous step and subtract the amount of water added. • Multiply the new value by 5. This new value is the percentage of ethanol in the fuel. •  N0048579 <table><thead><tr><th>Item Number</th><th>Description</th></tr></thead><tbody><tr><td>1</td><td>Stopper</td></tr><tr><td>2</td><td>Gasoline</td></tr><tr><td>3</td><td>Separation Point at 14 ml</td></tr><tr><td>4</td><td>Ethanol/Water Mixture</td></tr></tbody></table> • Record the calculated percentage of ethanol in the fuel. • Is any ethanol present in the fuel?	Item Number	Description	1	Stopper	2	Gasoline	3	Separation Point at 14 ml	4	Ethanol/Water Mixture	
Item Number	Description											
1	Stopper											
2	Gasoline											
3	Separation Point at 14 ml											
4	Ethanol/Water Mixture											

Fuel Control

H

Test Step		Results / Action to Take
H22	COMPARE THE FF_INF PID TO THE CALCULATED PERCENTAGE OF ETHANOL	Yes GO to H26. No GO to H23.
Note: When determining if the FF_INF PID value is within 50% of the calculated percentage of ethanol, if the calculated percentage of ethanol value is 40% then the PID value should be between 0 - 90%. The PID value cannot be less than zero. • Key ON, engine OFF. • Access the PCM and monitor the FF_INF PID. • Compare the FF_INF PID to the calculated percentage of ethanol. • Is the FF_INF PID value within 50% of the calculated percentage of ethanol?		
H23	RESET THE PERCENT ETHANOL PARAMETER IN THE PCM	Yes GO to H24. No GO to H42.
Note: Certain customer fueling practices such as only fueling with small amounts of fuel or repeatedly switching between gasoline and an ethanol blend greater than E15 may prevent the PCM from learning the correct ethanol content in the fuel. • Reset the keep alive memory (KAM). Refer to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). • Key ON, engine running. • Access the PCM and monitor the FF_LRND PID. • Drive the vehicle approximately 11.3 km (7 miles) or until the FF_LRND PID indicates yes. • Is the PID state YES?		
H24	COMPARE THE UPDATED FF_INF PID TO THE CALCULATED PERCENTAGE OF ETHANOL	Yes RETURN the vehicle to the customer. ADVISE the customer of the correct fueling practices when using flex fuel. REFER to the Owner's Literature for additional information. ADVISE the customer to continue to use the same fuel for the next 2-3 refuels. This practice helps to verify the PCM is learning the correct percentage of ethanol in the fuel. No A fuel system concern may be present, which prevents the PCM from learning the correct percentage of ethanol in the fuel, GO to HC13.
• Key in OFF position. • Key ON, engine OFF. • Access the PCM and monitor the FF_INF PID. • Is the FF_INF PID value within 50% of the calculated percentage of ethanol?		

Yes
GO to H26.

No
GO to H23.

Yes
GO to H24.

No
GO to H42.

Yes
RETURN the vehicle to the customer. ADVISE the customer of the correct fueling practices when using flex fuel. REFER to the Owner's Literature for additional information. ADVISE the customer to continue to use the same fuel for the next 2-3 refuels. This practice helps to verify the PCM is learning the correct percentage of ethanol in the fuel.

No
A fuel system concern may be present, which prevents the PCM from learning the correct percentage of ethanol in the fuel, GO to HC13.

Fuel Control

H

Test Step		Results / Action to Take				
H25	DETERMINE IF THE PERCENTAGE OF ETHANOL IN THE FUEL IS LESS THAN 25%					
• Check the recorded calculated percentage of ethanol in the fuel. • Is the calculated percentage of ethanol in the fuel less than 25%?		Yes GO to H26. No REPAIR as necessary. ADVISE the customer of the correct fuel type required for this vehicle. REFER to the Owner's Literature for additional information. CLEAR the DTCs. REPEAT the self-test.				
H26	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 P0171, P0172, P0174 or P0175, GO to DC28. For DTCs P2195 or P2197, GO to H27. For DTCs P2196 or P2198, GO to H28. No INSTALL a new fuel injector. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.				
H27	CHECK THE HO2S OUTPUT VOLTAGE					
• HO2S connector disconnected. • Visually inspect the HO2S circuit for exposed wiring, contamination, corrosion and correct assembly. Repair as necessary. • 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> • Increase the engine speed to 2,000 RPM for 3 minutes. • Carry out the KOER self-test. • Monitor the signal voltage during the self-test. • Is the voltage greater than 0.5 volt at any time during the self-test?		(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side	HO2S Signal	SIGRTN	Yes GO to H30. No INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.
(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side					
HO2S Signal	SIGRTN					

Fuel Control**H**

Test Step		Results / Action to Take				
H28	ATTEMPT TO RETRIEVE DTC P2195 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 P2195 or P2197 present?	Point A HO2S Connector, Harness Side	Point B Vehicle Battery	HO2S Signal	Negative terminal	Yes GO to H29. No GO to H42.
Point A HO2S Connector, Harness Side	Point B Vehicle Battery					
HO2S Signal	Negative terminal					
H29	HO2S VOLTAGE CHECK - Key in OFF position. - Remove the jumper wire(s). - HO2S connector disconnected. - Key ON, engine running. - Increase the engine speed to 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> - Carry out the KOER self-test. - Monitor the signal voltage during the self-test. - Is the voltage less than 0.4 volt at any time during the self-test?	(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side	HO2S Signal	SIGRTN	Yes GO to H30. No INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.
(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side					
HO2S Signal	SIGRTN					
H30	CARRY OUT A THOROUGH WIGGLE TEST ON THE HO2S HARNESS - Key in OFF position. - 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, does the HO2S stop switching?	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to H31.				

Fuel Control

H

Test Step		Results / Action to Take
H31	TEST DRIVE THE VEHICLE WHILE MONITORING THE HO2S PID FOR SWITCHING	
	- Access the PCM and monitor the HO2S Signal and FUELSYS PIDs. - Start the engine and let idle until the vehicle goes into the closed loop fuel condition. - Drive the vehicle in a manner consistent with the freeze frame data in an attempt to simulate the original concern. Does the HO2S PID switch?	Yes GO to DC28. No INSTALL a new HO2S. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.
H32	DTCS P2270, P2272, P2271, 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. - Key in OFF position. - 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. CLEAR the DTCs. REPEAT the self-test. No For KOER DTCs P2270, P2271, P2272, P2273, P2274 or P2275, GO to H34. For continuous memory DTCs P2270, P2271, P2272, P2273, P2274 or P2275, GO to H33.
H33	CHECK FOR KOER DTCs	
	- Key ON, engine OFF. - Clear the DTCs. - Key ON, engine running. - Run the engine at approximately 2,000 RPM. Maintain the engine speed for 3 minutes. - Retrieve the continuous memory DTCs. Are DTCs P2270, P2271, P2272, P2273, P2274 or P2275 present?	Yes GO to H34. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.

Fuel Control

H

Test Step		Results / Action to Take												
H34	CHECK THE HO2S SIGNAL LEVEL TOO HIGH Note: Fuel calculations can be affected by unmetered air leaks. • Key in OFF position. • Carefully inspect the following areas for potential air leaks: — hoses connecting to the mass air flow (MAF) sensor assembly — hoses connecting to the throttle body — intake manifold gasket leaks — PCV system — the vacuum lines are disconnected — improperly seated engine oil dipstick, tube or oil fill cap — exhaust leaks at flanges and gaskets • With the vehicle in NEUTRAL, position it on a hoist. Refer to Maintenance/Service and Repair, Jacking and Lifting for the locations of the lifting points. • 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?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to H35.												
H35	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 H36. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) 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													

Fuel Control

H

Test Step		Results / Action to Take										
H36	CHECK THE HO2S CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) HO2S Connector, Harness Side</th></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 H37. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side											
HO2S Heater	HO2S Heater											
VPWR	VPWR											
HO2S Signal	HO2S Signal											
SIGRTN	SIGRTN											
H37	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 For partial zero emission vehicle (PZEV), GO to H40. For all others, GO to H39. No GO to H38.										
H38	CHECK THE HO2S CIRCUIT VOLTAGE - Key in OFF position. - PCM connector connected. - HO2S connector disconnected. - Connect a 5 amp fused jumper wire between the following:<table><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 OFF. - 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). REPEAT the self-test. No GO to H42.						
Point A HO2S Connector, Harness Side	Point B HO2S Connector, Harness Side											
HO2S Signal	VPWR											
H39	CHECK FOR OVER VOLTAGE IN THE PCM - Key in OFF position. - HO2S connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><th>(+) HO2S Connector, Harness Side</th><th>(-) Vehicle Battery</th></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). REPEAT the self-test. No GO to H42.				
(+) HO2S Connector, Harness Side	(-) Vehicle Battery											
SIGRTN	Negative terminal											
HO2S Signal	Negative terminal											

Fuel Control

H

Test Step		Results / Action to Take				
H40	CHECK THE HO2S CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS - Key in OFF position. - 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 H41. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side					
HO2S Signal	VPWR					
H41	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). REPEAT the self-test. No GO to H42.
Point A HO2S Connector, Harness Side	Point B HO2S Connector, Harness Side					
HO2S Signal	VPWR					
H42	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.				

H40-H42

Test HC: Fuel Delivery System

PINPOINT TEST HC: FUEL DELIVERY SYSTEM

Fuel Delivery System

HC

 **WARNING:** Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.

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

- Connect Rotunda fuel pressure gauge 134-R0087 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.

Failure to follow these instructions may result in personal injury.

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.**

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.

This pinpoint test is intended to diagnose the following:

- chassis components
- engine vacuum
- fuel pressure
- fuel supply line
- fuel supply
- fuel filter (9155)
- fuel injector(s) (9F593)
- fuel pump (9H307)

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

Caution And Note

Fuel Delivery System**HC****Fuel System Specification Chart (Key ON, Engine OFF Values)**

Application	Fuel System Type	FRP PID Fuel Pressure (kPa)	FRP PID Fuel Pressure (psi)	External Pressure Gauge (kPa)	External Pressure Gauge (psi)
Crown Victoria/Grand Marquis/Town Car	ERFS (1)	240-485	35-70	240-485	35-70
Edge/MKX	MRFS (2)	-	-	331-485	48-70
Escape/Mariner	ERFS (1)	240-485	35-70	240-485	35-70
E-Series	ERFS (1)	240-485	35-70	240-485	35-70
Expedition/Navigator	MRFS (2)	-	-	331-485	48-70
Explorer/Explorer Sport Trac/Mountaineer	ERFS (1)	240-485	35-70	240-485	35-70
F-150, Mark LT	ERFS (1)	240-485	35-70	240-485	35-70
F-Super Duty	ERFS (1)	240-485	35-70	240-485	35-70
Taurus/Taurus X/Sable	MRFS (2)	-	-	331-485	48-70
Focus	MRFS (2)	-	-	331-485	48-70
Fusion/Milan/MKZ	MRFS (2)	-	-	331-485	48-70
Mustang	ERFS (1)	240-485	35-70	240-485	35-70
Ranger	MRFS (2)	-	-	331-485	48-70

Fuel System Type Definitions:**(1) 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 temperature (FRPT) 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 temperature (FRPT) sensor.

Fuel System Specification Chart (Key On, Engine Off Values)

Fuel Delivery System**HC****Inertia Fuel Shutoff (IFS) Switch - Reset Instructions**

 **WARNING:** If you see or smell gasoline at any time other than during fueling, do not reset the inertia fuel shutoff (IFS) switch. Failure to follow these instructions may result in personal injury.

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

Fuel Delivery System**HC**

Test Step		Results / Action to Take
HC1	DTC P0148 OR SYMPTOMS WITHOUT DTCS: CHECK THE SYSTEM INTEGRITY	
	• Visually inspect the complete fuel delivery system for damage and leakage. Check the following: — fuel lines and connections — relays — fuel tank — fuel pump — fuel pressure regulator — fuel pulse damper — fuel rail at injectors — damaged connector pins — electrical connectors not fully engaged • Verify the vehicle has followed the maintenance schedule. 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, Roadside Emergencies for the location of the IFS switch. • Verify the fuse integrity. • Verify the battery is fully charged. • Verify clean sufficient fuel. • Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to HC2.
HC2	CHECK ALL SYSTEM RELATED DEVICES (SENSOR, DAMPER OR REGULATOR) FOR LEAKAGE	
	• Key in OFF position. • FP connector connected. • Remove the vacuum hose on each system device connected to the fuel rail. • Inspect for the presence of fuel in the vacuum line of each device connected to the fuel rail. • Key ON, engine running. • Check for manifold vacuum at each system related component with a vacuum line. • Key in OFF position. • Are all vacuum lines for system related devices indicating no fuel present?	Yes GO to HC3. No If the vacuum line connected to a component indicates that a fuel leak is present, INSTALL a new component. CLEAR the DTCs. REPEAT the self-test.

Fuel Delivery System

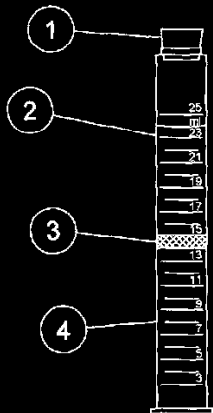
HC

Test Step		Results / Action to Take				
HC3	CHECK THE FUEL PRESSURE • Key in OFF position. • Relieve the fuel pressure. Refer to Fuel Delivery and Air Induction, Fuel System for the Fuel System Pressure Release procedure. • Mechanical fuel pressure gauge connected. • Key ON, engine OFF. • Pressurize the fuel system. Refer to Fuel Delivery and Air Induction, Fuel System for the Fuel System Pressure Release procedure to pressurize the fuel system. • FP connector connected. • Cycle the key several times to charge the fuel system. • Compare the fuel pressure reading to the Fuel System Specification Chart. • Is the fuel pressure within range?	Yes GO to HC6. No GO to HC4.				
HC4	CHECK THE FUEL PUMP GROUND CIRCUIT FOR AN OPEN IN THE HARNESS Note: Refer to Vehicle/Diagrams Manual for schematic and connector information. • FP connector disconnected. • 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 HC5. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Vehicle Battery	(-) FP Connector, Har- ness Side					
Positive terminal	FPGND					
HC5	CHECK THE FUEL PUMP POWER CIRCUIT FOR AN OPEN IN THE HARNESS Note: During output state control, the fuel pump stays commanded on for only about 5 seconds. • Verify the inertia fuel shutoff (IFS) switch is set (button pushed in). Refer to the Owner's Literature, Roadside Emergencies for the location of the IFS switch. • FP connector disconnected. • Key ON, engine OFF. • 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 GO to HC12. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FP Connector, Har- ness Side	(-) Vehicle Battery					
FPPWR	Negative terminal					

Fuel Delivery System**HC**

Test Step		Results / Action to Take
HC6	CHECK THE SEPARATION LEVEL OF THE ETHANOL/WATER MIXTURE AND GASOLINE IN THE FUEL	
Note: This step requires the use of a locally obtained 200 ml beaker and a 25 ml graduated cylinder. Note: After approximately 3 minutes of standing, the ethanol and water mixes together and settles to the bottom of the 25 ml graduated cylinder. The gasoline rises to the top. • Fill the 200 ml beaker with 5 ml of clean water. • Use the pressure relief valve on the mechanical fuel gauge to drain 22 ml of fuel into an approved clean container. • Pour 20 ml of fuel from the approved clean container into the 25 ml graduated cylinder. • Add enough water from the 200 ml beaker to the 25 ml graduated cylinder to bring the total volume of liquid to 24 ml. • Insert a stopper plug in the opening of the 25 ml graduated cylinder. • Firmly hold the stopper in place and shake the 25 ml graduated cylinder to mix the water and fuel. • Allow the liquid to stand and separate for approximately 3 minutes. • Record the separation level from the 25 ml graduated cylinder where the ethanol/water mixture and gasoline meet. • Did the ethanol/water mixture and gasoline separate?		Yes GO to HC7. No COMPLETE all steps before continuing. The ethanol/water mixture will separate from the gasoline. If the fuel does not appear to separate, then the fuel is either 100% ethanol or a mixture of ethanol and water.

Fuel Delivery System**HC**

Test Step		Results / Action to Take										
HC7	CALCULATE THE PERCENTAGE OF ETHANOL IN THE FUEL Note: Use the illustration as an example for calculating the percentage of ethanol in the following steps. If the separation level is at 14 ml the calculation becomes; 14 minus 4, then multiply by 5 to equal 50. The percentage of ethanol in the fuel is 50%. • Key in OFF position. • Take the recorded separation level from the previous step and subtract the amount of water added. • Multiply the new value by 5. This new value is the percentage of ethanol in the fuel. •  N0048579 <table><tr><th>Item Number</th><th>Description</th></tr><tr><td>1</td><td>Stopper</td></tr><tr><td>2</td><td>Gasoline</td></tr><tr><td>3</td><td>Separation Point at 14 ml</td></tr><tr><td>4</td><td>Ethanol/Water Mixture</td></tr></table> • Record the calculated percentage of ethanol in the fuel. • Is any ethanol present in the fuel?	Item Number	Description	1	Stopper	2	Gasoline	3	Separation Point at 14 ml	4	Ethanol/Water Mixture	Yes For flex fuel vehicles, GO to HC8. For all others, GO to HC11. No GO to HC12.
Item Number	Description											
1	Stopper											
2	Gasoline											
3	Separation Point at 14 ml											
4	Ethanol/Water Mixture											

Fuel Delivery System

HC

Test Step		Results / Action to Take
HC8	COMPARE THE FF_INF PID TO THE CALCULATED PERCENTAGE OF ETHANOL	
	Note: When determining if the FF_INF PID value is within 50% of the calculated percentage of ethanol, if the calculated percentage of ethanol value is 40% then the PID value should be between 0 - 90%. The PID value cannot be less than zero. • Key ON, engine OFF. • Access the PCM and monitor the FF_INF PID. • Compare the FF_INF PID to the calculated percentage of ethanol. • Is the FF_INF PID value within 50% of the calculated percentage of ethanol?	Yes GO to HC12. No GO to HC9.
HC9	RESET THE PERCENT ETHANOL PARAMETER IN THE PCM	
	Note: Certain customer fueling practices such as only fueling with small amounts of fuel or repeatedly switching between gasoline and an ethanol blend greater than E15 may prevent the PCM from learning the correct ethanol content in the fuel. • Reset the keep alive memory (KAM). Refer to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). • Key ON, engine running. • Access the PCM and monitor the FF_LRND PID. • Drive the vehicle approximately 11.3 km (7 miles) or until the FF_LRND PID indicates yes. • Is the PID state YES?	Yes GO to HC10. No GO to HC18.
HC10	COMPARE THE UPDATED FF_INF PID TO THE CALCULATED PERCENTAGE OF ETHANOL	
	• Key in OFF position. • Key ON, engine OFF. • Access the PCM and monitor the FF_INF PID. • Is the FF_INF PID value within 50% of the calculated percentage of ethanol?	Yes RETURN the vehicle to the customer. ADVISE the customer of the correct fueling practices when using flex fuel. REFER to the Owner's Literature for additional information. ADVISE the customer to continue to use the same fuel for the next 2-3 refuels. This practice helps to verify the PCM is learning the correct percentage of ethanol in the fuel. No A fuel system concern may be present, which prevents the PCM from learning the correct percentage of ethanol in the fuel, GO to HC12.

Fuel Delivery System

HC

Test Step		Results / Action to Take
HC11	DETERMINE IF THE PERCENTAGE OF ETHANOL IN THE FUEL IS LESS THAN 25%	
	- Check the recorded calculated percentage of ethanol in the fuel. - Is the calculated percentage of ethanol in the fuel less than 25%?	Yes GO to HC12. No REPAIR as necessary. ADVISE the customer of the correct fuel type required for this vehicle. REFER to the Owner's Literature for additional information. CLEAR the DTCs. REPEAT the self-test.
HC12	CHECK THE FUEL PRESSURE LEAKDOWN	
	Note: When the fuel pump is commanded off, the fuel pressure may substantially decrease and then stabilize. Note: During output state control, the fuel pump stays commanded on for only about 5 seconds. - Mechanical fuel pressure gauge connected. - Key ON, engine OFF. - Access the PCM and control the FP PID. - Run the fuel pump to obtain maximum fuel pressure. - Command the fuel pump off. - Allow the fuel pressure to stabilize. - Record the stabilized reading. - Monitor the fuel pressure for 1 minute. - Does the fuel pressure remain within 34 kPa (5 psi) of the recorded reading (MRFS) or greater than 275 kPa (40 psi) (ERFS) after 1 minute?	Yes For ERFS, GO to HC14. For MRFS, GO to HC15. No GO to HC13.
HC13	CHECK THE FUEL INJECTOR FLOW AND LEAKAGE	
	Note: Observe the Warnings, Cautions, and Notes. - Check the fuel injectors for leakage and flow rate using the injector flow tester or other method such as inspecting the intake manifold for fuel. - Are the test results satisfactory?	Yes For ERFS, GO to HC14. For MRFS, GO to HC15. No INSTALL a new fuel injector as necessary. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.

Fuel Delivery System

HC

Test Step		Results / Action to Take
HC14	COMPARE THE FRP PID TO THE MECHANICAL GAUGE	
	Note: Most mechanical gauges are referenced to atmospheric pressure. The FRPT sensor is referenced to manifold pressure. In order to make a valid comparison, the engine must be off. Note: The vehicle may exhibit a long crank until the fuel system is pressurized. • Key in OFF position. • Relieve the fuel pressure. Refer to Fuel Delivery and Air Induction, Fuel System for the Fuel System Pressure Release procedure. • Disable the fuel pump. • Key ON, engine OFF. • Monitor the mechanical gauge. • Access the PCM and monitor the FRP PID. • Compare the FRP PID value to the mechanical gauge. • Key in OFF position. • Pressurize the fuel system. Refer to Fuel Delivery and Air Induction, Fuel System for the Fuel System Pressure Release procedure to pressurize the fuel system. • Key ON, engine running. • Allow the fuel pressure to stabilize. • Key in OFF position. • Key ON, engine OFF. • Compare the FRP PID value to the mechanical gauge. • Are the FRP PID values within 34 kPa (5 psi) of the mechanical gauge readings?	Yes GO to HC15. No INSTALL a new FRPT sensor. REFER to the fuel system WARNING information at the beginning of this pinpoint test. REFER to Computers and Control Systems, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test.
HC15	MONITOR THE FUEL PRESSURE WHILE ROAD TESTING THE VEHICLE	
	 WARNING: Strict observance of posted speed limits and attention to driving conditions are mandatory when carrying out the road test. Failure to follow these instructions may result in personal injury. Note: Some concerns may only be present during certain fuel level conditions. Determine the fuel level at the time of the concern. Access the information from the customer information worksheet and the customer. • Key in OFF position. • Securely route the mechanical gauge so that the gauge is viewable while road testing the vehicle. • Key ON, engine running. • Engine at normal operating temperature. • Monitor the mechanical gauge. • From a stop, accelerate to 89 km/h (55 mph) at full throttle. Repeat this 3 times. • Is the fuel pressure always greater than 240 kPa (35 psi)?	Yes For misfire DTC diagnosis, GO to HD8. For symptoms without DTCs, the concern is elsewhere. RETURN to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index for further direction. For all others, unable to duplicate or identify the concern at this time. No GO to HC16.

Fuel Delivery System

HC

Test Step		Results / Action to Take
HC16	CHECK THE FUEL SUPPLY LINE FOR RESTRICTION	
	Note: Observe the Warnings, Cautions, and Notes. • Key in OFF position. • Disconnect the fuel supply line at the fuel rail. • Disconnect the fuel supply line at the fuel pump. • Check the fuel supply line for restriction. • Apply 21 to 34 kPa (3 to 5 psi) air pressure to the fuel supply line. • Does air flow freely through the line?	Yes INSTALL a new Fuel Filter assembly. GO to HC17. No REPAIR the cause of the restriction. CLEAR the DTCs. REPEAT the self-test.
HC17	VERIFY THE REPAIR	
	 WARNING: Strict observance of posted speed limits and attention to driving conditions are mandatory when carrying out the road test. Failure to follow these instructions may result in personal injury. • Key ON, engine running. • Engine at normal operating temperature. • Monitor the mechanical gauge. • From a stop, accelerate to 89 km/h (55 mph) at full throttle. Repeat this 3 times. • Is the fuel pressure always greater than 240 kPa (35 psi)?	Yes The test is complete and no concerns are present. No INSTALL a new FP module. CLEAR the DTCs. REPEAT the self-test.
HC18	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.

HC16-HC18

Test HD: Misfire Detection Monitor

PINPOINT TEST HD: MISFIRE DETECTION MONITOR

Misfire Detection Monitor

HD

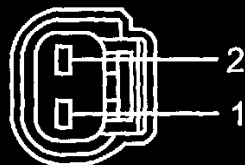
 **WARNING:** Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.

Note: Mechanical noise caused by the front end accessory drive components, mechanically driven cooling fans, or rough roads at high RPM with light load conditions may produce a nonsymmetrical loss of cylinder acceleration, which may result in a misfire.

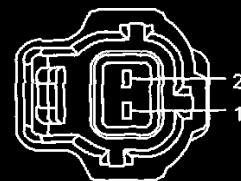
This pinpoint test is intended to diagnose the misfire detection monitor.

Clearing the powertrain control module (PCM) diagnostic trouble codes (DTCs) erases any PCM recorded freeze frame data. Make sure to record any PCM freeze frame information before proceeding. Refer to Diagnostic Methods, Freeze Frame Data.

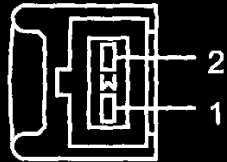
Camshaft Position (CMP) Sensor Connector

A

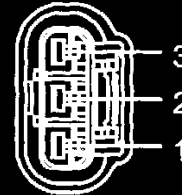
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B

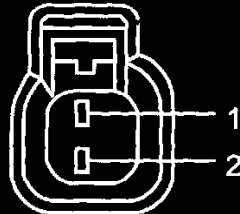
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Misfire Detection Monitor**HD****C**

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D

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E

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F

Vehicle	Connector	Pin	Circuit
Edge, Expedition, F-150 4.6L, F-150 5.4L, Mark LT, MKX, MKZ, Navigator, Sable, Taurus, Taurus X	A	2	CMP
Escape/Mariner 2.3L, Ranger 2.3L	B	1 2	SIGRTN CMP
Explorer 4.0L, Explorer Sport Trac 4.0L, Mountaineer 4.0L, Mustang 4.0L, Ranger 4.0L	C	2 1	SIGRTN CMP

(Continued)

Camshaft Position (CMP) Sensor Connector Continued

Misfire Detection Monitor

HD

Vehicle	Connector	Pin	Circuit
Fusion 2.3L, Milan 2.3L	D	3 2	SIGRTN CMP
Fusion 3.0L, Milan 3.0L	E	1	CMP
F-150 4.2L	D	2 3 1	CMP PWRGND VPWR
Focus	F	3 2	SIGRTN CMP
All other vehicles	A	1 2	SIGRTN CMP

Test Step		Results / Action to Take
HD1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	
	Are DTCs P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0309, P0310, P0315, or P0316 present?	Yes For DTCs P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0309, P0310 or P0316, GO to HD2. For DTC P0315, GO to HD21. No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
HD2	DTCs P0300 THROUGH P0310 AND P0316: VIEW THE PCM MISFIRE FREEZE FRAME DATA	
	Note: 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 REFER to the table in Pinpoint Test Z to find corresponding circuit, and proceed with the intermittent diagnosis. GO to Pinpoint Test Z. No GO to HD3.
HD3	CHECK FOR OTHER NON-MISFIRE CONTINUOUS MEMORY DTCs	
	- Retrieve all continuous memory DTCs. - Are there any non-misfire continuous memory DTCs present?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to HD4.

Misfire Detection Monitor**HD**

Test Step		Results / Action to Take
HD4	CHECK FOR ANY KOEO SELF-TEST DTCS	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to HD5 .
	• Carry out the KOEO self-test. • Are any KOEO DTCS present?	
HD5	CHECK FOR ANY KOER DTCS	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to HD6 .
	• Carry out the KOER self-test. • Are any KOER DTCS present?	
HD6	CHECK THE IGNITION SYSTEM FOR CONCERNS	Yes REPAIR as necessary. CLEAR the DTCS. REPEAT the self-test. No GO to HD7 .
	• For Ignition 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?	
HD7	CHECK THE FUEL SYSTEM FOR CONCERNS	Yes REPAIR as necessary. CLEAR the DTCS. REPEAT the self-test. No GO to HD8 .
	• GO to Pinpoint Test HC and follow the pinpoint test direction. • Is a fuel system related concern present?	

Misfire Detection Monitor

HD

Test Step		Results / Action to Take
HD8	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 For vehicles equipped with a differential pressure feedback EGR system, GO to HD9. For vehicles equipped with an electric EGR (EEGR) system, GO to HD10. For vehicles equipped with an EGR system module (ESM) EGR system, GO to HD11. For all others, GO to HD15. No REPAIR the vacuum system. CLEAR the DTCs. REPEAT the self-test.
HD9	MONITOR THE DIFFERENTIAL PRESSURE FEEDBACK EGR 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 ON, engine OFF. - Record the PID values with the engine off. - Compare the 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 HD12.
HD10	MONITOR THE EEGR 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 PIDs. - Record the PID values with the engine idling. - Key ON, engine OFF. - Record the PID values with the engine off. - Compare the 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 HD13.

Misfire Detection Monitor

HD

Test Step		Results / Action to Take
HD11	MONITOR THE ESM SYSTEM RELATED PIDS	Yes GO to Pinpoint Test HH and diagnose the EGR system. No GO to HD14 .
	• Key ON, engine running. • Bring the engine to normal operating temperature. • Access the PCM and monitor the DPFEGR, EGRVR and MAP PIDs. • Record the PID values with the engine idling. • Key ON, engine OFF. • Record the PID values with the engine off. • Compare the recorded PID values to the typical reference values in Reference Values. • Are any values out of range?	
HD12	RECREATE THE MISFIRE SYMPTOM WITH THE DIFFERENTIAL PRESSURE FEEDBACK EGR SYSTEM DISABLED	Yes GO to HD15 . No REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding or other damage. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
	Note: The PCM may store EGR system related DTCs during this procedure. Note: To recreate the original conditions that set the DTC or caused the symptom, the vehicle may require driving. • Key in OFF position. • EGR Vacuum Regulator Solenoid connector disconnected. • Access the misfire freeze frame data (if available) and record the operating conditions. • Obtain information from the customer information worksheet or any other available data from the customer. • Recreate the misfire symptom using the freeze frame and customer information. • Can the symptom be recreated?	
HD13	RECREATE THE MISFIRE SYMPTOM WITH EEGR SYSTEM DISABLED	Yes GO to HD15 . No REMOVE and INSPECT the EEGR for signs of contamination, unusual wear, carbon deposits, binding or other damage. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
	Note: The PCM may store EGR system related DTCs during this procedure. Note: To recreate the original conditions that set the DTC or caused the symptom, the vehicle may require driving. • Key in OFF position. • EEGR Assembly connector disconnected. • Access the misfire freeze frame data (if available) and record the operating conditions. • Obtain information from the customer information worksheet or any other available data from the customer. • Recreate the misfire symptom using the freeze frame and customer information. • Can the symptom be recreated?	

Misfire Detection Monitor

HD

Test Step		Results / Action to Take
HD14	RECREATE THE MISFIRE SYMPTOM WITH THE ESM SYSTEM DISABLED	
	Note: The PCM may store EGR system related DTCs during this procedure. Note: To recreate the original conditions that set the DTC or caused the symptom, the vehicle may require driving. • Key in OFF position. • ESM connector disconnected. • Access the misfire freeze frame data (if available) and record the operating conditions. • Obtain information from the customer information worksheet or any other available data from the customer. • Recreate the misfire symptom using the freeze frame and customer information. • Can the symptom be recreated?	Yes GO to HD15. No REMOVE and INSPECT the ESM for signs of contamination, unusual wear, carbon deposits, binding or other damage. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
HD15	CHECK FOR BASE ENGINE CONCERNS	
	Note: The engine temperature may affect the results. • This step determines if there are any base engine concerns that may have caused the misfire DTC or drive concern. • Key in OFF position. • Carry out the following tests in order to evaluate base engine integrity: — For vehicles equipped with mechanically driven cooling fans only, rotate the cooling fan by hand. The cooling fan should rotate freely, with no abnormal binding or interference. If binding or interference is present, remove any foreign materials or repair the cooling fan as necessary. — Refer to Thrive Belts, Mounts, Brackets and Accessories, Accessory Drive and carry out checks in the Visual Inspection Chart. — Refer to Engine System and carry out the Compression Test and Cylinder Leakage Detection. — Refer to Engine System and carry out the Valve Train Analysis. — Visually inspect the positive crankcase ventilation (PCV) valve and tube for leaks. — Refer to Engine System and carry out Component Tests. • Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to HD19.
HD16	DTC P1336: IDENTIFY THE CMP SENSOR TYPE	
	Note: The variable reluctance (VR) sensors have 2-wire connectors, Hall-effect sensors have 3-wire connectors. • Identify which type of CMP sensor the vehicle uses. • Does the vehicle use a Hall-effect sensor?	Yes GO to HD17. No GO to HD18.

Misfire Detection Monitor

HD

Test Step		Results / Action to Take										
HD17	CHECK THE CMP SENSOR LOW RANGE OUTPUT VOLTAGE - Key in OFF position. - CMP Sensor connector disconnected. - Connect a 5 amp fused jumper wire between the following: <table border="1"> <tr> <th>Point A CMP Sensor Connector, Harness Side</th> <th>Point B CMP Sensor Connector, Component Side</th> </tr> <tr> <td>VPWR</td> <td>VPWR</td> </tr> <tr> <td>PWRGND</td> <td>PWRGND</td> </tr> </table> - Key ON, engine running. - Digital multimeter (DMM) on low voltage DC scale. - Measure the voltage between: <table border="1"> <tr> <th>(+) CMP Sensor Connector, Component Side</th> <th>(-) 12 Volt Vehicle Battery</th> </tr> <tr> <td>CMP</td> <td>Negative terminal</td> </tr> </table> - Does the voltage switch between LOW (less than 2 volts DC) and HIGH (greater than 8 volts DC)?	Point A CMP Sensor Connector, Harness Side	Point B CMP Sensor Connector, Component Side	VPWR	VPWR	PWRGND	PWRGND	(+) CMP Sensor Connector, Component Side	(-) 12 Volt Vehicle Battery	CMP	Negative terminal	Yes A Hall-effect CMP sensor that is installed out of synchronization may produce a DTC. To verify the correct CMP sensor installation, REFER to Computers and Control Systems, Electronic Engine Control, Engine Synchronizer. If the CMP sensor is installed properly, GO to HD19. No INSTALL a new CMP sensor. CLEAR the DTCs. REPEAT the self-test.
Point A CMP Sensor Connector, Harness Side	Point B CMP Sensor Connector, Component Side											
VPWR	VPWR											
PWRGND	PWRGND											
(+) CMP Sensor Connector, Component Side	(-) 12 Volt Vehicle Battery											
CMP	Negative terminal											
HD18	CHECK THE CMP SENSOR OUTPUT VOLTAGE - Key in OFF position. - PCM connector connected. - CMP Sensor connector disconnected. - DMM on low voltage AC scale. - Key ON, engine running. - Measure the voltage between: <table border="1"> <tr> <th>(+) CMP Sensor Connector, Component Side</th> <th>(-) CMP Sensor Connector, Component Side</th> </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 GO to HD19. No INSTALL a new CMP sensor. CLEAR the DTCs. REPEAT the self-test.						
(+) CMP Sensor Connector, Component Side	(-) CMP Sensor Connector, Component Side											
CMP	SIGRTN											
HD19	CHECK THE GENERATOR FOR EXCESSIVE ELECTRICAL NOISE Note: If the generator/regulator is electrically noisy, the noise decreases when the B+ connector is disconnected. - Key ON, engine running. - Monitor the generator for an audible electric noise. - Key in OFF position. - Generator/regulator B+ connector disconnected. - Key ON, engine running. - With the engine running, determine if the generator is still noisy. - Does the noise remain constant when the B+ connector is disconnected?	Yes GO to HD20. No REFER to Charging System and diagnose the generator is noisy symptom.										

Misfire Detection Monitor**HD**

Test Step		Results / Action to Take
HD20	CHECK THE CKP HARNESS FOR INTERMITTENT CONCERNS	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to HD21.
	Note: Chafed CKP wires or other physical damage to the harness may cause an intermittent short in the CKP circuit. • Key in OFF position. • Visually check for chafed CKP wires or other physical damage to the CKP harness. • Is a concern present?	
HD21	DTC P0315: CHECK THE PHYSICAL CONDITION OF THE CRANKSHAFT PULSE WHEEL	Yes If the CKP is installed properly, GO to HD22. No REPAIR as necessary. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). COMPLETE the Misfire and Fuel Monitors drive cycle procedure to learn the profile. Refer to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle. To verify the repair RECREATE the original conditions that set the misfire DTC or caused the symptom using the freeze frame data and customer information. MONITOR the cylinder misfire data in Mode 6 - On Board Test Results and VERIFY the misfire count is below 10. REFER to the scan tool manufacturer's manual for specific information on the Mode 6 - On Board Test Results.
	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 pulse wheel for wobble. • Check for a loose crankshaft pulse wheel. • Check the CKP sensor for damage. • Are the CKP sensor and crankshaft pulse wheel OK?	

Misfire Detection Monitor

HD

Test Step		Results / Action to Take
HD22	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 electronic ignition (EI) pulse ring fastened to the harmonic dampener. • Does the crank pulley wobble or is the pulse ring loose or damaged?	Yes INSTALL a new pulley or damper assembly. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). COMPLETE the Misfire and Fuel Monitors drive cycle procedure to learn the profile. Refer to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle. To verify the repair RECREATE the original conditions that set the misfire DTC or caused the symptom using the freeze frame data and customer information. MONITOR the cylinder misfire data in Mode 6 - On Board Test Results and VERIFY the misfire count is below 10. REFER to the scan tool manufacturer's manual for specific information on the Mode 6 - On Board Test Results. No GO to HD23.
HD23	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

HD22-HD23

Test HE: Exhaust Gas Recirculation (EGR) Systems

PINPOINT TEST HE: EXHAUST GAS RECIRCULATION (EGR) SYSTEMS

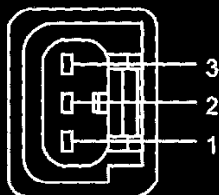
Exhaust Gas Recirculation (EGR) Systems

HE

This pinpoint test is intended to diagnose the following:

- differential pressure feedback exhaust gas recirculation (EGR) sensor (9J460)
- EGR valve (9D460) (9D475)
- EGR vacuum regulator solenoid (9J459)
- orifice tube assembly (9D477)
- differential pressure feedback EGR sensor pressure hoses
- vacuum lines
- harness circuits: VREF, DPFE, SIGRTN, EVR, VPWR, VREF and PWRGND
- powertrain control module (PCM) (12A650)

Differential Pressure Feedback EGR Sensor Connector

A

A0077573

B

A0077575

Vehicle	Connector	Pin	Circuit
Vehicles equipped with a tube mounted differential pressure feedback EGR sensor	A	3 2 1	DPFE SIGRTN VREF
All other vehicles	B	1 2 3	DPFE SIGRTN VREF

Description And Differential Pressure Feedback EGR Sensor Connector

**Exhaust Gas Recirculation (EGR)
Systems****HE****EGR Vacuum Regulator Solenoid Connector**

A0077544

Pin	Circuit
2	EVR (EGR Vacuum Regulator)
1	VPWR (Vehicle Power)

Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
Escape/Mariner	150 (50-50-50) Pin	B47 E27 E40 E41 E44	PWRGND EVR VREF SIGRTN DPFE
Ranger	170 Pin	B47 E63 E57 E58 E21	PWRGND EVR VREF SIGRTN DPFE

EGR Vacuum Regulator Solenoid Connector And Powertrain Control Module (PCM) Connector

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take			
HE1	CHECK FOR DTCS	Yes For DTCs P0401 and P1408, GO to HE36 . For DTC P0402, GO to HE13 . For KOEO and KOER DTCs P0403 and P1409, GO to HE59 . For continuous memory DTCs P0403 and P1409, GO to HE64 . For DTC P0405, GO to HE2 . For DTC P0406, GO to HE6 . For DTC P1405, GO to HE27 . For DTC P1406, GO to HE31 . No For symptoms without DTCs, GO to HE57 . For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.			
	Are DTCs P0401, P0402, P0403, P0405, P0406, P1405, P1406, P1408, or P1409 present?				
HE2	DTC P0405: DETERMINE THE PRESENT DPFEGR PID VOLTAGE	Yes GO to HE3 . No An intermittent concern is suspected in the EGR system. GO to HE12 .			
	Note: Depending on the application, verify a prior repair has not resulted in the differential pressure feedback EGR sensor being installed backwards or the vacuum hoses being installed on the opposite ports. - Key ON, engine OFF. - Access the PCM and monitor the DPFEGR PID. - Is the voltage less than 0.05 V?				
HE3	CHECK THE VREF AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS	Yes GO to HE4 . No GO to Pinpoint Test C.			
	- Key in OFF position. - Differential Pressure Feedback EGR Sensor connector disconnected. - Key ON, engine OFF. - Measure the voltage between: <table><tr><td>(+) Differential Pressure Feedback EGR Sensor Connector, Harness Side</td><td>(-) Differential Pressure Feedback EGR Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> - Is the voltage between 4 - 5.5 V?		(+) Differential Pressure Feedback EGR Sensor Connector, Harness Side	(-) Differential Pressure Feedback EGR Sensor Connector, Harness Side	VREF
(+) Differential Pressure Feedback EGR Sensor Connector, Harness Side	(-) Differential Pressure Feedback EGR Sensor Connector, Harness Side				
VREF	SIGRTN				

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take								
HE4	CHECK THE DPFE CIRCUIT(S) FOR A SHORT TO SIGRTN OR GND 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>DPFE</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>DPFE</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	DPFE	SIGRTN	(+) PCM Connector, Harness Side	(-) Vehicle Battery	DPFE	Negative terminal	Yes Go to HE5. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
DPFE	SIGRTN									
(+) PCM Connector, Harness Side	(-) Vehicle Battery									
DPFE	Negative terminal									
HE5	INDUCE THE OPPOSITE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR VOLTAGE - PCM connector connected. - Key ON, engine OFF. - Access the PCM and monitor the DPFEGR PID. - Is the voltage between 4 - 5.5 V?	Yes INSTALL a new Differential Pressure Feedback EGR sensor. After installing the new differential pressure feedback EGR sensor, TURN the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new differential pressure feedback EGR sensor. Failure to do this may result in an incorrect DTC P0402. CLEAR the DTCs. REPEAT the self-test. No Go to HE66.								
HE6	DTC P0406: DETERMINE THE PRESENT DPFEGR PID VOLTAGE - Key ON, engine OFF. - Access the PCM and monitor the DPFEGR PID. - Is the voltage greater than 4 V?	Yes Go to HE7. No An intermittent concern is suspected in the EGR system. Go to HE12.								

HE4-HE6

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take						
HE7	CHECK THE VREF VOLTAGE TO THE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR - Key in OFF position. - Differential Pressure Feedback EGR Sensor connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) Differential Pressure Feedback EGR Sensor Connector, Harness Side</td><td>(-) Differential Pressure Feedback EGR Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> - Is the voltage between 4 - 5.5 V?	(+) Differential Pressure Feedback EGR Sensor Connector, Harness Side	(-) Differential Pressure Feedback EGR Sensor Connector, Harness Side	VREF	SIGRTN	Yes GO to HE8. No GO to Pinpoint Test C.		
(+) Differential Pressure Feedback EGR Sensor Connector, Harness Side	(-) Differential Pressure Feedback EGR Sensor Connector, Harness Side							
VREF	SIGRTN							
HE8	CHECK THE DPFE 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>(-) Differential Pressure Feedback EGR Sensor Connector, Harness Side</td></tr><tr><td>DPFE</td><td>DPFE</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) Differential Pressure Feedback EGR Sensor Connector, Harness Side	DPFE	DPFE	SIGRTN	SIGRTN	Yes GO to HE9. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) Differential Pressure Feedback EGR Sensor Connector, Harness Side							
DPFE	DPFE							
SIGRTN	SIGRTN							
HE9	CHECK THE DPFE 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>DPFE</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	VREF	DPFE	Yes GO to HE10. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
VREF	DPFE							
HE10	CHECK THE DPFE CIRCUIT FOR A SHORT TO VOLTAGE - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) Differential Pressure Feedback EGR Sensor Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>DPFE</td><td>Negative terminal</td></tr></table> - Is the voltage less than 0.2 V?	(+) Differential Pressure Feedback EGR Sensor Connector, Harness Side	(-) Vehicle Battery	DPFE	Negative terminal	Yes GO to HE11. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) Differential Pressure Feedback EGR Sensor Connector, Harness Side	(-) Vehicle Battery							
DPFE	Negative terminal							

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take				
HE11	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 Differential Pressure Feedback EGR Sensor Connector, Harness Side</td><td>Point B</td></tr><tr><td>DPFE</td><td>Ground</td></tr></table> • Key ON, engine OFF. • Access the PCM and monitor the DPFEGR PID. • Is the DPFEGR PID greater than 4.5 V with the jumper wire removed and is the DPFEGR PID less than 0.1 V with the jumper wire installed?	Point A Differential Pressure Feedback EGR Sensor Connector, Harness Side	Point B	DPFE	Ground	Yes INSTALL a new Differential Pressure Feedback EGR sensor. CLEAR the DTCs. REPEAT the self-test. No GO to HE66.
Point A Differential Pressure Feedback EGR Sensor Connector, Harness Side	Point B					
DPFE	Ground					
HE12	CARRY OUT A THOROUGH WIGGLE TEST ON THE DIFFERENTIAL PRESSURE FEEDBACK EGR 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. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.				
HE13	DTCs P0402 AND P1405: CHECK FOR SIMULTANEOUS PRESENCE • Is DTC P0402 present with DTC P1405?	Yes GO to HE28. No GO to HE14.				

HE11-HE13

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE14	DTC P0402: CHECK FOR EGR FLOW AT IDLE WITH THE EGR VACUUM HOSE DISCONNECTED	Yes INSPECT the pressure hoses for correct routing, 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 HE15. No CONNECT the EGR valve vacuum hose. GO to HE16.
	Note: A pinched or plugged EGR vacuum hose can trap vacuum between the EGR vacuum regulator solenoid and EGR valve, not allowing the EGR valve to close. Note: Disregard DTC P1408 if it is generated as a result of carrying out the KOER self-test with the EGR vacuum source hose disconnected. - Trace each vacuum hose from the EGR vacuum regulator solenoid and verify each hose is connected correctly. - Verify the EGR vacuum hose is not pinched or plugged and is routed correctly. - Disconnect and plug the vacuum hose connected to the EGR valve. - Carry out the KOER self-test. Does KOER DTC P0402 appear or are you unable to run the KOER self-test due to an engine stall or no start?	
HE15	CARRY OUT THE KOER SELF-TEST	Yes GO to HE18. No The test is complete and no concerns are found. CLEAR the DTCs. REPEAT the self-test.
	- Clear the DTCs. - Carry out the KOER self-test. Is DTC P0402 present?	
HE16	CHECK FOR EGR FLOW AT IDLE WITH THE EGR VACUUM HOSE CONNECTED	Yes GO to HE17. No INSPECT the pressure hoses for pinching, icing or other blockage. REPAIR as necessary. GO to HE23.
	- Key in OFF position. - Connect the EGR valve vacuum hose. - Carry out the KOER self-test. Does KOER DTC P0402 appear or are you unable to run the KOER self-test due to an engine stall or no start?	

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE17	CHECK THE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR OUTPUT BY APPLYING VACUUM WITH THE HAND PUMP	
	• Disconnect the pressure hoses at the differential pressure feedback EGR 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 ON, engine OFF. • Access the PCM and monitor the DPFEGR PID. • Apply 27 - 30 kPa (8 - 9 in-Hg) vacuum to the differential pressure feedback EGR 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 concern in the differential pressure feedback EGR sensor?	Yes INSTALL a new Differential Pressure Feedback EGR sensor. After installing the new differential pressure feedback EGR sensor, TURN the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new differential pressure feedback EGR sensor. Failure to do this may result in an incorrect DTC P0402. CLEAR the DTCs. REPEAT the self-test. No GO to HE18.
HE18	CHECK EGR FLOW AT IDLE WITH THE EGR VACUUM REGULATOR HARNESS CONNECTOR OFF	
	• Differential Pressure Feedback EGR Sensor connector connected. • Disconnect the vacuum hose at the EGR valve and connect the hose to the vacuum gauge. • Start the engine. • EGR Vacuum Regulator 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 EGR vacuum regulator solenoid is disconnected, a concern may be present in the EGR vacuum regulator solenoid. • Does the EGR vacuum remain greater than 5.4 kPa (1.6 in-Hg) at idle after the EGR vacuum regulator is disconnected?	Yes GO to HE19. No GO to HE20.

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take				
HE19	INSPECT THE EGR VACUUM REGULATOR SOLENOID VENT FOR BLOCKAGE Note: When the EGR valve is closed, the EGR vacuum regulator solenoid vacuum is vented through the solenoid vent to the atmosphere. A plugged EGR vacuum regulator solenoid vent does not allow EGR vacuum to vent to the atmosphere. • Key in OFF position. • Remove the EGR vacuum regulator solenoid vent cap. • Remove the filter and inspect for blockage or icing. • Is the EGR vacuum regulator solenoid vent or vent filter plugged or restricted?	Yes REPAIR the vent, or if not repairable, INSTALL a new EGR vacuum regulator solenoid. CLEAR the DTCs. REPEAT the self-test. No INSTALL a new EGR Vacuum Regulator solenoid. CLEAR the DTCs. REPEAT the self-test.				
HE20	CHECK THE EGR VACUUM REGULATOR SOLENOID COIL RESISTANCE • Key in OFF position. • Measure the resistance between:<table><tr><td>(+) EGR Vacuum Regulator Solenoid Connector, Component Side</td><td>(-) EGR Vacuum Regulator Solenoid Connector, Component Side</td></tr><tr><td>VPWR - Pin 1</td><td>EVR - Pin 2</td></tr></table> • Is the resistance between 26 - 40 ohms?	(+) EGR Vacuum Regulator Solenoid Connector, Component Side	(-) EGR Vacuum Regulator Solenoid Connector, Component Side	VPWR - Pin 1	EVR - Pin 2	Yes GO to HE21. No INSTALL a new EGR Vacuum Regulator solenoid. CLEAR the DTCs. REPEAT the self-test.
(+) EGR Vacuum Regulator Solenoid Connector, Component Side	(-) EGR Vacuum Regulator Solenoid Connector, Component Side					
VPWR - Pin 1	EVR - Pin 2					
HE21	CHECK THE EGR VACUUM REGULATOR 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>EVR</td><td>Negative terminal</td></tr></table> • Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	EVR	Negative terminal	Yes GO to HE22. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
EVR	Negative terminal					

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take				
HE22	CHECK THE EGR VACUUM REGULATOR CIRCUIT FOR SHORT TO VREF - Measure the resistance between: <table border="1"> <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 GO to HE66. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side					
EVR	VREF					
HE23	CHECK THE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR OUTPUT BY APPLYING VACUUM WITH THE HAND PUMP - Disconnect the pressure hoses at the differential pressure feedback EGR 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 ON, engine OFF. - Access the PCM and monitor the DPFEGR PID. - Apply 27 - 30 kPa (8 - 9 in-Hg) vacuum to the differential pressure feedback EGR sensor and hold for 10 seconds. - Quickly release the vacuum. - The DPFEGR PID voltage must be between 0.25 and 1.3 volts 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 concern in the differential pressure feedback EGR sensor?	Yes INSTALL a new Differential Pressure Feedback EGR sensor. After installing the new differential pressure feedback EGR sensor, TURN the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new differential pressure feedback EGR sensor. Failure to do this may result in an incorrect DTC P0402. CLEAR the DTCs. REPEAT the self-test. No GO to HE24.				

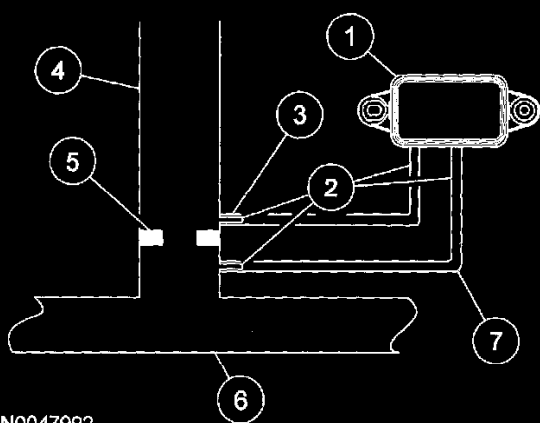
Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE24	CHECK THE EGR VALVE OPERATION Note: Typical sensor voltage with no EGR flow is between 0.25 volt and 1.3 volts. Note: A higher voltage at idle may be due to a non-seating or heavily carboned EGR valve pintle. 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. - Differential Pressure Feedback EGR Sensor connector connected. - Key ON, engine OFF. - Access the PCM and monitor the DPFEGR PID. - 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. - Apply just enough vacuum to the EGR valve to open it without stalling the engine. - Quickly release the vacuum. - Repeat this 3 times. - Observe the DPFEGR PID. 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. CLEAR the DTCs. REPEAT the self-test. No GO to HE25.
HE25	CARRY OUT A THOROUGH WIGGLE TEST ON THE EGR VACUUM REGULATOR HARNESS Note: An intermittent short to GND in the EGR vacuum regulator 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. Note: A concern is indicated by a sudden jump in the vacuum reading during the wiggle test. - 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 EGR vacuum regulator solenoid. - Carry out a thorough wiggle test on the EGR vacuum regulator harness. Is a concern present?	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No CONNECT the vacuum hose(s). GO to HE26.

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take																
HE26	INSPECT THE EGR VACUUM REGULATOR SOLENOID AND VACUUM HOSES FOR PLUGGING • Key in OFF position. • Remove the EGR vacuum regulator solenoid vent cap. • Remove the filter and inspect for blockage or icing. • Inspect the pressure hoses for pinching, icing or other blockage. • Is the EGR vacuum regulator solenoid vent or vent filter plugged or restricted?	Yes REPAIR, or if not repairable, INSTALL a new EGR vacuum regulator solenoid. CLEAR the DTCs. REPEAT the self-test. No GO to Pinpoint Test Z.																
HE27	DTC P1405: INSPECT THE UPSTREAM PRESSURE HOSE CONNECTIONS • Inspect the upstream hose at the differential pressure feedback EGR sensor and orifice tube assembly for a disconnect or a poor connection. •  N0047992 Typical Differential Pressure Feedback EGR System <table><tr><th>Item Number</th><th>Description</th></tr><tr><td>1</td><td>Differential Pressure Feedback EGR Sensor</td></tr><tr><td>2</td><td>Pickup Tubes</td></tr><tr><td>3</td><td>Upstream Pressure Hose</td></tr><tr><td>4</td><td>To EGR Valve</td></tr><tr><td>5</td><td>Orifice Tube Assembly</td></tr><tr><td>6</td><td>Exhaust Manifold</td></tr><tr><td>7</td><td>Downstream Pressure Hose</td></tr></table> • Is vacuum hose off or poorly connected?	Item Number	Description	1	Differential Pressure Feedback EGR Sensor	2	Pickup Tubes	3	Upstream Pressure Hose	4	To EGR Valve	5	Orifice Tube Assembly	6	Exhaust Manifold	7	Downstream Pressure Hose	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to HE28.
Item Number	Description																	
1	Differential Pressure Feedback EGR Sensor																	
2	Pickup Tubes																	
3	Upstream Pressure Hose																	
4	To EGR Valve																	
5	Orifice Tube Assembly																	
6	Exhaust Manifold																	
7	Downstream Pressure Hose																	

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE28	INSPECT THE UPSTREAM PRESSURE HOSE FOR PLUGGING	Yes REPAIR or INSTALL a new pressure hose as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to HE29.
	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?	
HE29	CHECK THE ORIFICE TUBE ASSEMBLY AND THE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR	Yes REPAIR or INSTALL a new Differential Pressure Feedback EGR sensor or orifice tube assembly as necessary. After installing the new differential pressure feedback EGR sensor, TURN the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new differential pressure feedback EGR sensor. Failure to do this may result in an incorrect DTC P0402. CLEAR the DTCs. REPEAT the self-test. No GO to HE30.
	- Inspect the upstream connection on the differential pressure feedback EGR 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 differential pressure feedback EGR sensor or orifice tube assembly plugged or damaged?	

Exhaust Gas Recirculation (EGR) Systems

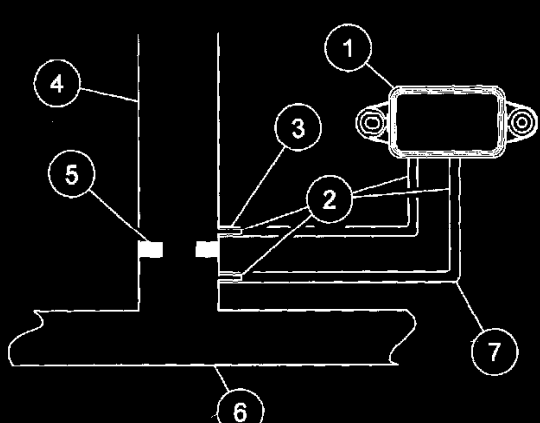
HE

Test Step		Results / Action to Take
HE30	CHECK THE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR OUTPUT BY APPLYING VACUUM WITH THE HAND PUMP	
• Disconnect the pressure hoses at the differential pressure feedback EGR 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 ON, engine OFF. • Access the PCM and monitor the DPFEGR PID. • Apply 27 - 30 kPa (8 - 9 in-Hg) vacuum to the differential pressure feedback EGR sensor and hold for 10 seconds. • Quickly release the vacuum. — The DPFEGR PID voltage must be between 0.25 and 1.3 volts 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 concern in the differential pressure feedback EGR sensor?		Yes INSTALL a new Differential Pressure Feedback EGR sensor. After installing the new differential pressure feedback EGR sensor, TURN the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new differential pressure feedback EGR sensor. Failure to do this may result in an incorrect DTC P0402. CLEAR the DTCs. REPEAT the self-test. No GO to Pinpoint Test Z.

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 concern 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 differential pressure feedback EGR sensor and orifice tube assembly for a disconnect or a poor connection. •  N0047992 Typical Differential Pressure Feedback EGR System <table><tr><th>Item Number</th><th>Description</th></tr><tr><td>1</td><td>Differential Pressure Feedback EGR Sensor</td></tr><tr><td>2</td><td>Pickup Tubes</td></tr><tr><td>3</td><td>Upstream Pressure Hose</td></tr><tr><td>4</td><td>To EGR Valve</td></tr><tr><td>5</td><td>Orifice Tube Assembly</td></tr><tr><td>6</td><td>Exhaust Manifold</td></tr><tr><td>7</td><td>Downstream Pressure Hose</td></tr></table> • Is vacuum hose off or poorly connected?	Item Number	Description	1	Differential Pressure Feedback EGR Sensor	2	Pickup Tubes	3	Upstream Pressure Hose	4	To EGR Valve	5	Orifice Tube Assembly	6	Exhaust Manifold	7	Downstream Pressure Hose	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to HE32.
Item Number	Description																	
1	Differential Pressure Feedback EGR Sensor																	
2	Pickup Tubes																	
3	Upstream Pressure Hose																	
4	To EGR Valve																	
5	Orifice Tube Assembly																	
6	Exhaust Manifold																	
7	Downstream Pressure Hose																	
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. CLEAR the DTCs. REPEAT the self-test. No GO to HE33.																

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE33	CHECK THE ORIFICE TUBE ASSEMBLY AND THE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR	Yes REPAIR or INSTALL a new Differential Pressure Feedback EGR sensor or orifice tube assembly as necessary. After installing the new differential pressure feedback EGR sensor, TURN the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new differential pressure feedback EGR sensor. Failure to do this may result in an incorrect DTC P0402. CLEAR the DTCs. REPEAT the self-test. No GO to HE34.
	- Inspect the connections at the differential pressure feedback EGR sensor for plugging or damage. - Inspect the intake manifold side pressure tube at the orifice tube assembly for plugging or damage. Is the differential pressure feedback EGR sensor or orifice tube assembly plugged or damaged?	
HE34	CHECK THE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR OUTPUT BY APPLYING VACUUM WITH THE HAND PUMP	Yes GO to HE35. No GO to Pinpoint Test Z.
	- Disconnect the pressure hoses at the differential pressure feedback EGR 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 ON, engine OFF. - Access the PCM and monitor the DPFEGR PID. - Apply 27 - 30 kPa (8 - 9 in-Hg) vacuum to the differential pressure feedback EGR sensor and hold for 10 seconds. - Quickly release the vacuum. - The DPFEGR PID voltage must be between 0.25 and 1.3 volts 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 concern in the differential pressure feedback EGR sensor?	

HE33-HE34

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take								
HE35	CHECK THE DPFE CIRCUIT(S) FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between: <table border="1"> <thead> <tr> <th>(+) PCM Connector, Harness Side</th> <th>(-) Differential Pressure Feedback EGR Sensor Connector, Harness Side</th> </tr> </thead> <tbody> <tr> <td>DPFE</td> <td>DPFE</td> </tr> <tr> <td>SIGRTN</td> <td>SIGRTN</td> </tr> <tr> <td>VREF</td> <td>VREF</td> </tr> </tbody> </table> - Are the resistances greater than 5 ohms?	(+) PCM Connector, Harness Side	(-) Differential Pressure Feedback EGR Sensor Connector, Harness Side	DPFE	DPFE	SIGRTN	SIGRTN	VREF	VREF	Yes REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test. No INSTALL a new Differential Pressure Feedback EGR sensor. After installing the new differential pressure feedback EGR sensor, TURN the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new differential pressure feedback EGR sensor. Failure to do this may result in an incorrect DTC P0402. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) Differential Pressure Feedback EGR Sensor Connector, Harness Side									
DPFE	DPFE									
SIGRTN	SIGRTN									
VREF	VREF									
HE36	DTC P0401: CARRY OUT THE KOER SELF-TEST - Carry out the KOER self-test. - Does DTC P1408 appear?	Yes GO to HE37. No GO to HE53.								
HE37	KOER AND CONTINUOUS MEMORY DTC P1408: RETRIEVE CONTINUOUS MEMORY DTCS Note: If any DTC other than P1406 appears, note the DTC and refer to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions after carrying out this pinpoint test. - Retrieve all continuous memory DTCs. - Is DTC 1406 present?	Yes GO to HE31. No GO to HE38.								

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take																
HE38	INSPECT THE DIFFERENTIAL PRESSURE FEEDBACK EGR PRESSURE HOSES - Inspect the pressure hoses for a reverse connection at the differential pressure feedback EGR sensor or at the orifice tube assembly. - Inspect the hoses for incorrect routing. - Inspect both hoses for leaks and blockage. - Inspect the differential pressure feedback EGR sensor and orifice tube assembly for blockage or damage at the pick-up tubes. N0047992 Typical Differential Pressure Feedback EGR System <table><tr><th>Item Number</th><th>Description</th></tr><tr><td>1</td><td>Differential Pressure Feedback EGR Sensor</td></tr><tr><td>2</td><td>Pickup Tubes</td></tr><tr><td>3</td><td>Upstream Pressure Hose</td></tr><tr><td>4</td><td>To EGR Valve</td></tr><tr><td>5</td><td>Orifice Tube Assembly</td></tr><tr><td>6</td><td>Exhaust Manifold</td></tr><tr><td>7</td><td>Downstream Pressure Hose</td></tr></table> - Is a concern present?	Item Number	Description	1	Differential Pressure Feedback EGR Sensor	2	Pickup Tubes	3	Upstream Pressure Hose	4	To EGR Valve	5	Orifice Tube Assembly	6	Exhaust Manifold	7	Downstream Pressure Hose	Yes REPAIR or INSTALL a new pressure hose as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to HE39.
Item Number	Description																	
1	Differential Pressure Feedback EGR Sensor																	
2	Pickup Tubes																	
3	Upstream Pressure Hose																	
4	To EGR Valve																	
5	Orifice Tube Assembly																	
6	Exhaust Manifold																	
7	Downstream Pressure Hose																	

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take				
HE39	CHECK THE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR OUTPUT BY APPLYING VACUUM WITH THE HAND PUMP • Disconnect the pressure hoses at the differential pressure feedback EGR 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 ON, engine OFF. • Access the PCM and monitor the DPFEGR PID. • Apply 27 - 30 kPa (8 - 9 in-Hg) vacuum to the differential pressure feedback EGR sensor and hold for 10 seconds. • Quickly release the vacuum. — The DPFEGR PID voltage must be between 0.25 and 1.3 volts 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 concern in the differential pressure feedback EGR sensor?	Yes INSTALL a new Differential Pressure Feedback EGR sensor. After installing the new differential pressure feedback EGR sensor, TURN the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new differential pressure feedback EGR sensor. Failure to do this may result in an incorrect DTC P0402. CLEAR the DTCs. REPEAT the self-test. No CONNECT all the hoses. GO to HE40.				
HE40	CHECK THE VREF VOLTAGE TO THE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR • Key in OFF position. • Differential Pressure Feedback EGR Sensor connector disconnected. • Key ON, engine OFF. • Measure the voltage between:<table><tr><td>(+) Differential Pressure Feedback EGR Sensor Connector, Harness Side</td><td>(-) Differential Pressure Feedback EGR Sensor Connector, Harness Side</td></tr><tr><td>VREF</td><td>SIGRTN</td></tr></table> • Is the voltage between 4 - 5.5 V?	(+) Differential Pressure Feedback EGR Sensor Connector, Harness Side	(-) Differential Pressure Feedback EGR Sensor Connector, Harness Side	VREF	SIGRTN	Yes GO to HE41. No GO to Pinpoint Test C.
(+) Differential Pressure Feedback EGR Sensor Connector, Harness Side	(-) Differential Pressure Feedback EGR Sensor Connector, Harness Side					
VREF	SIGRTN					
HE41	CHECK THE DPFE 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>DPFE</td></tr></table> • Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	VREF	DPFE	Yes GO to HE42. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side					
VREF	DPFE					

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE42	CARRY OUT THE KOER SELF-TEST WHILE MONITORING THE EGR VACUUM	
	Note: Since the EGR vacuum hose is disconnected, ignore the DTCs during this KOER self-test. • PCM connector connected. • Differential Pressure Feedback EGR Sensor connector connected. • Disconnect the vacuum hose at the EGR valve and connect the hose to the vacuum gauge. • Carry out the KOER self-test. • Monitor 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?	Yes GO to HE43. No GO to HE44.
HE43	CHECK THE EGR VALVE FUNCTION BY APPLYING VACUUM WITH THE HAND PUMP	
	• 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 differential pressure feedback EGR sensor and hold for 10 seconds. If the engine wants to stall, increase the engine speed to approximately 1,000 RPM and hold steady. • Monitor 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 DPFEGR 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 HE47. No GO to HE44.

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE44	PHYSICALLY INSPECT ALL VACUUM LINES BETWEEN THE EGR VALVE, EGR VACUUM REGULATOR AND VACUUM SOURCE	Yes REPAIR as necessary. If the EGR vacuum regulator is damaged, INSTALL a new EGR vacuum regulator. CLEAR the DTCs. REPEAT the self-test. 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 EGR vacuum regulator 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. CLEAR the DTCs. REPEAT the self-test. 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. CLEAR the DTCs. REPEAT the self-test.
	• EGR vacuum regulator 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)?	

Exhaust Gas Recirculation (EGR) Systems

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Test Step		Results / Action to Take				
HE47	CHECK THE VPWR VOLTAGE TO THE EGR VACUUM REGULATOR SOLENOID • Key in OFF position. • EGR Vacuum Regulator Solenoid connector disconnected. • Key ON, engine OFF. • Measure the voltage between:<table><tr><td>(+) EGR Vacuum Regulator 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 V?	(+) EGR Vacuum Regulator Solenoid Connector, Harness Side	(-) Vehicle Battery	VPWR - Pin 1	Negative terminal	Yes GO to HE48. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) EGR Vacuum Regulator Solenoid Connector, Harness Side	(-) Vehicle Battery					
VPWR - Pin 1	Negative terminal					
HE48	CHECK THE EGR VACUUM REGULATOR SOLENOID COIL RESISTANCE • Key in OFF position. • Measure the resistance between:<table><tr><td>(+) EGR Vacuum Regulator Solenoid Connector, Component Side</td><td>(-) EGR Vacuum Regulator Solenoid Connector, Component Side</td></tr><tr><td>VPWR - Pin 1</td><td>EVR - Pin 2</td></tr></table> • Is the resistance between 26 - 40 ohms?	(+) EGR Vacuum Regulator Solenoid Connector, Component Side	(-) EGR Vacuum Regulator Solenoid Connector, Component Side	VPWR - Pin 1	EVR - Pin 2	Yes GO to HE49. No INSTALL a new EGR Vacuum Regulator solenoid. CLEAR the DTCs. REPEAT the self-test.
(+) EGR Vacuum Regulator Solenoid Connector, Component Side	(-) EGR Vacuum Regulator Solenoid Connector, Component Side					
VPWR - Pin 1	EVR - Pin 2					
HE49	CHECK THE EGR VACUUM REGULATOR CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS • PCM connector disconnected. • Key ON, engine OFF. • 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. CLEAR the DTCs. REPEAT the self-test. No GO to HE50.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
EVR	Negative terminal					
HE50	CHECK THE EGR VACUUM REGULATOR CIRCUIT FOR AN OPEN IN THE HARNESS • Key in OFF position. • Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) EGR Vacuum Regulator 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	(-) EGR Vacuum Regulator Solenoid Connector, Harness Side	EVR	EVR - Pin 2	Yes GO to HE51. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) EGR Vacuum Regulator Solenoid Connector, Harness Side					
EVR	EVR - Pin 2					

Exhaust Gas Recirculation (EGR) Systems

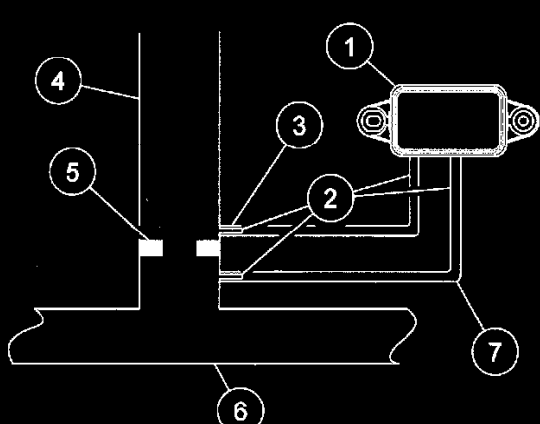
HE

Test Step		Results / Action to Take			
HE51	INSPECT THE EGR SYSTEM FOR LEAKS, RESTRICTIONS AND POOR CONNECTIONS	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to HE52.			
	- EGR Vacuum Regulator Solenoid connector connected. - PCM connector connected. - Visually inspect the EGR system for signs of intermittent failure. Is a concern present?				
HE52	CHECK THE EGR VACUUM REGULATOR SOLENOID VACUUM FLOW BY GROUNDING THE EVR CIRCUIT	Yes GO to HE66. No INSTALL a new EGR Vacuum Regulator solenoid. CLEAR the DTCs. REPEAT the self-test.			
	Note: If the EGR vacuum regulator does not react within 2 seconds, an EGR vacuum regulator concern may be present. - 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 border="1"><tr><td>Point A EGR Vacuum Regulator Solenoid Connector, Harness Side</td><td>Point B Vehicle Battery</td></tr><tr><td>EVR - Pin 2</td><td>Negative terminal</td></tr></table> Does the vacuum gauge indicate 13.5 kPa (4.0 in-Hg) or greater within 2 seconds?		Point A EGR Vacuum Regulator Solenoid Connector, Harness Side	Point B Vehicle Battery	EVR - Pin 2
Point A EGR Vacuum Regulator Solenoid Connector, Harness Side	Point B Vehicle Battery				
EVR - Pin 2	Negative terminal				

HE51-HE52

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take																
HE53	INSPECT THE DIFFERENTIAL PRESSURE FEEDBACK EGR PRESSURE HOSES • Visually inspect the upstream pressure hose routing. • Visually inspect the downstream pressure hose routing. • Inspect for a reversed connection at the differential pressure feedback EGR 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 differential pressure feedback EGR sensor and orifice tube assembly for blockage or damage at the pick-up tubes. •  N0047992 Typical Differential Pressure Feedback EGR System <table><tr><th>Item Number</th><th>Description</th></tr><tr><td>1</td><td>Differential Pressure Feedback EGR Sensor</td></tr><tr><td>2</td><td>Pickup Tubes</td></tr><tr><td>3</td><td>Upstream Pressure Hose</td></tr><tr><td>4</td><td>To EGR Valve</td></tr><tr><td>5</td><td>Orifice Tube Assembly</td></tr><tr><td>6</td><td>Exhaust Manifold</td></tr><tr><td>7</td><td>Downstream Pressure Hose</td></tr></table> • Is a concern present?	Item Number	Description	1	Differential Pressure Feedback EGR Sensor	2	Pickup Tubes	3	Upstream Pressure Hose	4	To EGR Valve	5	Orifice Tube Assembly	6	Exhaust Manifold	7	Downstream Pressure Hose	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to HE54.
Item Number	Description																	
1	Differential Pressure Feedback EGR Sensor																	
2	Pickup Tubes																	
3	Upstream Pressure Hose																	
4	To EGR Valve																	
5	Orifice Tube Assembly																	
6	Exhaust Manifold																	
7	Downstream Pressure Hose																	

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE54	CHECK THE EGR VALVE FUNCTION BY APPLYING VACUUM WITH THE HAND PUMP	Yes INSTALL a new Differential Pressure Feedback EGR sensor. After installing the new differential pressure feedback EGR sensor, TURN the key to the ON position for approximately 5 seconds before starting. This allows the PCM to calibrate itself to the new differential pressure feedback EGR sensor. Failure to do this may result in an incorrect DTC P0402. CLEAR the DTCs. REPEAT the self-test. No CONNECT all the hoses. GO to HE55.
	• Disconnect the pressure hoses at the differential pressure feedback EGR 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 ON, engine OFF. • Access the PCM and monitor the DPFEGR PID. • Apply 27 - 30 kPa (8 - 9 in-Hg) vacuum to the differential pressure feedback EGR sensor and hold for 10 seconds. • Quickly release the vacuum. — The DPFEGR PID voltage must be between 0.25 and 1.3 volts 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 concern in the differential pressure feedback EGR sensor?	
HE55	CHECK THE EGR VALVE FUNCTION BY APPLYING VACUUM WITH THE HAND PUMP	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. CLEAR the DTCs. REPEAT the self-test.
	• 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 differential pressure feedback EGR sensor and hold for 10 seconds. If the engine wants to stall, increase the engine speed to approximately 1,000 RPM and hold steady. • Monitor 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 DPFEGR 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?	

HE54-HE55

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take				
HE56	INSPECT THE EGR VACUUM SIGNAL SUPPLY FOR AN INTERMITTENT CONCERN • Key in OFF position. • Remove the vacuum hose from the EGR valve and connect to a vacuum gauge. • Key ON, engine running. • Connect a 5 amp fused jumper wire between the following:<table><tr><td>Point A EGR Vacuum Regulator Solenoid Connector, Harness Side</td><td>Point B Vehicle Battery</td></tr><tr><td>EVR - Pin 2</td><td>Negative terminal</td></tr></table> • The solenoid is full ON. • Vacuum gauge should read above 13.5 kPa (4 in-Hg). • Observe the vacuum gauge. • Look for a concern while carrying out the following checks: — Lightly tap on the EGR vacuum regulator solenoid. — Carry out a thorough wiggle test on the EGR vacuum regulator harness. — Inspect the EGR vacuum signal supply for an intermittent concern. — Inspect the EGR vacuum regulator solenoid and vacuum hoses for plugging. — A concern is indicated by a sudden drop in the vacuum reading. • Is a concern Indicated?	Point A EGR Vacuum Regulator Solenoid Connector, Harness Side	Point B Vehicle Battery	EVR - Pin 2	Negative terminal	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. Note: In cold climates, the EGR valve may temporarily freeze shut and thaw when the engine warms. GO to Pinpoint Test Z.
Point A EGR Vacuum Regulator 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 • 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 — EGR vacuum regulator solenoid vent restricted — Damaged EGR vacuum regulator solenoid • Disconnect and plug the vacuum hose connected to the EGR valve. • Key ON, engine OFF. • 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 differential pressure feedback EGR sensor is sensing EGR flow. • Is the DPFEGR PID voltage greater at idle by 0.15 V 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. CLEAR the DTCs. REPEAT the self-test. No Inspect the EGR vacuum regulator solenoid and vacuum hoses for plugging. INSPECT the EGR vacuum regulator solenoid vent for blockage. GO to HE58.				

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take				
HE58	DETERMINE THE EGR VALVE VACUUM SUPPLY Is a concern present in the EGR valve vacuum supply?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No INSTALL a new EGR Vacuum Regulator solenoid. CLEAR the DTCs. REPEAT the self-test.				
HE59	DTCS P0403 AND P1409: CHECK THE EGR VACUUM REGULATOR SOLENOID COIL RESISTANCE - Key in OFF position. - EGR Vacuum Regulator Solenoid connector disconnected. - Measure the resistance between:<table><tr><td>(+) EGR Vacuum Regulator Solenoid Connector, Component Side</td><td>(-) EGR Vacuum Regulator Solenoid Connector, Component Side</td></tr><tr><td>VPWR - Pin 1</td><td>EVR - Pin 2</td></tr></table> - Is the resistance between 26 - 40 ohms?	(+) EGR Vacuum Regulator Solenoid Connector, Component Side	(-) EGR Vacuum Regulator Solenoid Connector, Component Side	VPWR - Pin 1	EVR - Pin 2	Yes GO to HE60. No INSTALL a new EGR Vacuum Regulator solenoid. CLEAR the DTCs. REPEAT the self-test.
(+) EGR Vacuum Regulator Solenoid Connector, Component Side	(-) EGR Vacuum Regulator Solenoid Connector, Component Side					
VPWR - Pin 1	EVR - Pin 2					
HE60	CHECK THE VPWR VOLTAGE TO EGR VACUUM REGULATOR SOLENOID - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) EGR Vacuum Regulator 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 V?	(+) EGR Vacuum Regulator Solenoid Connector, Harness Side	(-) Vehicle Battery	VPWR - Pin 1	Negative terminal	Yes GO to HE61. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) EGR Vacuum Regulator Solenoid Connector, Harness Side	(-) Vehicle Battery					
VPWR - Pin 1	Negative terminal					
HE61	CHECK THE EGR VACUUM REGULATOR 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>(-) EGR Vacuum Regulator 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	(-) EGR Vacuum Regulator Solenoid Connector, Harness Side	EVR	EVR - Pin 2	Yes GO to HE62. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) EGR Vacuum Regulator Solenoid Connector, Harness Side					
EVR	EVR - Pin 2					

HE58-HE61

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take				
HE62	CHECK THE EGR VACUUM REGULATOR CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - 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. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
EVR	Negative terminal					
HE63	CHECK THE EGR VACUUM REGULATOR CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - 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	PWRGND	Yes GO to HE66. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side					
EVR	PWRGND					
HE64	CHECK FOR THE PRESENCE OF KOER DTCS P0403 OR P1409 - Carry out the KOER self-test. - Are DTCs P0403 or P1409 present?	Yes GO to HE59. No GO to HE65.				
HE65	CARRY OUT A THOROUGH WIGGLE TEST ON THE EGR VACUUM REGULATOR HARNESS - Key in OFF position. - PCM connector disconnected. - Key ON, engine OFF. - 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 EGR vacuum regulator solenoid. Wiggle the EGR vacuum regulator solenoid connector. Carry out a thorough wiggle test on the harness. A concern is indicated by a voltage drop during the wiggle test. - Is the voltage greater than 10 V?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	EVR	PWRGND	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to Pinpoint Test Z.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side					
EVR	PWRGND					

Exhaust Gas Recirculation (EGR) Systems

HE

Test Step		Results / Action to Take
HE66	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

HE66

Test HF: Catalyst Efficiency Monitor and Exhaust Systems**PINPOINT TEST HF: CATALYST EFFICIENCY MONITOR AND EXHAUST SYSTEMS**

Catalyst Efficiency Monitor and Exhaust Systems

HF

 **WARNING:** Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.

This pinpoint test is intended to diagnose the following:

- catalytic converter
- exhaust system

Test Step		Results / Action to Take
HF1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	Yes GO to HF2. No For symptoms without DTCs, GO to HF6. For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
	• Are DTCs P0420 or P0430 present?	
HF2	CHECK FOR OTHER DTCs	Yes GO to Powertrain DTC Charts and Descriptions, Diagnostic Trouble Code (DTC) Charts and Descriptions for pinpoint test direction and REPAIR the misfire DTCs. CLEAR the DTCs. REPEAT the self-test. No GO to HF3.
	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. Note: Make 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. • Check for self-test DTCs. • Are any DTCs present other than the following: P0420, P0430?	

Catalyst Efficiency Monitor and Exhaust Systems

HF

Test Step		Results / Action to Take
HF3	CHECK THE ELECTRONIC ENGINE CONTROL (EEC) WIRING HARNESS	
	Note: Check the HO2S electrical connectors to make sure the correct HO2S 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 fails. • Visually inspect the 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?	Yes REPAIR as necessary. CLEAR the DTCs. CARRY OUT the catalyst monitor drive cycle to verify the repairs. No GO to HF4.
HF4	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. Failure to follow these instructions may result in personal injury.  WARNING: Before repairing or installing a new component in the fuel system, reduce the possibility of injury or fire by following the warning, caution, and handling directions in pinpoint test HC. GO to Pinpoint Test HC. Failure to follow these instructions may result in personal injury. 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. Note: On electronic returnless fuel system (ERFS), the fuel pressure can be monitored by the scan tool using the fuel rail pressure (FRP) PID. • 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. • Access the PCM and monitor the FRP PID. • Start the engine. Record the fuel pressure. • Compare the recorded fuel pressure reading to the Fuel System Specification Chart found at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC. • Key in OFF position. • Is the fuel pressure within specifications?	Yes The fuel pressure is OK. If applicable, REMOVE the fuel pressure gauge. GO to HF5. No The fuel pressure is out of specification. GO to HC3.

HF3-HF4

Catalyst Efficiency Monitor and Exhaust Systems

HF

Test Step		Results / Action to Take
HF5	CHECK FOR LEAKS IN THE EXHAUST SYSTEM	Yes REPAIR as necessary. CLEAR the DTCs. CARRY OUT the catalyst monitor drive cycle to verify the repairs. No GO to HF10.
	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?	
HF6	CHECK FOR RESTRICTIONS IN THE EXHAUST SYSTEM	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to HF7.
	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?	
HF7	CHECK FOR EXCESSIVE EXHAUST BACK PRESSURE	Yes GO to HF8. No GO to HF9.
	- The internal condition of exhaust system and its ability to flow can be checked with an exhaust back pressure tool. Is an exhaust back pressure tester available?	
HF8	CHECK FOR EXCESSIVE EXHAUST BACK PRESSURE WITH EXHAUST BACK PRESSURE TOOL	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. To continue diagnosis of a symptom (lack of power, loss of power, or no start), REFER to Symptom Charts. No No indication of restrictions or leaks has been detected in the exhaust system. To continue diagnosis of a symptom (lack of power, loss of power, or no start), REFER to Symptom Charts.
	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 wide open throttle (WOT) under load. - Install an exhaust back pressure tester and follow the tool manufacturer installation and testing instructions. Does the exhaust back pressure test indicate a restriction?	

HF5-HF8

Catalyst Efficiency Monitor and Exhaust Systems

HF

Test Step		Results / Action to Take
HF9	CHECK MANIFOLD VACUUM FOR AN INDICATION OF EXCESSIVE EXHAUST SYSTEM RESTRICTION	
	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. • Attach a vacuum gauge to the intake manifold vacuum source. • Observe the vacuum gauge while increasing the engine RPM. • Does the vacuum gauge indicate an exhaust restriction concern?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. To continue diagnosis of a symptom (lack of power, loss of power, or no start), REFER to Symptom Charts. No No indication of restrictions or leaks has been detected in the exhaust system. To continue diagnosis of a symptom (lack of power, loss of power, or no start), REFER to Symptom Charts.
HF10	CARRY OUT THE CATALYST MONITOR DRIVE CYCLE	
	• Carry out the 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 the bank referenced, (P0420 Bank 1), (P0430 Bank 2). Do not install a new unmonitored catalyst unless it is repaired as an assembly. CLEAR the DTCs. REPEAT the self-test. No The test is complete and no concerns are present.

HF9-HF10

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

Positive Crankcase Ventilation (PCV) System

HG

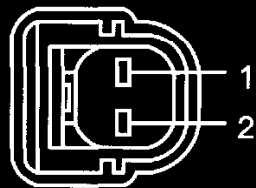
This pinpoint test is intended to diagnose the following:

- 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)

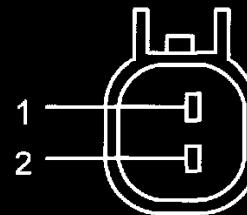
Note: For the electrically heated PCV system only, refer to Description and Operation, Positive Crankcase Ventilation (PCV) System.

Positive Crankcase Ventilation (PCV) Connector

Electrically Heated PCV

A

A0077518

B

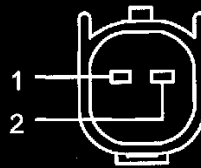
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Description, Note And Positive Crankcase Ventilation (PCV) Connector

Positive Crankcase Ventilation (PCV) System

HG

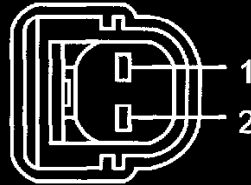
C



A0077556

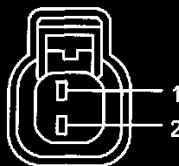
Vehicle	Connector	Pin	Circuit
Crown Victoria (PCM controlled PCV heater), E-Series 6.8L (PCM controlled PCV heater), E-Series 4.6L (PCM controlled PCV heater), Explorer 4.0L (PCM controlled PCV heater), Explorer Sport Trac 4.0L (PCM controlled PCV heater), F-150 4.2L (PCM controlled PCV heater), F-150 4.6L (PCM controlled PCV heater), Fusion 3.0L (PCM controlled PCV heater), Grand Marquis (PCM controlled PCV heater), Milan 3.0L (PCM controlled PCV heater), Mountaineer 4.0L (PCM controlled PCV heater), Mustang 4.0L (PCM controlled PCV heater), Mustang 5.4L (PCM controlled PCV heater), Town Car (PCM controlled PCV heater)	A	1 2	PCVHC IGN START/RUN
Expedition (Non-PCM controlled heated PCV tube), F-150 5.4L (Non-PCM controlled heated PCV tube), Mark LT (Non-PCM controlled heated PCV tube), Navigator (Non-PCM controlled heated PCV tube)	B	2 1	GND IGN START/RUN
F-Super Duty 5.4L (PCM controlled heated PCV tube)	C	2 1	PCVHC IGN START/RUN
All other vehicles	A	1 2	GND IGN START/RUN

Positive Crankcase Ventilation (PCV) Connector Continued

**Positive Crankcase Ventilation (PCV)
System****HG****Positive Crankcase Ventilation Heated Fitting
(PCVHF) Connector**

A0077518

Pin	Circuit
1	PCVHF (Positive Crankcase Ventilation Heated Fitting)
2	IGN START/RUN

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

A0077564

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

Positive Crankcase Ventilation (PCV) System

HG

Powertrain Control Module (PCM) Connector

This table is only for vehicles equipped with a PCM controlled PCV heater.

Vehicle	Connector	Pin	Circuit
E-Series, F-Super Duty	170 Pin	E2	PCVHC
F-150	190 Pin	E3	PCVHC
Fusion, Milan	140 Pin	E2	PCVHC
Mustang 5.4L	170 Pin	E67	PCVHC
All other vehicles	170 Pin	E3	PCVHC

Test Step		Results / Action to Take
HG1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	
	- Check for DTCs P053A, P145E or P1489. - Are any of the above listed DTCs present?	Yes GO to HG5. No For all other symptoms without DTCs, GO to HG2.
HG2	VISUAL INSPECTION OF THE PCV VALVE	
	Note: If the PCV valve or tube is electrically heated, verify the 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 5°C (40°F) +/- 4°C (+/- 7°F). 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 an electrically heated PCV tube, GO to HG4. For all others, GO to HG3.

Positive Crankcase Ventilation (PCV) System

HG

Test Step		Results / Action to Take							
HG3	STUCK PCV VALVE CHECK	Yes REINSTALL the PCV valve. For PCV systems with electrical heating, GO to HG4 . For PCV systems without electrical heating, GO to HG12 . No The PCV valve is sticking. INSTALL a new PCV valve. VERIFY the symptom no longer exists.							
	• Disconnect the PCV valve from the valve cover. • Shake the PCV valve. • Does the PCV valve rattle when shaken?								
HG4	CHECK FOR A PCM CONTROLLED PCV HEATER	Yes GO to HG5 . No GO to HG8 .							
	Note: If a thermal extension harness is present then the PCV is non-PCM controlled. Refer to Description and Operation, Positive Crankcase Ventilation (PCV) System. • Check if the PCV heater is PCM controlled. • Is the PCV heater PCM controlled?								
HG5	CHECK THE HARNESS VOLTAGE TO THE PCM CONTROLLED PCV HEATER	Yes GO to HG6 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.							
	• Suspect PCV connector disconnected. • Key ON, engine OFF. • Measure the voltage between: <table border="1"><tr><td>(+) PCVHF Connector, Harness Side</td><td>(-)</td></tr><tr><td>IGN START/RUN - Pin 2</td><td>Ground</td></tr></table> • Measure the voltage between: <table border="1"><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 V?		(+) PCVHF Connector, Harness Side	(-)	IGN START/RUN - Pin 2	Ground	(+) PCV Connector, Harness Side	(-)	IGN START/RUN
(+) PCVHF Connector, Harness Side	(-)								
IGN START/RUN - Pin 2	Ground								
(+) PCV Connector, Harness Side	(-)								
IGN START/RUN	Ground								

Positive Crankcase Ventilation (PCV) System

HG

Test Step		Results / Action to Take								
HG6	CHECK THE HARNESS CIRCUIT TO THE PCM CONTROLLED PCV HEATER - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) PCVHF Connector, Harness Side</td></tr><tr><td>PCVHF</td><td>PCVHF - Pin 1</td></tr></table> - 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 greater than 5 ohms?	(+) PCM Connector, Harness Side	(-) PCVHF Connector, Harness Side	PCVHF	PCVHF - Pin 1	(+) PCM Connector, Harness Side	(-) PCV Connector, Harness Side	PCVHC	PCVHC	Yes GO to HG7. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCVHF Connector, Harness Side									
PCVHF	PCVHF - Pin 1									
(+) PCM Connector, Harness Side	(-) PCV Connector, Harness Side									
PCVHC	PCVHC									
HG7	CHECK THE RESISTANCE OF THE PCM CONTROLLED PCV VALVE OR TUBE HEATER - Measure the resistance between:<table><tr><td>(+) PCVHF Connector, Component Side</td><td>(-) PCVHF Connector, Component Side</td></tr><tr><td>IGN START/RUN - Pin 2</td><td>PCVHF - Pin 1</td></tr></table> - 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 - 35 ohms?	(+) PCVHF Connector, Component Side	(-) PCVHF Connector, Component Side	IGN START/RUN - Pin 2	PCVHF - Pin 1	(+) PCV Connector, Component Side	(-) PCV Connector, Component Side	IGN START/RUN	PCVHC	Yes GO to HG13. No INSTALL a new PCV valve or tube. CLEAR the DTCs. REPEAT the self-test.
(+) PCVHF Connector, Component Side	(-) PCVHF Connector, Component Side									
IGN START/RUN - Pin 2	PCVHF - Pin 1									
(+) PCV Connector, Component Side	(-) PCV Connector, Component Side									
IGN START/RUN	PCVHC									
HG8	CHECK THE VOLTAGE AND GROUND AT THE HARNESS ELECTRICALLY HEATED PCV VALVE OR TUBE NON-PCM CONTROLLED - PCV connector disconnected. - PCVTE-Harness Side connector disconnected. - Key ON, engine OFF. - 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 V?	(+) PCVTE-Harness Side, Harness Side	(-) PCVTE-Harness Side, Harness Side	IGN START/RUN - Pin 1	GND - Pin 2	Yes For vehicles with a thermal extension harness, GO to HG10. For all others, GO to HG11. No GO to HG9.				
(+) PCVTE-Harness Side, Harness Side	(-) PCVTE-Harness Side, Harness Side									
IGN START/RUN - Pin 1	GND - Pin 2									

Positive Crankcase Ventilation (PCV) System

HG

Test Step		Results / Action to Take				
HG9	CHECK THE VOLTAGE CIRCUIT - PCV connector disconnected. - Key ON, engine OFF. - 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 V?	(+) PCV Connector, Harness Side	(-)	IGN START/RUN	Ground	Yes REPAIR the open GND circuit. TEST the system for normal operation. No REPAIR the open PWR circuit TEST the system for normal operation.
(+) PCV Connector, Harness Side	(-)					
IGN START/RUN	Ground					
HG10	VALVE RESISTANCE CHECK WITHOUT AN EXTENSION HARNESS Note: On some applications the vehicle may be equipped with a thermal harness that only provides electrical continuity when the temperature is less than 5°C (40°F) +/- 4°C (+/- 7°F). Typically this harness is located close to the PCV valve or tube. - Disconnect the thermal extension harness from the 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 - 35 ohms?	(+) PCV Connector, Component Side	(-) PCV Connector, Component Side	IGN START/RUN	PCVHC	Yes INSTALL a new thermal extension harness PCV. TEST the system for normal operation. No INSTALL a new PCV.
(+) PCV Connector, Component Side	(-) PCV Connector, Component Side					
IGN START/RUN	PCVHC					
HG11	CHECK THE RESISTANCE OF THE 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 - 35 ohms?	(+) PCV Connector, Component Side	(-) PCV Connector, Component Side	IGN START/RUN	GND	Yes GO to HG12. No INSTALL a new PCV valve or tube.
(+) PCV Connector, Component Side	(-) PCV Connector, Component Side					
IGN START/RUN	GND					

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

Test Step		Results / Action to Take
HG12	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. RETURN to Symptom Charts for further direction. 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 vehicle emissions control information (VECI) label for PCV system components and routing. REPAIR as necessary.
HG13	CHECK IF A CONCERN OR DTC IS STILL PRESENT - Connect the PCV system. - Clear the DTCs. - Carry out the self-test. Is the concern or DTC is still present?	Yes GO to HG14. No Unable to duplicate or identify the concern at this time. RETURN to Symptom Charts for further direction.
HG14	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

HG12-HG14

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

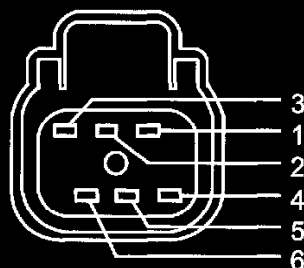
Exhaust Gas Recirculation System Module (ESM)

HH

This pinpoint test is intended to diagnose the following:

- ESM (9Y456)
- orifice tube assembly (9D477)
- differential pressure feedback exhaust gas recirculation (EGR) sensor pressure hoses
- vacuum lines
- harness circuits: VREF, DPFE, SIGRTN, EVR, VPWR and VREF
- powertrain control module (PCM) (12A650)

EGR System Module (ESM) Connector



A0077577

Pin	Circuit
1	EVR (EGR Vacuum Regulator)
4	VPWR (Vehicle Power)
6	SIGRTN (Signal Return)
5	DPFE (Differential Pressure Feedback EGR)
2	VREF (Reference Voltage)

Powertrain Control Module (PCM) Connector

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

Description, EGR System Module (ESM) Connector And Powertrain Control Module (PCM) Connector

Exhaust Gas Recirculation System Module (ESM)

HH

Vehicle	Connector	Pin	Circuit
E-Series, F-Super Duty	170 Pin	E63 E58 E57 E58 E21	EVR SIGRTN VREF SIGRTN DPFE
F-150	190 Pin	E63 E58 B29, E57 B58, E58, T43 E21	EVR SIGRTN VREF SIGRTN DPFE
Mustang	170 Pin	E63 E58 B40, E57 B41, E58, T41 E21	EVR SIGRTN VREF SIGRTN DPFE
All other vehicles	170 Pin	E63 E58 E57 B41, E58, T41 E21	EVR SIGRTN VREF SIGRTN DPFE

Test Step		Results / Action to Take
HH1	CHECK FOR DTCS	
	Are DTCs P0401, P0402, P0403, P0405, P0406, P1408, or P1409 present?	Yes For DTC P0401, GO to HH16. For DTC P0402, GO to HH12. For DTCs P0403 and P1409, GO to HH22. For DTC P0405, GO to HH2. For DTC P0406, GO to HH5. For DTC P1408, GO to HH17. No For symptoms without DTCs, GO to HH28. For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
HH2	DTC P0405: DETERMINE THE PRESENT DPFEGR PID VOLTAGE	
	- Key ON, engine OFF. - Access the PCM and monitor the DPFEGR PID. - Is the voltage less than 0.05 V?	Yes GO to HH3. No GO to HH11.

Exhaust Gas Recirculation System Module (ESM)

HH

Test Step		Results / Action to Take								
HH3	INDUCE THE OPPOSITE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR SIGNAL • Key in OFF position. • ESM connector disconnected. • Key ON, engine OFF. • Access the PCM and monitor the DPFEGR PID. • Is the voltage between 4 - 6 V?	Yes INSTALL a new Differential Pressure Feedback EGR sensor. CLEAR the DTCs. REPEAT the self-test. No GO to HH4.								
HH4	CHECK THE DPFE CIRCUIT FOR A SHORT TO SIGRTN OR GND 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>DPFE</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>DPFE</td><td>Negative terminal</td></tr></table> • Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	DPFE	SIGRTN	(+) PCM Connector, Harness Side	(-) Vehicle Battery	DPFE	Negative terminal	Yes GO to HH29. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
DPFE	SIGRTN									
(+) PCM Connector, Harness Side	(-) Vehicle Battery									
DPFE	Negative terminal									
HH5	DTC P0406: DETERMINE THE PRESENT DPFEGR PID VOLTAGE • Key ON, engine OFF. • Access the PCM and monitor the DPFEGR PID. • Is the voltage greater than 4 V?	Yes GO to HH6. No GO to HH11.								
HH6	CHECK THE VREF VOLTAGE TO THE ESM • Key in OFF position. • ESM connector disconnected. • Key ON, engine OFF. • 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 - 5.5 V?	(+) ESM Connector, Harness Side	(-) Vehicle Battery	VREF - Pin 2	Negative terminal	Yes GO to HH7. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.				
(+) ESM Connector, Harness Side	(-) Vehicle Battery									
VREF - Pin 2	Negative terminal									

Exhaust Gas Recirculation System Module (ESM)

HH

Test Step		Results / Action to Take						
HH7	CHECK THE DPFE CIRCUIT FOR A SHORT TO VOLTAGE - Key in OFF position. - PCM connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) ESM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>DPFE - Pin 5</td><td>Negative terminal</td></tr></table> - Is the voltage less than 1 V?	(+) ESM Connector, Harness Side	(-) Vehicle Battery	DPFE - Pin 5	Negative terminal	Yes GO to HH8. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) ESM Connector, Harness Side	(-) Vehicle Battery							
DPFE - Pin 5	Negative terminal							
HH8	CHECK THE DPFE 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>DPFE</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side	VREF	DPFE	Yes GO to HH9. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
VREF	DPFE							
HH9	CHECK THE DPFE 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>DPFE</td><td>DPFE - 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	DPFE	DPFE - Pin 5	SIGRTN	SIGRTN - Pin 6	Yes GO to HH10. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) ESM Connector, Harness Side							
DPFE	DPFE - Pin 5							
SIGRTN	SIGRTN - Pin 6							
HH10	INDUCE THE OPPOSITE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR VOLTAGE - 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>DPFE - Pin 5</td><td>SIGRTN - Pin 6</td></tr></table> - Key ON, engine OFF. - 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	DPFE - Pin 5	SIGRTN - Pin 6	Yes INSTALL a new Differential Pressure Feedback EGR sensor. CLEAR the DTCs. REPEAT the self-test. No GO to HH29.		
Point A ESM Connector, Harness Side	Point B ESM Connector, Harness Side							
DPFE - Pin 5	SIGRTN - Pin 6							

Exhaust Gas Recirculation System Module (ESM)

HH

Test Step		Results / Action to Take				
HH11	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. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.				
HH12	DTC P0402: CHECK THE VREF VOLTAGE TO THE ESM Note: Diagnose and repair all circuit concern DTCs before diagnosing range/performance or flow concerns. For circuit concern DTC diagnosis, refer to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. • Key in OFF position. • ESM connector disconnected. • Key ON, engine OFF. • 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 - 5.5 V?	(+) ESM Connector, Harness Side	(-) Vehicle Battery	VREF - Pin 2	Negative terminal	Yes GO to HH13. No GO to Pinpoint Test C.
(+) ESM Connector, Harness Side	(-) Vehicle Battery					
VREF - Pin 2	Negative terminal					
HH13	SIMULATE THE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR SIGNAL WITH A VACUUM PUMP • Disconnect the downstream differential pressure feedback EGR sensor port hose at the ESM. • Verify the hose and port are clear and free of obstructions. • Connect a vacuum pump to the downstream differential pressure feedback EGR sensor port. • Key ON, engine OFF. • Access the PCM and monitor the DPFEGR PID. • Apply 27 - 30 kPa (8 - 9 in-Hg) vacuum to the differential pressure feedback EGR sensor and hold for 10 seconds. • Quickly release the vacuum. — The DPFEGR PID voltage must be between 0.25 and 1.3 volts 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 concern in the differential pressure feedback EGR sensor?	Yes INSTALL a new Differential Pressure Feedback EGR sensor. CLEAR the DTCs. REPEAT the self-test. No GO to HH14.				

Exhaust Gas Recirculation System Module (ESM)

HH

Test Step		Results / Action to Take				
HH14	INSPECT THE EGR VACUUM REGULATOR SOLENOID VENT FOR BLOCKAGE					
Note: When the EGR valve is closed, the EGR vacuum regulator solenoid vacuum is vented through the solenoid vent to the atmosphere. A plugged EGR vacuum regulator solenoid vent does not allow EGR vacuum to vent to the atmosphere. • EGR vacuum regulator vacuum hoses disconnected. • Connect a hand vacuum pump to the EGR vacuum regulator source port. • Apply 34 to 51 kPa (10 to 15 in-Hg) vacuum. • Does the EGR vacuum regulator solenoid vacuum bleed off?		Yes GO to HH15. No INSTALL a new EGR vacuum regulator solenoid. CLEAR the DTCs. REPEAT the self-test.				
HH15	CHECK THE EGR VALVE FOR CARBON BUILD-UP					
• Remove the ESM. • Visually inspect the EGR valve and valve seat for correct seating, carbon build-up and debris. • Is a concern present?		Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time.				
HH16	DTC P0401: CARRY OUT THE KOER SELF-TEST					
Note: Diagnose and repair all circuit concern DTCs before diagnosing range/performance or flow concerns. • Carry out the KOER self-test. • Is DTC P1408 present?		Yes GO to HH17. No GO to HH18.				
HH17	DTC P1408: CHECK THE VREF VOLTAGE TO THE ESM					
• Key in OFF position. • ESM connector disconnected. • Key ON, engine OFF. • 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 4.5 - 5.5 V?		(+) ESM Connector, Harness Side	(-) Vehicle Battery	VREF - Pin 2	Negative terminal	Yes GO to HH18. No GO to Pinpoint Test C.
(+) ESM Connector, Harness Side	(-) Vehicle Battery					
VREF - Pin 2	Negative terminal					
HH18	CHECK THE EGR VACUUM REGULATOR SOLENOID VACUUM					
• ESM connector connected. • Disconnect the EGR vacuum regulator vacuum source hose. • Connect a vacuum gauge to the EGR vacuum regulator 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 HH19. No REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.				

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

Test Step		Results / Action to Take
HH19	SIMULATE THE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR SIGNAL WITH A VACUUM PUMP	
	• Key in OFF position. • Disconnect the downstream differential pressure feedback EGR sensor port hose at the ESM. • Verify the hose and port are clear and free of obstructions. • Connect a vacuum pump to the downstream differential pressure feedback EGR sensor port. • Key ON, engine OFF. • Access the PCM and monitor the DPFEGR PID. • Apply 27 - 30 kPa (8 - 9 in-Hg) vacuum to the differential pressure feedback EGR sensor and hold for 10 seconds. • Quickly release the vacuum. — The DPFEGR PID voltage must be between 0.25 and 1.3 volts 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 concern in the differential pressure feedback EGR sensor?	Yes INSTALL a new Differential Pressure Feedback EGR sensor. CLEAR the DTCs. REPEAT the self-test. No CONNECT all the hoses. GO to HH20.
HH20	CHECK THE EGR VACUUM REGULATOR 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 EGR vacuum regulator duty cycle while monitoring the RPM PID. • Does the RPM decrease or the engine stall as the EGR vacuum regulator duty cycle is increased?	Yes Unable to duplicate or identify the concern at this time. No GO to HH21.

Exhaust Gas Recirculation System Module (ESM)

HH

Test Step		Results / Action to Take				
HH21	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. • Disconnect the air inlet tube from the throttle body. • 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 INSTALL the ESM. CLEAR the DTCs. REPEAT the self-test. No INSTALL a new ESM. CLEAR the DTCs. REPEAT the self-test.				
HH22	DTCs P0403 AND P1409: CHECK THE EGR VACUUM REGULATOR 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 EGR vacuum regulator duty cycle while monitoring the RPM PID. • Does the RPM decrease or the engine stall as the EGR vacuum regulator duty cycle is increased?		Yes Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z. No GO to HH23.				
HH23	CHECK THE VPWR VOLTAGE TO THE EGR VACUUM REGULATOR SOLENOID					
• Key in OFF position. • ESM connector disconnected. • Key ON, engine OFF. • 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 V?		(+) ESM Connector, Harness Side	(-) Vehicle Battery	VPWR - Pin 4	Negative terminal	Yes GO to HH24. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) ESM Connector, Harness Side	(-) Vehicle Battery					
VPWR - Pin 4	Negative terminal					

Exhaust Gas Recirculation System Module (ESM)

HH

Test Step		Results / Action to Take				
HH24	CHECK THE EGR VACUUM REGULATOR 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>EVR - Pin 1</td></tr></table> - Is the resistance between 26 - 40 ohms?	(+) ESM Connector, Component Side	(-) ESM Connector, Component Side	VPWR - Pin 4	EVR - Pin 1	Yes GO to HH25. No INSTALL a new EGR Vacuum Regulator solenoid. CLEAR the DTCs. REPEAT the self-test.
(+) ESM Connector, Component Side	(-) ESM Connector, Component Side					
VPWR - Pin 4	EVR - Pin 1					
HH25	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 HH26. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) ESM Connector, Harness Side	(-) PCM Connector, Harness Side					
EVR - Pin 1	EVR					
HH26	CHECK THE EVR CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - 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 HH27. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
EVR	Negative terminal					
HH27	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 GO to HH29. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
EVR	Ground					

Exhaust Gas Recirculation System Module (ESM)

HH

Test Step		Results / Action to Take
HH28	EGR DIAGNOSIS BY SYMPTOM: CHECK FOR EGR FLOW WITH THE EGR VACUUM REGULATOR VACUUM HOSE DISCONNECTED AND PLUGGED	
	Note: An increase in DPFEGR PID voltage at idle indicates EGR flow. • 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 — EGR vacuum regulator solenoid vent restricted — Damaged EGR vacuum regulator solenoid • Disconnect and plug the EGR vacuum regulator vacuum source hose. • Key ON, engine OFF. • 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. • Is the idle DPFEGR PID voltage greater than 0.15 V 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. CLEAR the DTCs. REPEAT the self-test. No INSPECT the EGR vacuum regulator solenoid vent for blockage. To continue symptom diagnosis, REFER to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Charts.
HH29	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

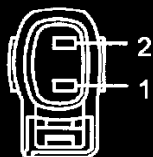
HH28-HH29

Test HK: Variable Camshaft Timing (VCT)
PINPOINT TEST HK: VARIABLE CAMSHAFT TIMING (VCT)

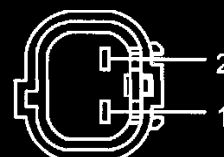
Variable Camshaft Timing (VCT)**HK**

This pinpoint test is intended to diagnose the following:

- VCT solenoid (6L713) or (6B297)
- spider assembly right bank (6C260), or left bank (6C261)
- harness circuits: VPWR and VCT
- powertrain control module (PCM) (12A650)

Variable Camshaft Timing Bank 1 (VCT1) Solenoid Connector**A**

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B

A0077562

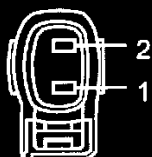
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A0077516

Description And Variable Camshaft Timing Bank 1 (VCT1) Solenoid Connector

Variable Camshaft Timing (VCT)**HK**

Vehicle	Connector	Pin	Circuit
Edge, Fusion 3.0L, Milan 3.0L, MKX, MKZ, Sable, Taurus, Taurus X	A	1 2	VPWR VCT1
Fusion 2.3L, Milan 2.3L	B	2 1	VPWR VCT1
All other vehicles	C	1 2	VPWR VCT1

Variable Camshaft Timing Bank 2 (VCT2) Solenoid Connector**A**

A0077517

B

A0077516

Vehicle	Connector	Pin	Circuit
Edge, Fusion 3.0L, Milan 3.0L, MKX, MKZ, Sable, Taurus, Taurus X	A	1 2	VPWR VCT2
All other vehicles	B	1 2	VPWR VCT2

Variable Camshaft Timing (VCT)**HK****Powertrain Control Module (PCM) Connector**

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

Vehicle	Connector	Pin	Circuit
Expedition, Navigator	140 Pin	B51, B52, B53 E68 E67	VPWR VCT2 VCT1
Explorer, Explorer Sport Trac, F-Super Duty, Mountaineer, Mustang	170 Pin	B35, B36 E68 E67	VPWR VCT2 VCT1
Fusion 3.0L, Milan 3.0L, MKZ	140 Pin	B51, B52 E68 E67	VPWR VCT2 VCT1
Fusion 2.3L, Milan 2.3L	140 Pin	B51, B52 E67	VPWR VCT1
All other vehicles	190 Pin	B51, B52, B53 E68 E67	VPWR VCT2 VCT1

Test Step		Results / Action to Take
HK1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	
	Are DTCs P0010, P0011, P0012, P0016, P0018, P0020, P0021, P0022, P052A, P052B, P052C or P052D present?	Yes For DTCs P0010 or P0020, GO to HK2. For DTCs P0011, P0012, P0021, P0022, P052A, P052B, P052C or P052D, GO to HK17. For DTCs P0016 and P0018 with or without P0011, P0012, P0021, P0022, P052A, P052B, P052C or P052D, GO to HK16. No For symptoms without DTCs, GO to HK17. For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.

HK1

Variable Camshaft Timing (VCT)

HK

Test Step		Results / Action to Take			
HK2	DTCS P0010 OR P0020: CHECK FOR VCT DTCS	Yes For KOER DTC P0010, GO to HK4. For KOER DTC P0020, GO to HK10. No GO to HK3.			
Note: The engine should be at operating temperature before running the self-test. • Clear the DTCs. • Carry out the KOER self-test. • Are DTCs P0010 or P0020 present?					
HK3	CARRY OUT A THOROUGH WIGGLE TEST ON THE VCT HARNESS	Yes For KOER DTC P0010, GO to HK4. For KOER DTC P0020, GO to HK10. No GO to Pinpoint Test Z.			
• Carry out a thorough wiggle test on the VCT harness. • Carry out the KOER self-test. • Are DTCs P0010 or P0020 present?					
HK4	CHECK THE VCT1 SOLENOID RESISTANCE	Yes GO to HK5. No INSTALL a new VCT1 solenoid. CLEAR the DTCs. REPEAT the self-test.			
• Key in OFF position. • VCT1 Solenoid connector disconnected. • Measure the resistance between: <table><tr><td>(+) VCT1 Solenoid Connector, Component Side</td><td>(-) VCT1 Solenoid Connector, Component Side</td></tr><tr><td>VCT1</td><td>VPWR</td></tr></table> • Is the resistance between 5 - 14 ohms?			(+) VCT1 Solenoid Connector, Component Side	(-) VCT1 Solenoid Connector, Component Side	VCT1
(+) VCT1 Solenoid Connector, Component Side	(-) VCT1 Solenoid Connector, Component Side				
VCT1	VPWR				
HK5	CHECK THE VCT1 SOLENOID FOR INTERNAL SHORTS	Yes GO to HK6. No INSTALL a new VCT1 solenoid. CLEAR the DTCs. REPEAT the self-test.			
• Measure the resistance between: <table><tr><td>(+) VCT1 Solenoid Connector, Component Side</td><td>(-)</td></tr><tr><td>VCT1</td><td>Ground</td></tr></table> • Is the resistance greater than 10K ohms?			(+) VCT1 Solenoid Connector, Component Side	(-)	VCT1
(+) VCT1 Solenoid Connector, Component Side	(-)				
VCT1	Ground				

Variable Camshaft Timing (VCT)

HK

Test Step		Results / Action to Take				
HK6	CHECK THE VPWR CIRCUIT FOR AN OPEN IN THE HARNESS - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) VCT1 Solenoid Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) VCT1 Solenoid Connector, Harness Side	(-)	VPWR	Ground	Yes GO to HK7. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) VCT1 Solenoid Connector, Harness Side	(-)					
VPWR	Ground					
HK7	CHECK THE VCT1 CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) VCT1 Solenoid Connector, Harness Side</td><td>(-)</td></tr><tr><td>VCT1</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) VCT1 Solenoid Connector, Harness Side	(-)	VCT1	Ground	Yes GO to HK8. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) VCT1 Solenoid Connector, Harness Side	(-)					
VCT1	Ground					
HK8	CHECK THE VCT1 CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) VCT1 Solenoid Connector, 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 Solenoid Connector, Harness Side	(-) PCM Connector, Harness Side	VCT1	VCT1	Yes GO to HK9. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) VCT1 Solenoid Connector, Harness Side	(-) PCM Connector, Harness Side					
VCT1	VCT1					
HK9	CHECK THE VCT1 CIRCUIT FOR A SHORT TO GND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) VCT1 Solenoid Connector, Harness Side</td><td>(-)</td></tr><tr><td>VCT1</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) VCT1 Solenoid Connector, Harness Side	(-)	VCT1	Ground	Yes GO to HK18. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) VCT1 Solenoid Connector, Harness Side	(-)					
VCT1	Ground					

Variable Camshaft Timing (VCT)

HK

Test Step		Results / Action to Take				
HK10	DTC P0020: CHECK THE VCT2 SOLENOID RESISTANCE - Key in OFF position. - VCT2 Solenoid connector disconnected. - Measure the resistance between:<table><tr><td>(+) VCT2 Solenoid Connector, Component Side</td><td>(-) VCT2 Solenoid Connector, Component Side</td></tr><tr><td>VCT2</td><td>VPWR</td></tr></table> - Is the resistance between 5 - 14 ohms?	(+) VCT2 Solenoid Connector, Component Side	(-) VCT2 Solenoid Connector, Component Side	VCT2	VPWR	Yes GO to HK11. No INSTALL a new VCT2 solenoid. CLEAR the DTCs. REPEAT the self-test.
(+) VCT2 Solenoid Connector, Component Side	(-) VCT2 Solenoid Connector, Component Side					
VCT2	VPWR					
HK11	CHECK THE VCT2 SOLENOID FOR INTERNAL SHORTS - Measure the resistance between:<table><tr><td>(+) VCT2 Solenoid Connector, Component Side</td><td>(-)</td></tr><tr><td>VCT2</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) VCT2 Solenoid Connector, Component Side	(-)	VCT2	Ground	Yes GO to HK12. No INSTALL a new VCT2 solenoid. CLEAR the DTCs. REPEAT the self-test.
(+) VCT2 Solenoid Connector, Component Side	(-)					
VCT2	Ground					
HK12	CHECK THE VPWR CIRCUIT FOR AN OPEN IN THE HARNESS - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) VCT2 Solenoid Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) VCT2 Solenoid Connector, Harness Side	(-)	VPWR	Ground	Yes GO to HK13. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) VCT2 Solenoid Connector, Harness Side	(-)					
VPWR	Ground					
HK13	CHECK THE VCT2 CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) VCT2 Solenoid Connector, Harness Side</td><td>(-)</td></tr><tr><td>VCT2</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) VCT2 Solenoid Connector, Harness Side	(-)	VCT2	Ground	Yes GO to HK14. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) VCT2 Solenoid Connector, Harness Side	(-)					
VCT2	Ground					

Variable Camshaft Timing (VCT)

HK

Test Step		Results / Action to Take			
HK14	CHECK THE VCT2 CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to HK15. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.			
	- Key in OFF position. - Measure the resistance between:<table><tr><td>(+) VCT2 Solenoid Connector, 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 Solenoid Connector, Harness Side	(-) PCM Connector, Harness Side	VCT2
(+) VCT2 Solenoid Connector, Harness Side	(-) PCM Connector, Harness Side				
VCT2	VCT2				
HK15	CHECK THE VCT2 CIRCUIT FOR A SHORT TO GND IN THE HARNESS	Yes GO to HK18. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.			
	- Measure the resistance between:<table><tr><td>(+) VCT2 Solenoid Connector, Harness Side</td><td>(-)</td></tr><tr><td>VCT2</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?		(+) VCT2 Solenoid Connector, Harness Side	(-)	VCT2
(+) VCT2 Solenoid Connector, Harness Side	(-)				
VCT2	Ground				
HK16	CONTINUOUS DTCS P0016, P0018 WITH OR WITHOUT P0011, P0012, P0021, P0022, P052A, P052B, P052C, P052D: CHECK THE FUNCTIONALITY OF THE VCT SYSTEM	Yes For a VCTADV PID value between -16 and -46 degrees (2.3L, 3.5L), -14 and -36 degrees (3.0L), or 24 and 73 degrees (4.6L 3V, 5.4L 3V) INSTALL a new VCT solenoid. CLEAR the DTCs. REPEAT the self-test. For all others, REFER to Engine, Timing Drive Components, to verify the engine timing. No Unable to duplicate or identify the concern at this time.			
	Note: On 4.6L 3V and 5.4L 3V engines, the VCTADV PID indicates a positive value. For all others, the VCTADV PID indicates a negative value. - Engine at normal operating temperature. - Clear the DTCs. - For DTC P0016. - Access the PCM and monitor the VCTADV PID. - For DTC P0018. - Access the PCM and monitor the VCTADV2 PID. - Run the engine at idle for 1 minute while monitoring the VCTADV (P0016) or VCTADV2 (P0018) PID. - Retrieve the continuous memory DTCs. - Are DTCs P0016 or P0018 present?				

Variable Camshaft Timing (VCT)

HK

Test Step		Results / Action to Take
HK17	CONTINUOUS DTCS P0011, P0012, P0021, P0022, P052A, P052B, P052C OR P052D: CHECK THE OPERATION OF THE VCT SYSTEM	Yes Unable to duplicate or identify the concern at this time. No INSTALL a new VCT solenoid. CLEAR the DTCS. REPEAT the self-test.
	Note: Some vehicles require higher RPMs and loads to actuate the VCT system than others. The VCTERR PID should be close to 0 whether actuating or not. During rapid VCT movements, the VCTERR PID may momentarily deviate from 0. - For DTCS P0011, P0012, P052A or P052B. - Access the PCM and monitor the VCTADV and VCTADVERR PIDs. - For DTCS P0021, P0022, P052C or P052D. - Access the PCM and monitor the VCTADV2 and VCTADVERR2 PIDs. - Drive the vehicle exercising the throttle to induce VCT movement. Does the VCTADV PID indicate VCT movement while the VCTERR PID maintain close to 0?	
HK18	CHECK FOR CORRECT PCM OPERATION	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.
	- 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?	

HK17-HK18

Test HM: Secondary Air Injection (AIR) System

PINPOINT TEST HM: SECONDARY AIR INJECTION (AIR) SYSTEM

Secondary Air Injection (AIR) System

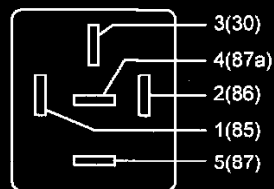
HM

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, AIR, AIRM, ground
- powertrain control module (PCM) (12A650)
- secondary air injection diverter valve (9F491)
- vacuum supply
- hoses
- partial restricted exhaust

Refer to the Vehicle/Diagrams for schematic and connector information.

Secondary AIR Relay Connector



A0077583

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

Description And Secondary AIR Relay Connector

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

A0077529

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

Powertrain Control Module (PCM) Connector

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

Connector	Pin	Circuit
140 Pin	B58 B66 B67 B33 B51 B50 B1	SIGRTN CASE GND PWRGND VREF VPWR AIRM AIR

Test Step		Results / Action to Take
HM1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTC)	Yes GO to HM2. No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
	Are DTCs P0410, P0412, P0491, P2257, P2258, or P2448 present?	

HM1

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take					
HM2	VISUALLY INSPECT THE SECONDARY AIR SYSTEM COMPONENTS AND HOSES - Visually inspect the secondary AIR system components, connectors and hoses for: — damaged hoses — obstructions — exhaust damage — restricted secondary AIR pump inlet — water or ice - Are the secondary AIR system components and hoses OK?	Yes GO to HM3. No REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.					
HM3	CHECK THE VPWR VOLTAGE TO THE SECONDARY AIR RELAY - Secondary AIR relay removed. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) Secondary AIR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 85</td><td>Ground</td></tr><tr><td>B+ - Pin 30</td><td>Ground</td></tr></table> - Are the voltages greater than 10 V?		(+) Secondary AIR Relay Connector, Harness Side	(-)	VPWR - Pin 85	Ground	B+ - Pin 30
(+) Secondary AIR Relay Connector, Harness Side	(-)						
VPWR - Pin 85	Ground						
B+ - Pin 30	Ground						
HM4	CHECK THE SECONDARY AIR RELAY - Key in OFF position. - Carry out the relay component test. - Does the relay pass the component test?	Yes GO to HM5. No INSTALL a new secondary AIR relay. CLEAR the DTCs. REPEAT the self-test.					
HM5	CHECK THE SECONDARY AIR PUMP GROUND CIRCUIT FOR AN OPEN IN THE HARNESS - Secondary AIR Pump Motor connector disconnected. - Measure the resistance between:<table><tr><td>(+) Secondary Air Pump 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?	(+) Secondary Air Pump Connector, Harness Side	(-)	AIR_GND - Pin 1	Ground	Yes GO to HM6. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.	
(+) Secondary Air Pump Connector, Harness Side	(-)						
AIR_GND - Pin 1	Ground						

Secondary Air Injection (AIR) System

HM

Test Step		Results / Action to Take						
HM6	CHECK THE SECONDARY AIR PUMP CIRCUIT(S) FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) Secondary AIR Relay Connector, Harness Side</td><td>(-) Secondary Air Pump 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?	(+) Secondary AIR Relay Connector, Harness Side	(-) Secondary Air Pump Connector, Harness Side	AIR_PWR - Pin 87	AIR_PWR - Pin 2	Yes GO to HM7. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) Secondary AIR Relay Connector, Harness Side	(-) Secondary Air Pump Connector, Harness Side							
AIR_PWR - Pin 87	AIR_PWR - Pin 2							
HM7	CHECK THE SECONDARY AIR CIRCUIT(S) FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Secondary AIR Relay Connector, Harness Side</td></tr><tr><td>AIR - Pin B1</td><td>AIR - Pin 86</td></tr><tr><td>AIRM - Pin B50</td><td>AIR_PWR - Pin 87</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) Secondary AIR Relay Connector, Harness Side	AIR - Pin B1	AIR - Pin 86	AIRM - Pin B50	AIR_PWR - Pin 87	Yes GO to HM8. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) Secondary AIR Relay Connector, Harness Side							
AIR - Pin B1	AIR - Pin 86							
AIRM - Pin B50	AIR_PWR - Pin 87							
HM8	CHECK THE SECONDARY AIR MONITOR CIRCUIT AND THE SECONDARY AIR PUMP VOLTAGE CIRCUIT FOR A SHORT TO GROUND - Measure the resistance between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>AIRM - Pin B50</td><td>Ground</td></tr><tr><td>AIR - Pin B1</td><td>Ground</td></tr></table> - Are the resistances greater than 10K ohms?	(+) PCM Connector, Harness Side	(-)	AIRM - Pin B50	Ground	AIR - Pin B1	Ground	Yes GO to HM9. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)							
AIRM - Pin B50	Ground							
AIR - Pin B1	Ground							
HM9	CHECK THE SECONDARY AIR MONITOR CIRCUIT AND THE SECONDARY AIR PUMP VOLTAGE CIRCUIT FOR A SHORT TO VOLTAGE - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>AIRM - Pin B50</td><td>Ground</td></tr><tr><td>AIR - Pin B1</td><td>Ground</td></tr></table> - Is any voltage present?	(+) PCM Connector, Harness Side	(-)	AIRM - Pin B50	Ground	AIR - Pin B1	Ground	Yes REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test. No GO to HM10.
(+) PCM Connector, Harness Side	(-)							
AIRM - Pin B50	Ground							
AIR - Pin B1	Ground							

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

Test Step		Results / Action to Take
HM10	MEASURE THE VACUUM AT THE SECONDARY AIR SOLENOID VALVE	
	 CAUTION: Running the secondary AIR pump with OTM longer than 2 minutes may overheat and damage the secondary AIR pump. Refer to Diagnostic Methods, {Output Test Mode}. • Key in OFF position. • Secondary AIR relay installed. • Secondary AIR Solenoid connector connected. • PCM connector connected. • Key ON, engine OFF. • Connect a vacuum gauge to the control vacuum outlet at the secondary AIR valve. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the outputs ON. • Observe the vacuum gauge reading at the secondary AIR valve. • Command the outputs OFF. • Exit output test mode. • Is vacuum present at the secondary AIR diverter valve?	Yes GO to HM11. No INSTALL a new secondary AIR valve. CLEAR the DTCs. REPEAT the self-test.
HM11	CHECK THE SECONDARY AIR PUMP OPERATION	
	• Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Disconnect the inlet hose from the secondary AIR valve. • Command the outputs ON. • Place your hand over the secondary AIR valve inlet hose. • Command the outputs OFF. • Exit output test mode. • Is there any air flow from the secondary AIR inlet valve hose?	Yes INSTALL a new secondary AIR valve. CLEAR the DTCs. REPEAT the self-test. No INSTALL a new secondary AIR pump. CLEAR the DTCs. REPEAT the self-test.

HM10-HM11

Test HU: Intake Air Systems

PINPOINT TEST HU: INTAKE AIR SYSTEMS

Intake Air Systems

HU

This pinpoint test is intended to diagnose the following:

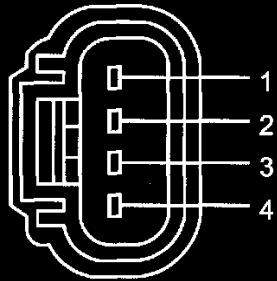
- accelerator cable linkage to throttle body (9C799)
- air cleaner assembly (including air cleaner element) (9600)
- air inlet tube (9F843)
- clean air tube hose and resonator (9R504) and (9F593)
- intake manifold runner control (IMRC) housing assembly (9U531), (9U524) and (9J447)
- IMRC actuator assembly (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

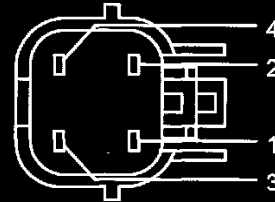
IMRCM Voltage Values

VEHICLE	IMRC OFF	IMRC ON
Focus, 2.0L	0	5
F-150 5.4L, Mark LT	5	0
All Others	2.5	0

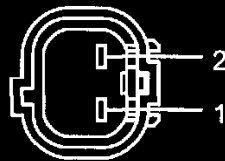
Description And Intake Air System

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

A0077580

B

A0077557

C

A0077562

Vehicle	Connector	Pin	Circuit
Expedition 5.4L, F-150 5.4L, F-Super Duty 5.4L, Mark LT 5.4L, Navigator 5.4L	A	4 3 2 1	IMRCM IMRC PWRGND VPWR
Explorer 4.6L, Explorer Sport Trac 4.6L, Mountaineer 4.6L, Mustang 4.6L	A	3 2 1	IMRC PWRGND VPWR
F-150 4.2L	B	4 1 2 3	IMRCM IMRC PWRGND VPWR

(Continued)

Intake Manifold Runner Control (IMRC) Actuator Connector

Intake Air Systems

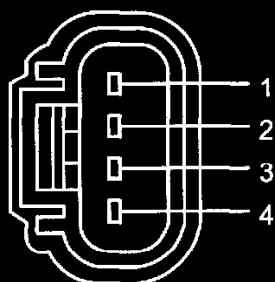
HU

Vehicle	Connector	Pin	Circuit
Focus	C	2 1	IMRC VPWR
Fusion 2.3L, Milan 2.3L	C	1 2	IMRC VPWR

Intake Manifold Runner Control Monitor (IMRCM) Sensor Connector

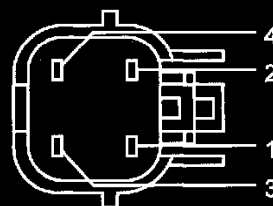
For most vehicles the IMRCM is integrated into the IMRC connector.

A



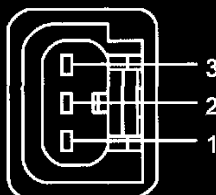
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B



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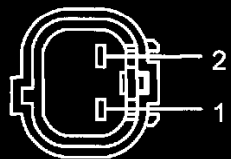
C



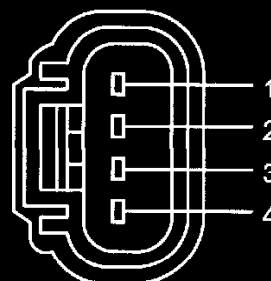
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Intake Air Systems**HU**

Vehicle	Connector	Pin	Circuit
Expedition 5.4L, F-150 5.4L, F-Super Duty 5.4L, Mark LT 5.4L, Navigator 5.4L	A	2 1 4	PWRGND VPWR IMRCM
F-150 4.2L	B	2 3 4	PWRGND VPWR IMRCM
Focus	C	2 3 1	PWRGND VPWR IMRCM
Fusion 2.3L, Milan 2.3L	C	1	IMRCM

Intake Manifold Tuning Valve (IMTV) Actuator Connector**A**

A0077562

B

A0077580

Vehicle	Connector	Pin	Circuit
Escape/Mariner 2.3L, Fusion 2.3L, Milan 2.3L	A	1 2	IMTV VPWR
F-Super Duty 6.8L	B	3 1	IMTV VPWR

Intake Air Systems**HU****Powertrain Control Module (PCM) Connector**

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

Vehicle	Connector	Pin	Circuit
Escape/Mariner	150 (50-50-50) Pin	E41 E6 B47	SIGRTN IMTV PWRGND
Expedition, Navigator	140 Pin	E58 B67 E43 E50	SIGRTN PWRGND IMRCM IMRC
F-150, Mark LT	190 Pin	E58 B67 E43 E50	SIGRTN PWRGND IMRCM IMRC
F-Super Duty 5.4L	170 Pin	E58 B47 E43 E50	SIGRTN PWRGND IMRCM IMRC
F-Super Duty 6.8L	170 Pin	E58 E64 B47	SIGRTN IMTV PWRGND
Focus	190 Pin	E64 B69 E25 E22	SIGRTN PWRGND IMRCM IMRC
Fusion, Milan	140 Pin	E58 E64 B67 E43 E50	SIGRTN IMTV PWRGND IMRCM IMRC
All other vehicles	170 Pin	E58 B47 E50	SIGRTN PWRGND IMRC

Powertrain Control Module (PCM) Connector

Intake Air Systems

HU

Test Step		Results / Action to Take
HU1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	
	Are DTCs P0660, P0663, P1512, P1513, P1516, P1517, P1518, P1519, P151A, P1520, P1537, P1538, P1549, P2004, P2005, P2006, P2007, P2008, P2014, P2015, P2019, P2020, P2070, or P2071 present?	Yes For DTCs P0660, P0663, P1549, P2070 or P2071, GO to HU42. For DTCs P1512, P1513, P1516, P1517, P1518, P1519, P1520, P1537, P1538, P2004, P2005, P2006, P2007, P2008, P2014, P2015, P2019 or P2020, GO to HU15. For DTC P151A, Mustang 4.6L, Explorer 4.6L, Explorer Sport Trac 4.6L, and Mountaineer 4.6L. GO to HU18. For DTC P151A, all others, GO to HU17. No For lack/loss of power, GO to HU42. For all other symptoms without DTCs, GO to HU2.
HU2	PART THROTTLE SYMPTOM	
	Are any part throttle concerns present?	Yes GO to HU7. No GO to HU3.
HU3	CHECK THE BASE IDLE SPEED	
	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 Reference Values, Typical Reference Value Charts, if necessary. - Access the PCM and monitor the RPM PID. - If equipped, read the vehicle tachometer. - Is vehicle idle speed correct?	Yes GO to HU5. No GO to HU4.
HU4	CHECK THE THROTTLE ARM CONTACTS	
	- Key in OFF position. - Check that the throttle arm contacts the return stop. - Is the idle speed high?	Yes GO to HU9. No GO to HU10.

Intake Air Systems

HU

Test Step		Results / Action to Take
HU5	CHECK FOR BINDING OR STICKING IN THE THROTTLE SYSTEM	
	- 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 and bind condition present?	Yes GO to HU6. No GO to HU7.
HU6	ISOLATE THE BINDING AND/OR STICKING CONCERN	
	 CAUTION: Do not attempt to clean the throttle bore and plate area. Cleaning damages 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?	Yes REPAIR the cable(s) causing the concern. CLEAR the DTCs. REPEAT the self-test. No INSTALL a new throttle body assembly. CLEAR the DTCs. REPEAT the self-test.
HU7	CHECK THE FUNCTIONALITY OF THE THROTTLE POSITION (TP) SENSOR	
	- Key ON, engine OFF. - Access the PCM and monitor the TP PID. - Gently cycle the throttle from fully closed to fully open and back to fully closed. - Does the TP PID display a smooth voltage reading?	Yes GO to HU8. No INSTALL a new TP sensor. CLEAR the DTCs. REPEAT the self-test.
HU8	CHECK THE INTAKE AIR SYSTEM FOR LEAKS, OBSTRUCTIONS AND DAMAGE	
	Note: The Focus air cleaner element is integral to the air cleaner assembly. Inspect the air restriction gauge (if equipped) for a restriction indication. - Key in OFF position. - 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?	Yes REMOVE the restriction. INSTALL a new air cleaner element. CLEAR the DTCs. REPEAT the self-test. No REINSTALL the air cleaner element. GO to HU9.

Intake Air Systems**HU**

Test Step		Results / Action to Take
HU9	CHECK THE POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM	Yes INSTALL a new PCV valve. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No For high idle, GO to HU13 . For all others, CONNECT the PCV valve. GO to HU10 .
	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?	
HU10	CHECK THE IDLE AIR CONTROL (IAC) VALVE RESPONSE	Yes GO to HU12 . No GO to HU11 .
	• Key ON, engine running. • The vehicle must be at operating temperature and at idle for a minimum of 1 minute. • IAC connector disconnected. • Does the RPM drop or the engine stall?	
HU11	CHECK THE IAC VALVE RESPONSE	Yes GO to HU13 . No INSTALL a new IAC. CLEAR the DTCs. REPEAT the self-test.
	• Is the idle speed high?	
HU12	INSPECT THE THROTTLE BODY PLATE HOLE FOR PLUGGING	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No The concern is elsewhere. RETURN to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index to diagnose performance while driving concerns.
	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?	

Intake Air Systems

HU

Test Step		Results / Action to Take
HU13	CHECK FOR VACUUM LEAKS	
	- Listen for vacuum leaks. - Inspect the entire intake air system from the mass air flow (MAF) sensor to the intake manifold for leaks such as: - cracked or punctured inlet air tube - loose connections on the inlet air tube at the air cleaner housing or throttle body - 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 REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to HU14.
HU14	CHECK THE THROTTLE BODY FOR EXCESSIVE WEAR	
	- Key in OFF position. - Remove the throttle body assembly. - 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?	Yes INSTALL a new throttle body assembly. CLEAR the DTCs. REPEAT the self-test. No The concern is elsewhere. RETURN to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index to diagnose performance while driving concerns.
HU15	DTCs P1512, P1513, P1516, P1517, P1518, P1519, P1520, P1537, P1538, P2004, P2005, P2006, P2007, P2008, P2014, P2015, P2019 OR P2020: VISUAL INSPECTION	
	Note: If unable to fully carry out the following inspections, answer NO to the question in this step. Note: The IMRC return spring is strong on vacuum systems. Make sure the vacuum system operates correctly 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. - 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. - Manually open and close the IMRC plates at the intake manifold while checking for sticking or binding. Is a mechanical concern present?	Yes GO to HU16. No For Explorer 4.6L, Explorer Sport Trac 4.6L, Mountaineer 4.6L, and Mustang 4.6L, GO to HU18. For all others, GO to HU17.

Intake Air Systems

HU

Test Step		Results / Action to Take												
HU16	CHECK THE IMRC FOR MECHANICAL OPERATION Note: The IMRC return spring is strong - approximately 0.34 to 0.45 Nm (3 to 4 in-lb). Note: Some electric motor applications do not use a return spring and should move freely when open and closed. • Disconnect the IMRC linkage or remove the actuator assembly from the manifold. • 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?	Yes REPAIR as necessary or INSTALL a new IMRC. CLEAR the DTCs. REPEAT the self-test. No CONNECT the IMRC linkage. For Explorer 4.6L, Explorer Sport Trac 4.6L, Mountaineer 4.6L, and Mustang 4.6L, GO to HU18 . For all others, GO to HU17 .												
HU17	DTC P151A: CHECK THE FUNCTIONALITY OF THE IMRC  WARNING: Keep fingers clear of the mechanism. Failure to follow these instructions may result in personal injury. Note: The vehicle must be at operating temperature and at idle for a minimum of 1 minute. Note: If the vehicle is equipped with a vacuum-type IMRC, return to Key ON, engine running to conduct the IMRC check. Momentarily increase the engine speed above 3,000 RPM and observe the PIDs. • Key ON, engine running. • Key ON, engine OFF. • Access the PCM and control the IMRC PID. • Access the PCM and monitor the IMRCM PID. • Command IMRC ON then OFF. IMRCM Voltage Values <table border="1"> <thead> <tr> <th>VEHICLE</th><th>IMRC OFF</th><th>IMRC ON</th></tr> </thead> <tbody> <tr> <td>Focus, 2.0L</td><td>0</td><td>5</td></tr> <tr> <td>F-150 5.4L, Mark LT</td><td>5</td><td>0</td></tr> <tr> <td>All Others</td><td>2.5</td><td>0</td></tr> </tbody> </table> • Using the table for reference, do the IMRCM voltage values correctly change while the IMRC is cycled?	VEHICLE	IMRC OFF	IMRC ON	Focus, 2.0L	0	5	F-150 5.4L, Mark LT	5	0	All Others	2.5	0	Yes GO to Pinpoint Test Z. No GO to HU19 .
VEHICLE	IMRC OFF	IMRC ON												
Focus, 2.0L	0	5												
F-150 5.4L, Mark LT	5	0												
All Others	2.5	0												

Intake Air Systems

HU

Test Step		Results / Action to Take			
HU18	CHECK THE FUNCTIONALITY OF BI-DIRECTIONAL IMRC	Yes GO to Pinpoint Test Z. No GO to HU19.			
 WARNING: Keep fingers clear of the mechanism. Failure to follow these instructions may result in personal injury. Note: The vehicle must be at operating temperature and at idle for a minimum of 1 minute. • Key ON, engine running. • Key ON, engine OFF. • Access the PCM and control the IMRC PID. • Access the PCM and monitor the IMRC_F PID. • Command IMRC ON then OFF. • Do the IMRC values correctly change from off to on while the IMRC is cycled and is the IMRCF PID no?					
HU19	CHECK THE FUNCTIONALITY OF THE IMRC	Yes GO to HU28. No GO to HU20.			
 WARNING: Keep fingers clear of the mechanism. Failure to follow these instructions may result in personal injury. Note: The vehicle must be at operating temperature and at idle for a minimum of 1 minute. Note: If the vehicle is equipped with a vacuum-type IMRC, return to Key ON, engine running to conduct the IMRC check. Momentarily increase the engine speed above 3,000 RPM and observe the PIDs. • Key ON, engine running. • Key ON, engine OFF. • Physically monitor the IMRC actuator. • Access the PCM and control the IMRC PID. • Command the outputs ON. • Do the IMRC levers cycle from fully closed and remain fully open while the outputs are on?					
HU20	CHECK THE VPWR CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to HU21. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.			
• Key in OFF position. • IMRC Actuator connector disconnected. • Key ON, engine OFF. • Measure the voltage between: <table border="1"><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 V?			(+) IMRC Actuator Con- nector, Harness Side	(-)	VPWR
(+) IMRC Actuator Con- nector, Harness Side	(-)				
VPWR	Ground				

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HU

Test Step		Results / Action to Take				
HU21	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 V?	(+) IMRC Actuator Con- nector, Harness Side	(-) IMRC Actuator Con- nector, Harness Side	VPWR	PWRGND	Yes GO to HU22. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) IMRC Actuator Con- nector, Harness Side	(-) IMRC Actuator Con- nector, Harness Side					
VPWR	PWRGND					
HU22	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 GO to HU27. No GO to HU23.
(+) IMRC Actuator Con- nector, Harness Side	(-) IMRC Actuator Con- nector, Harness Side					
VPWR	IMRC					
HU23	VERIFY THE DRIVER CIRCUIT FUNCTION WHILE COMMANDING ON IMRC Note: If the vehicle is equipped with a vacuum-type IMRC, return to Key ON, engine running to conduct the IMRC check. Momentarily increase the engine speed above 3,000 RPM and observe the PIDs. - 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. If the vehicle is equipped with a vacuum-type IMRC, return to Key ON, engine running 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	Yes GO to HU26. No GO to HU24.
(+) IMRC Actuator Con- nector, Harness Side	(-) IMRC Actuator Con- nector, Harness Side					
VPWR	IMRC					
HU24	CHECK THE IMRC CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) IMRC Actuator Con- nector, 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 Con- nector, Harness Side	(-) PCM Connector, Harness Side	IMRC	IMRC	Yes GO to HU25. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) IMRC Actuator Con- nector, Harness Side	(-) PCM Connector, Harness Side					
IMRC	IMRC					

Intake Air Systems

HU

Test Step		Results / Action to Take						
HU25	CHECK THE IMRC CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS - Key ON, engine OFF. - 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 V?	(+) IMRC Actuator Connector, Harness Side	(-)	IMRC	Ground	Yes GO to HU51. No REPAIR the short circuit to voltage. CLEAR the DTCs. REPEAT the self-test.		
(+) IMRC Actuator Connector, Harness Side	(-)							
IMRC	Ground							
HU26	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. CLEAR the DTCs. REPEAT the self-test. No GO to HU27.
(+) IMRC Actuator Connector, Harness Side	(-) IMRC Actuator Connector, Harness Side							
IMRC	IMRCM							
IMRC	PWRGND							
HU27	CHECK FOR SHORTS BETWEEN CIRCUITS IN THE IMRC HARNESS - PCM connector disconnected. - 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 GO to HU51. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. GO to HU41.
(+) IMRC Actuator Connector, Harness Side	(-) IMRC Actuator Connector, Harness Side							
IMRC	IMRCM							
IMRC	PWRGND							
HU28	CHECK THE IMRCM PID - Key ON, engine OFF. - Access the PCM and monitor the IMRCM PID. - Is the IMRCM PID displaying either VREF or approximately 2.5 volts?	Yes GO to HU29. No GO to HU33.						

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HU

Test Step		Results / Action to Take				
HU29	CHECK THE IMRCM CIRCUIT FOR A SHORT TO VPWR Note: The vehicle must be at operating temperature and at idle for a minimum of 1 minute. • Key ON, engine running. • Key ON, engine OFF. • Access the PCM and control the IMRC PID. • Command the outputs ON. If the vehicle is equipped with a vacuum-type IMRC, return to Key ON, engine running 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 GO to HU35. No GO to HU35.				
HU30	CHECK THE IMRCM CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS • Key ON, engine OFF. • 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 V?	(+) IMRCM Sensor Connector, Harness Side	(-)	IMRCM	Ground	Yes GO to HU31. No GO to HU32.
(+) IMRCM Sensor Connector, Harness Side	(-)					
IMRCM	Ground					
HU31	CHECK THE IMRCM CIRCUIT FOR A SHORT TO VOLTAGE IN THE CONTROL MODULE • PCM connector disconnected. • Key ON, engine OFF. • 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 V?	(+) IMRCM Sensor Connector, Harness Side	(-)	IMRCM	Ground	Yes REPAIR the short circuit to voltage CLEAR the DTCs. REPEAT the self-test. No GO to HU51.
(+) IMRCM Sensor Connector, Harness Side	(-)					
IMRCM	Ground					
HU32	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 Pinpoint Test Z. No INSTALL a new IMRCM sensor. CLEAR the DTCs. REPEAT the self-test. GO to HU41.
(+) IMRCM Sensor Connector, Component Side	(-) IMRCM Sensor Connector, Component Side					
IMRCM	VPWR					

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HU

Test Step		Results / Action to Take				
HU33	CHECK THE IMRCM CIRCUIT FOR A SHORT TO GROUND • Key ON, engine OFF. • Access the PCM and monitor the IMRCM PID. • IMRCM Sensor connector disconnected. • Does voltage change from less than 1 volt to VREF when disconnecting the IMRCM harness connector?	Yes INSTALL a new IMRCM sensor. CLEAR the DTCs. REPEAT the self-test. GO to HU41. No GO to HU34.				
HU34	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 GO to HU51. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. GO to HU41.
(+) IMRCM Sensor Connector, Harness Side	(-) IMRCM Sensor Connector, Harness Side					
IMRCM	PWRGND					
HU35	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> • Does voltage change from less than 1 volt to VREF when disconnecting the IMRCM harness connector?	Point A IMRCM Sensor Connector, Harness Side	Point B	IMRCM	Ground	Yes GO to HU36. No GO to HU39.
Point A IMRCM Sensor Connector, Harness Side	Point B					
IMRCM	Ground					
HU36	CHECK THE PWRGND CIRCUIT FOR CONTINUITY TO CHASSIS GND • Key in OFF position. • 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 HU37. No GO to HU38.
(+) IMRCM Sensor Connector, Harness Side	(-) Vehicle Battery					
PWRGND	Negative terminal					

Intake Air Systems**HU**

Test Step		Results / Action to Take				
HU37	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. CLEAR the DTCs. REPEAT the self-test. GO to HU41. No INSTALL a new IMRCM sensor. CLEAR the DTCs. REPEAT the self-test. GO to HU41.
(+) IMRCM Sensor Connector, Harness Side	(-) PCM Connector, Harness Side					
IMRCM	IMRCM					
HU38	CHECK THE 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 Pinpoint Test Z. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test. GO to HU41.
(+) IMRCM Sensor Connector, Harness Side	(-) PCM Connector, Harness Side					
PWRGND	PWRGND					
HU39	CHECK THE IMRCM CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - 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	Yes GO to HU40. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test. GO to HU41.
(+) IMRCM Sensor Connector, Harness Side	(-) PCM Connector, Harness Side					
IMRCM	IMRCM					

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HU

Test Step		Results / Action to Take				
HU40	CHECK THE MONITOR CIRCUIT FOR AN INTERMITTENT OPEN - 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. CLEAR the DTCs. REPEAT the self-test. GO to HU41. No GO to HU51.
(+) IMRCM Sensor Connector, Harness Side	(-) PCM Connector, Harness Side					
IMRCM	IMRCM					
HU41	VERIFY THE REPAIR - Key ON, engine OFF. - Clear the PCM DTCs. - Access the PCM and monitor the IMRCM, IMRC_F and IMRC PIDs. - Key ON, engine running. - Drive the vehicle, obeying all traffic and safety laws. - Safely carry out 3 acceleration runs from a stop or roll to between 3,000 and 4,000 RPM. - Watch for any PID change. - Carry out the PCM self-test. - Are any DTCs received?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No The test completed successfully.				
HU42	DTCS P0660, P0663, P1549, P2070 OR P2071: VISUAL INSPECTION OF INTAKE MANIFOLD TUNING VALVE - Inspect the component for signs of damage. - Check the harness and connection. - Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to HU43.				
HU43	CHECK THE VPWR CIRCUIT FOR AN OPEN IN THE HARNESS - IMTV Actuator connector disconnected. - Key ON, engine OFF. - 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 HU44. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) IMTV Actuator Connector, Harness Side	(-) Vehicle Battery					
VPWR	Negative terminal					

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HU

Test Step		Results / Action to Take				
HU44	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 HU45. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) IMTV Actuator Connector, Harness Side	(-) PCM Connector, Harness Side					
IMTV	IMTV					
HU45	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 HU46. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
IMTV	Ground					
HU46	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 HU47. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
IMTV	Ground					
HU47	CHECK THE IMTV DRIVER CIRCUIT WITH THE PCM CONNECTED - IMTV Actuator connector disconnected. - PCM connector connected. - Key ON, engine OFF. - Connect a non-powered test lamp between:<table><tr><td>(+) IMTV Actuator Connector, Harness Side</td><td>(-) IMTV Actuator Connector, Harness Side</td></tr><tr><td>VPWR</td><td>IMTV</td></tr></table> - Does the test lamp illuminate?	(+) IMTV Actuator Connector, Harness Side	(-) IMTV Actuator Connector, Harness Side	VPWR	IMTV	Yes GO to HU51. No GO to HU48.
(+) IMTV Actuator Connector, Harness Side	(-) IMTV Actuator Connector, Harness Side					
VPWR	IMTV					

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HU

Test Step		Results / Action to Take				
HU48	CHECK THE IMTV PCM DRIVER CIRCUIT WHEN COMMANDED ON - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Connect a non-powered test lamp between:<table><tr><td>(+) IMTV Actuator Connector, Harness Side</td><td>(-) IMTV Actuator Connector, Harness Side</td></tr><tr><td>VPWR</td><td>IMTV</td></tr></table> - Command the outputs ON. Does the test lamp illuminate?	(+) IMTV Actuator Connector, Harness Side	(-) IMTV Actuator Connector, Harness Side	VPWR	IMTV	Yes GO to HU49. No GO to HU51.
(+) IMTV Actuator Connector, Harness Side	(-) IMTV Actuator Connector, Harness Side					
VPWR	IMTV					
HU49	CHECK THE IMTV FOR DAMAGE - Key in OFF position. - Remove the IMTV. - Visually inspect the shutter for damage. - Manually rotate the shutter. Is a concern present?	Yes INSTALL a new IMTV actuator. CLEAR the DTCs. REPEAT the self-test. No GO to HU50.				
HU50	CHECK THE IMTV FOR FUNCTIONALITY WHEN COMMANDED ON - IMTV Actuator connector connected. - Key ON, engine OFF. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. Does the IMTV shutter rotate?	Yes The concern is an intermittent. GO to Pinpoint Test Z. No INSTALL a new IMTV actuator. CLEAR the DTCs. REPEAT the self-test.				

Intake Air Systems**HU**

Test Step		Results / Action to Take
HU51	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

HU51**Test HV: Cooling Fan Clutch****PINPOINT TEST HV: COOLING FAN CLUTCH**

Cooling Fan Clutch

HV

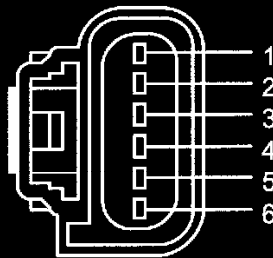
⚠ WARNING: To avoid the possibility of personal injury or damage to the vehicle, do not operate the engine until the fan blade has been first examined for possible cracks and separation. Failure to follow these instructions may result in personal injury or death.

Note: Before starting this pinpoint test, turn the clutch fan assembly by hand and check for mechanical binding around the fan shroud or surrounding components. If binding is present, correct the problem then continue with the pinpoint test. If no binding is present, start the engine and warm up to normal operating temperature then continue with the pinpoint test.

This pinpoint test is intended to diagnose the following:

- cooling fan clutch
- harness circuits: fan speed sensor (FSS), FSS PWRGND, FSS VPWR, fan control variable (FCV), and FCV VPWR
- powertrain control module (PCM) (12A650)

Cooling Fan Clutch Connector



A0077520

Pin	Circuit
4	FSS (Fan Speed Sensor)
5	PWRGND (Power Ground)
2	VBPWR (Vehicle Buffered Power)
3	VPWR (Vehicle Power)
6	FCV (Fan Control Variable)

Warning, Note And Cooling Fan Clutch Connector

Cooling Fan Clutch**HV****Powertrain Control Module (PCM) Connector**

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

Vehicle	Pin	Circuit
Expedition, Navigator	B51, B52, B53 B45 B67, B68, B69, B70 B20 B48	VPWR FSS PWRGND VBPWR FCV
F-150	B51, B52, B53 E24 B67, B68, B69, B70 B20 B48	VPWR FSS PWRGND VBPWR FCV
All other vehicles	B35, B36 E24 B47, B48, B49, B50 E20 E7	VPWR FSS PWRGND VBPWR FCV

Test Step		Results / Action to Take
HV1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs) Are DTCs P0480, P0483 or P0528 present?	Yes For KOEO and KOER DTC P0480, GO to HV4 . For KOEO and KOER DTCs P0483 or P0528, GO to HV2 . For continuous memory DTCs P0480 or P0528, GO to HV10 . No GO to HV2 .
HV2	CHECK THE COOLING FAN CLUTCH FOR MECHANICAL BINDING Note: The cooling fan clutch uses a viscous coupling. The viscous drag should be smooth during fan rotation. The amount of resistance is dependant upon the final cooling fan operational state before engine shutdown. - Key in OFF position. - Manually rotate the cooling fan. - Does the cooling fan clutch rotation feel rough or binding?	Yes INSTALL a new cooling fan clutch. CLEAR the DTCs. REPEAT the self-test. No GO to HV3 .

Cooling Fan Clutch

HV

Test Step		Results / Action to Take				
HV3	CHECK THE COOLING FAN CLUTCH OPERATION • Key ON, engine running. • Set the heater controls to OFF. • Access the PCM and monitor the FANSS PID. • Does the FANSS PID indicate any RPM?	Yes GO to HV4. No GO to HV11.				
HV4	KOEO AND KOER DTC P0480: CHECK THE COOLING FAN CLUTCH ACTUATOR VALVE SOLENOID RESISTANCE Note: If necessary, install terminal adapters on the component side pins to carry out the resistance measurement. • Key in OFF position. • Cooling Fan Clutch connector disconnected. • Measure the resistance between: <table><tr><td>(+) Cooling Fan Clutch Connector, Component Side</td><td>(-) Cooling Fan Clutch Connector, Component Side</td></tr><tr><td>FCV - Pin 6</td><td>VPWR - Pin 3</td></tr></table> • Is the resistance between 6 - 12 ohms?	(+) Cooling Fan Clutch Connector, Component Side	(-) Cooling Fan Clutch Connector, Component Side	FCV - Pin 6	VPWR - Pin 3	Yes GO to HV5. No INSTALL a new cooling fan clutch. CLEAR the DTCs. REPEAT the self-test.
(+) Cooling Fan Clutch Connector, Component Side	(-) Cooling Fan Clutch Connector, Component Side					
FCV - Pin 6	VPWR - Pin 3					
HV5	CHECK THE COOLING FAN CLUTCH ACTUATOR VALVE SOLENOID RESISTANCE • Measure the resistance between: <table><tr><td>(+) Cooling Fan Clutch Connector, Component Side</td><td>(-)</td></tr><tr><td>FCV - Pin 6</td><td>Ground</td></tr></table> • Is the resistance greater than 10K ohms?	(+) Cooling Fan Clutch Connector, Component Side	(-)	FCV - Pin 6	Ground	Yes GO to HV6. No INSTALL a new cooling fan clutch. CLEAR the DTCs. REPEAT the self-test.
(+) Cooling Fan Clutch Connector, Component Side	(-)					
FCV - Pin 6	Ground					
HV6	CHECK THE VPWR VOLTAGE TO THE COOLING FAN CLUTCH ACTUATOR VALVE SOLENOID • Key ON, engine OFF. • Measure the voltage between: <table><tr><td>(+) Cooling Fan Clutch Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR - Pin 3</td><td>Ground</td></tr></table> • Is the voltage greater than 10 V?	(+) Cooling Fan Clutch Connector, Harness Side	(-)	VPWR - Pin 3	Ground	Yes GO to HV7. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Cooling Fan Clutch Connector, Harness Side	(-)					
VPWR - Pin 3	Ground					

Cooling Fan Clutch

HV

Test Step		Results / Action to Take				
HV7	CHECK THE FCV CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) Cooling Fan Clutch Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FCV - Pin 6</td><td>FCV</td></tr></table> - Is the resistance less than 5 ohms?	(+) Cooling Fan Clutch Connector, Harness Side	(-) PCM Connector, Harness Side	FCV - Pin 6	FCV	Yes GO to HV8. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Cooling Fan Clutch Connector, Harness Side	(-) PCM Connector, Harness Side					
FCV - Pin 6	FCV					
HV8	CHECK THE FCV CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) Cooling Fan Clutch Connector, Harness Side</td><td>(-)</td></tr><tr><td>FCV - Pin 6</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) Cooling Fan Clutch Connector, Harness Side	(-)	FCV - Pin 6	Ground	Yes GO to HV9. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Cooling Fan Clutch Connector, Harness Side	(-)					
FCV - Pin 6	Ground					
HV9	CHECK THE FCV CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) Cooling Fan Clutch Connector, Harness Side</td><td>(-)</td></tr><tr><td>FCV - Pin 6</td><td>Ground</td></tr></table> - Is any voltage present?	(+) Cooling Fan Clutch Connector, Harness Side	(-)	FCV - Pin 6	Ground	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to HV19.
(+) Cooling Fan Clutch Connector, Harness Side	(-)					
FCV - Pin 6	Ground					
HV10	CONTINUOUS MEMORY DTCs P0480 OR P0528: INTERMITTENT CHECK Note: Keep the coil arm of the cooling fan clutch secure while checking the wiring harness. If the coil arm rotates, faulty readings may occur. - Key ON, engine OFF. - Access the PCM and monitor the FANSS and FANVAR_F PIDs. - While observing the PID wiggle, shake, and bend small sections of the wiring harness while working from the cooling fan clutch to the PCM. - Check the cooling fan clutch and the PCM connectors for damage and corrosion. - Is a concern present?	Yes ISOLATE the concern and REPAIR as necessary. No DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.				

Cooling Fan Clutch

HV

Test Step		Results / Action to Take				
HV11	KOEO AND KOER DTC P0528: CHECK THE VOLTAGE AND GROUND TO THE FSS SENSOR - Cooling Fan Clutch connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) Cooling Fan Clutch Connector, Harness Side</td><td>(-) Cooling Fan Clutch Connector, Harness Side</td></tr><tr><td>VBPWR - Pin 2</td><td>PWRGND - Pin 5</td></tr></table> - Is the voltage greater than 10 V?	(+) Cooling Fan Clutch Connector, Harness Side	(-) Cooling Fan Clutch Connector, Harness Side	VBPWR - Pin 2	PWRGND - Pin 5	Yes GO to HV15. No GO to HV12.
(+) Cooling Fan Clutch Connector, Harness Side	(-) Cooling Fan Clutch Connector, Harness Side					
VBPWR - Pin 2	PWRGND - Pin 5					
HV12	CHECK THE VOLTAGE TO THE FSS SENSOR - Measure the voltage between:<table><tr><td>(+) Cooling Fan Clutch Connector, Harness Side</td><td>(-)</td></tr><tr><td>VBPWR - Pin 2</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) Cooling Fan Clutch Connector, Harness Side	(-)	VBPWR - Pin 2	Ground	Yes GO to HV14. No GO to HV13.
(+) Cooling Fan Clutch Connector, Harness Side	(-)					
VBPWR - Pin 2	Ground					
HV13	CHECK THE VOLTAGE CIRCUIT TO THE FSS SENSOR FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) Cooling Fan Clutch Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>VBPWR - Pin 2</td><td>VBPWR</td></tr></table> - Is the resistance less than 5 ohms?	(+) Cooling Fan Clutch Connector, Harness Side	(-) PCM Connector, Harness Side	VBPWR - Pin 2	VBPWR	Yes GO to HV19. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Cooling Fan Clutch Connector, Harness Side	(-) PCM Connector, Harness Side					
VBPWR - Pin 2	VBPWR					
HV14	CHECK THE GROUND CIRCUIT TO THE FSS SENSOR FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) Cooling Fan Clutch Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>PWRGND - Pin 5</td><td>PWRGND</td></tr></table> - Is the resistance less than 5 ohms?	(+) Cooling Fan Clutch Connector, Harness Side	(-) PCM Connector, Harness Side	PWRGND - Pin 5	PWRGND	Yes GO to HV19. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Cooling Fan Clutch Connector, Harness Side	(-) PCM Connector, Harness Side					
PWRGND - Pin 5	PWRGND					

Cooling Fan Clutch

HV

Test Step		Results / Action to Take				
HV15	CHECK THE FSS CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) Cooling Fan Clutch Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FSS - Pin 4</td><td>FSS</td></tr></table> - Is the resistance less than 5 ohms?	(+) Cooling Fan Clutch Connector, Harness Side	(-) PCM Connector, Harness Side	FSS - Pin 4	FSS	Yes GO to HV16. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Cooling Fan Clutch Connector, Harness Side	(-) PCM Connector, Harness Side					
FSS - Pin 4	FSS					
HV16	CHECK THE FSS CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) Cooling Fan Clutch Connector, Harness Side</td><td>(-)</td></tr><tr><td>FSS - Pin 4</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) Cooling Fan Clutch Connector, Harness Side	(-)	FSS - Pin 4	Ground	Yes GO to HV17. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Cooling Fan Clutch Connector, Harness Side	(-)					
FSS - Pin 4	Ground					
HV17	CHECK THE FSS CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) Cooling Fan Clutch Connector, Harness Side</td><td>(-)</td></tr><tr><td>FSS - Pin 4</td><td>Ground</td></tr></table> - Is any voltage present?	(+) Cooling Fan Clutch Connector, Harness Side	(-)	FSS - Pin 4	Ground	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to HV18.
(+) Cooling Fan Clutch Connector, Harness Side	(-)					
FSS - Pin 4	Ground					
HV18	CHECK THE FUNCTIONALITY OF THE FSS CIRCUIT - Key in OFF position. - PCM connector connected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) Cooling Fan Clutch Connector, Harness Side</td><td>(-)</td></tr><tr><td>FSS - Pin 4</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) Cooling Fan Clutch Connector, Harness Side	(-)	FSS - Pin 4	Ground	Yes INSTALL a new cooling fan clutch. CLEAR the DTCs. REPEAT the self-test. No GO to HV19.
(+) Cooling Fan Clutch Connector, Harness Side	(-)					
FSS - Pin 4	Ground					

Cooling Fan Clutch**HV**

Test Step		Results / Action to Take
HV19	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

HV19

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

Evaporative Emission (EVAP) System and Monitor

HX

 **WARNING:** Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.

 **WARNING:** Before repairing or installing a new component in the fuel system, reduce the possibility of injury or fire by following the warning, caution, and handling directions in pinpoint test HC. Failure to follow these instructions may result in personal injury.

Note: Use this pinpoint test only when directed here.

The use of a soap solution around the fuel filler cap or capless fuel tank filler pipe (if equipped) 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 On Board Diagnostic (OBD) (including the ultrasonic 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.

When using the smoke machine, the fuel level in the fuel tank must be less than 85% full.

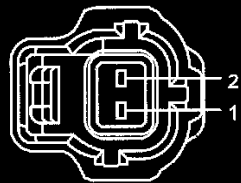
This pinpoint test is intended to diagnose the following:

- canister vent (CV) solenoid (9F945)
- fuel filler cap (9030)
- capless fuel tank filler pipe (9034)
- 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, FTP, FTPREF, SIGRTN, VPWR, VREF and CASE GND
- powertrain control module (PCM) (12A650)

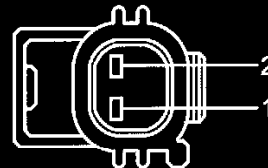
For additional information on the EVAP system, refer to Description and Operation, Evaporative Emission (EVAP) Systems, Evaporative Emissions.

Canister Vent (CV) Solenoid Connector

For applications that use the engine off natural vacuum (EONV) EVAP leak check monitor, KAPWR provides voltage to the CV solenoid instead of VPWR.

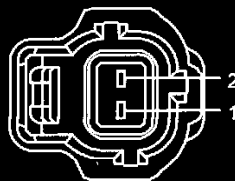
**Evaporative Emission (EVAP) System
and Monitor****HX****A**

A0077547

B

A0077524

Vehicle	Connector	Pin	Circuit
Escape/Mariner, Explorer, Explorer Sport Trac, Mountaineer	A	2 1	KAPWR CANV
Mustang	B	2 1	CANV VPWR
All other vehicles	A	1 2	KAPWR CANV

EVAP Canister Purge (EVAPCP) Valve Connector

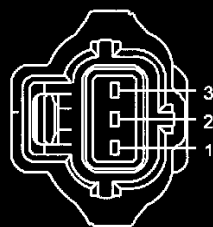
A0077550

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

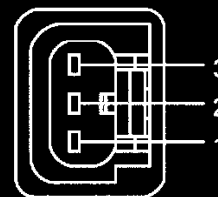
Canister Vent (CV) Solenoid Connector And EVAP Canister Purge (EVAPCP) Valve Connector

**Evaporative Emission (EVAP) System
and Monitor****HX****Fuel Tank Pressure (FTP) Sensor Connector**

For applications that use the engine off natural vacuum (EONV) EVAP leak check monitor, FTPREF provides voltage to the FTP sensor instead of VREF.

A

A0077554

B

A0077573

Vehicle	Connector	Pin	Circuit
E-Series tank design, F-Super Duty tank design	A	3 1 2	FTP FTPREF SIGRTN
Mustang	B	3 2 1	FTP SIGRTN VREF
All other vehicles	B	3 1 2	FTP FTPREF SIGRTN

Powertrain Control Module (PCM) Connector

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

Fuel Tank Pressure (FTP) Sensor Connector And Powertrain Control Module (PCM) Connector

Evaporative Emission (EVAP) System and Monitor

HX

Vehicle	Connector	Pin	Circuit
E-Series, F-Super Duty	170 Pin	B13 B3 B40 B41 B40 E1	CANV FTP FTPREF SIGRTN VREF EVAPCP
Edge, MKX, Sable, Taurus, Taurus X	190 Pin	B61 B44 B29 B58 B29, B64 B50	CANV FTP FTPREF SIGRTN VREF EVAPCP
Escape/Mariner	150 (50-50-50) Pin	B13 B9 B40 B41 B40 B34	CANV FTP FTPREF SIGRTN VREF EVAPCP
Expedition, Navigator	140 Pin	B61 B44 B29 B58 E57 B50	CANV FTP FTPREF SIGRTN VREF EVAPCP
F-150, Mark LT	190 Pin	B61 B44 B65 B58 B29 B50	CANV FTP FTPREF SIGRTN VREF EVAPCP
Focus	190 Pin	B20 B65 B66 B58 B52, B66 B55	CANV FTP FTPREF SIGRTN VREF EVAPCP
Fusion, Milan, MKZ	140 Pin	B61 B44 B29 B58 B33 B4	CANV FTP FTPREF SIGRTN VREF EVAPCP
Mustang	170 Pin	B13 B3 B41 B40 E6	CANV FTP SIGRTN VREF EVAPCP
All other vehicles	170 Pin	B13 B3 B40 B41 B40 E6	CANV FTP FTPREF SIGRTN VREF EVAPCP

Powertrain Control Module (PCM) Connector Continued

Evaporative Emission (EVAP) System and Monitor

HX

Test Step		Results / Action to Take				
HX1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs) Are DTCs P0442, P0443, P0446, P0451, P0452, P0453, P0455, P0456, P0457, P0460, P0461, P0462, P0463, P1443, P144A, P1450, P1451, or P260F present?	Yes For DTCs P0442 or P0456, GO to HX46. For DTC P0443, GO to HX2. For DTCs P0446 or P1451, GO to HX30. For DTC P0451, GO to HX39. For DTC P0452, GO to HX18. For DTC P0453, GO to HX23. For DTCs P0455 or P0457, GO to HX40. For DTC P0460, GO to HX38. For DTCs P0461 through P0463, GO to HX36. For DTC P1443, GO to HX43. For DTC P144A, GO to HX49. For DTC P1450, GO to HX8. For DTC P260F, GO to HX50. No For symptoms without DTCs, GO to HX13. For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.				
HX2	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:<table><tr><td>(+) EVAPCP Valve Connector, Harness Side</td><td>(-) EVAPCP Valve Connector, Harness Side</td></tr><tr><td>VPWR - Pin 1</td><td>EVAPCP - Pin 2</td></tr></table> - Key ON, engine OFF. - 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?	(+) EVAPCP Valve Connector, Harness Side	(-) EVAPCP Valve Connector, Harness Side	VPWR - Pin 1	EVAPCP - Pin 2	Yes GO to HX3. No GO to HX4.
(+) EVAPCP Valve Connector, Harness Side	(-) EVAPCP Valve Connector, Harness Side					
VPWR - Pin 1	EVAPCP - Pin 2					

HX1-HX2

Evaporative Emission (EVAP) System and Monitor

HX

Test Step		Results / Action to Take				
HX3	CHECK THE EVAP CANISTER PURGE VALVE SOLENOID RESISTANCE • Key in OFF position. • 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 - 7 ohms?	(+) EVAPCP Valve Connector, Component Side	(-) EVAPCP Valve Connector, Component Side	EVAPCP - Pin 2	VPWR - Pin 1	Yes Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z. No INSTALL a new EVAPCP valve. CLEAR the DTCs. REPEAT the self-test.
(+) EVAPCP Valve Connector, Component Side	(-) EVAPCP Valve Connector, Component Side					
EVAPCP - Pin 2	VPWR - Pin 1					
HX4	CHECK THE VPWR VOLTAGE TO THE EVAP CANISTER PURGE VALVE • Key ON, engine OFF. • 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 V?	(+) EVAPCP Valve Connector, Harness Side	(-) Vehicle Battery	VPWR - Pin 1	Negative terminal	Yes GO to HX5. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) EVAPCP Valve Connector, Harness Side	(-) Vehicle Battery					
VPWR - Pin 1	Negative terminal					
HX5	CHECK THE EVAP CANISTER PURGE VALVE 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>(-) 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	Yes GO to HX6. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) EVAPCP Valve Connector, Harness Side					
EVAPCP	EVAPCP - Pin 2					
HX6	CHECK THE EVAP CANISTER PURGE VALVE CIRCUIT FOR A SHORT TO PWRGND IN THE HARNESS • 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 HX7. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
EVAPCP	Ground					

Evaporative Emission (EVAP) System and Monitor

HX

Test Step		Results / Action to Take				
HX7	CHECK THE EVAP CANISTER PURGE VALVE CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - 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 GO to HX54. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) EVAPCP Valve Connector, Harness Side	(-)					
EVAPCP - Pin 2	Ground					
HX8	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, Evaporative Emissions and Fuel Delivery and Air Induction, Fuel Tank and Lines 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 concern present?	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 HX9.				
HX9	CHECK THE FTP SENSOR VOLTAGE WITH THE FUEL FILLER CAP REMOVED OR THE CAPLESS FUEL TANK FILLER PIPE OPENED Note: For vehicles with a capless fuel filler pipe, instead of removing the fuel filler cap, install the supplemental refueling adaptor provided with the vehicle to open the capless fuel tank filler pipe. - Remove the fuel filler cap. - Key ON, engine OFF. - Access the PCM and monitor the FTP PID. - Is the voltage between 2.4 - 2.8 V?	Yes GO to HX13. No GO to HX10.				

Evaporative Emission (EVAP) System and Monitor

HX

Test Step		Results / Action to Take								
HX10	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. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to HX11.								
HX11	CHECK THE VOLTAGE TO THE FTP SENSOR - Key in OFF position. - FTP Sensor connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><th>(+) FTP Sensor Connector, Harness Side</th><th>(-) FTP Sensor Connector, Harness Side</th></tr><tr><td>VREF</td><td>SIGRTN</td></tr><tr><td>FTPREF</td><td>SIGRTN</td></tr></table> - Are the voltages between 4 - 6 V?	(+) FTP Sensor Connector, Harness Side	(-) FTP Sensor Connector, Harness Side	VREF	SIGRTN	FTPREF	SIGRTN	Yes INSTALL a new FTP sensor. For some vehicles, the FTP sensor is integral to the fuel vapor tube 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 HX12.		
(+) FTP Sensor Connector, Harness Side	(-) FTP Sensor Connector, Harness Side									
VREF	SIGRTN									
FTPREF	SIGRTN									
HX12	CHECK THE FTPREF OR VREF AND SIGRTN CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><th>(+) PCM Connector, Harness Side</th><th>(-) FTP Sensor Connector, Harness Side</th></tr><tr><td>VREF</td><td>VREF</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr><tr><td>FTPREF</td><td>FTPREF</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) FTP Sensor Connector, Harness Side	VREF	VREF	SIGRTN	SIGRTN	FTPREF	FTPREF	Yes GO to HX54. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) FTP Sensor Connector, Harness Side									
VREF	VREF									
SIGRTN	SIGRTN									
FTPREF	FTPREF									
HX13	CHECK IF THE ENGINE IDLES - Key ON, engine running. - Does the engine stall or is it unable to maintain idle?	Yes GO to HX14. No GO to HX15.								

Evaporative Emission (EVAP) System and Monitor

HX

Test Step		Results / Action to Take
HX14	CHECK THE EVAP SYSTEM FOR A STUCK OPEN VALVE • Key in OFF position. • Disconnect the fuel vapor to intake manifold line at the EVAPCP valve and cap the line at the EVAPCP valve. • Key ON, engine running. • Does the engine stall or is it unable to maintain idle?	Yes The EVAP system is not the cause of the symptom. RETURN to Symptom Charts for further direction. No INSTALL a new EVAPCP valve. CLEAR the DTCs. REPEAT the self-test.
HX15	CHECK FOR BLOCKAGE IN THE FUEL TANK VENT SYSTEM Note: The CV is normally open and venting to the atmosphere. • Access the PCM and monitor the EVAPPDC, EVMV, FTP and EVAPCV PIDs. • While monitoring the FTP PID, ramp open the EVAPCP valve by incrementally commanding the EVAPPDC PID to a 100% duty cycle (or EVMV PID to a 1,000 mA). • Does the FTP sensor voltage drop below 2 volts when the EVAPCP valve is commanded fully open?	Yes CHECK for blockage in the vapor line to the CV solenoid. CHECK the CV solenoid filter for blockage or contamination. CHECK the carbon canister for blockage. If OK, INSTALL a new CV solenoid. CLEAR the DTCs. REPEAT the self-test. No GO to HX16.
HX16	CHECK THE EVAP SYSTEM FOR A STUCK OPEN VALVE • Key ON, engine running. • Access the PCM and control the EVAPPDC PID. • Close the EVAPCP by commanding the EVAPPDC PID to 0% duty cycle or the EVMV PID to 0 mA. • Access the PCM and control the EVAPCV PID. • Close the CV solenoid by commanding the EVAPCV PID to ON (100% duty cycle). • Does the FTPV PID decrease, the engine RPM change, or the engine stall, as an indication that the EVAPCP valve is stuck open?	Yes INSTALL a new EVAPCP valve. CLEAR the DTCs. REPEAT the self-test. No GO to HX17.

Evaporative Emission (EVAP) System and Monitor

HX

Test Step		Results / Action to Take
HX17	EVAP CANISTER PURGE VALVE TEST • Key ON, engine running. • Access the PCM and control the EVAPCV PID. • Close the CV solenoid by commanding the EVAPCV PID to ON (100% duty cycle). • Access the PCM and control the EVAPPDC PID. • While monitoring the FTP PID, open the EVAPCP valve by commanding the EVAPPDC PID to a 100% duty cycle (or EVMV PID to a 1,000 mA). • Does the FTP PID decrease, the engine RPM change, or the engine stall as an indication that the EVAPCP valve is opening?	Yes For DTC P1450, unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z. For all others, CHECK the EVAP system for leaks. No CHECK for blockages between the fuel tank, the EVAPCP valve, and the engine intake manifold. CHECK for obstructions in the EVAPCP valve diaphragm and ports. If OK, INSTALL a new EVAPCP valve. CLEAR the DTCs. REPEAT the self-test.
HX18	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. CLEAR the DTCs. REPEAT the self-test. No GO to HX19.
HX19	CHECK FOR LOW 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 ON, engine OFF. • Access the PCM and monitor the FTP PID. • Is the voltage less than 0.22 V?	Yes GO to HX20. No The concern that produced the DTC P0452 is intermittent. GO to Pinpoint Test Z.

Evaporative Emission (EVAP) System and Monitor

HX

Test Step		Results / Action to Take								
HX20	CHECK THE OPPOSITE INDUCED HIGH FTP SENSOR SIGNAL - Key in OFF position. - FTP Sensor connector disconnected. - 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 ON, engine OFF. - Access the PCM and monitor the FTP PID. - Is the voltage between 4 - 6 V?	Point A FTP Sensor Connector, Harness Side	Point B FTP Sensor Connector, Harness Side	VREF	FTP	Yes INSTALL a new FTP sensor. For some vehicles, the FTP sensor is integral to the fuel vapor tube assembly. CLEAR the DTCs. REPEAT the self-test. No GO to HX21.				
Point A FTP Sensor Connector, Harness Side	Point B FTP Sensor Connector, Harness Side									
VREF	FTP									
HX21	CHECK THE VREF VOLTAGE TO THE FTP SENSOR - Remove the jumper wire(s). - Key ON, engine OFF. - 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 - 6 V?	(+) FTP Sensor Connector, Harness Side	(-) FTP Sensor Connector, Harness Side	VREF	SIGRTN	Yes GO to HX22. No GO to Pinpoint Test C.				
(+) FTP Sensor Connector, Harness Side	(-) FTP Sensor Connector, Harness Side									
VREF	SIGRTN									
HX22	CHECK THE FTP CIRCUIT(S) FOR A SHORT TO SIGRTN OR GND 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>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 GO to HX54. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side									
FTP	SIGRTN									
(+) PCM Connector, Harness Side	(-) Vehicle Battery									
FTP	Negative terminal									
HX23	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 ON, engine OFF. - Access the PCM and monitor the FTP PID. - Is the voltage greater than 4.5 V?	Yes GO to HX24. No The concern that produced the DTC P0453 is intermittent. GO to Pinpoint Test Z.								

Evaporative Emission (EVAP) System and Monitor

HX

Test Step		Results / Action to Take				
HX24	CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN CIRCUITS AT THE FTP SENSOR VEHICLE HARNESS CONNECTOR • Key in OFF position. • FTP Sensor connector disconnected. • Key ON, engine OFF. • 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 - 6 V?	(+) FTP Sensor Con- nector, Harness Side	(-) FTP Sensor Con- nector, Harness Side	VREF	SIGRTN	Yes GO to HX25. No GO to Pinpoint Test C.
(+) FTP Sensor Con- nector, Harness Side	(-) FTP Sensor Con- nector, Harness Side					
VREF	SIGRTN					
HX25	CHECK THE FTP CIRCUIT FOR A SHORT TO VOLTAGE • 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 V?	(+) FTP Sensor Con- nector, Harness Side	(-) Vehicle Battery	FTP	Negative terminal	Yes GO to HX27. No GO to HX26.
(+) FTP Sensor Con- nector, Harness Side	(-) Vehicle Battery					
FTP	Negative terminal					
HX26	CHECK THE FTP CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS • Key in OFF position. • PCM connector disconnected. • Key ON, engine OFF. • 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 V?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	FTP	Negative terminal	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to HX54.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
FTP	Negative terminal					
HX27	CHECK THE FTP 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>(-) 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 HX28. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) FTP Sensor Con- nector, Harness Side					
FTP	FTP					

Evaporative Emission (EVAP) System and Monitor

HX

Test Step		Results / Action to Take						
HX28	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 HX29. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side							
VREF	FTP							
HX29	CHECK THE OPPOSITE INDUCED LOW FTP SIGNAL - PCM connector connected. - 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 ON, engine OFF. - Access the PCM and monitor the FTP 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. For some vehicles, the FTP sensor is integral to the fuel vapor tube assembly. CLEAR the DTCs. REPEAT the self-test. No GO to HX54.		
Point A FTP Sensor Connector, Harness Side	Point B FTP Sensor Connector, Harness Side							
FTP	SIGRTN							
HX30	DTCs P0446 OR P1451: CHECK THE PCM OUTPUT TO THE CV SOLENOID Note: For applications that use the engine off natural vacuum (EONV) EVAP leak check monitor, KAPWR provides voltage to the CV solenoid instead of VPWR. - Key in OFF position. - CV Solenoid connector disconnected. - Connect a non-powered test lamp between:<table><tr><td>(+) CV Solenoid Connector, Harness Side</td><td>(-) CV Solenoid Connector, Harness Side</td></tr><tr><td>VPWR</td><td>CANV</td></tr><tr><td>KAPWR</td><td>CANV</td></tr></table> - Key ON, engine OFF. - 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?	(+) CV Solenoid Connector, Harness Side	(-) CV Solenoid Connector, Harness Side	VPWR	CANV	KAPWR	CANV	Yes GO to HX31. No GO to HX32.
(+) CV Solenoid Connector, Harness Side	(-) CV Solenoid Connector, Harness Side							
VPWR	CANV							
KAPWR	CANV							

Evaporative Emission (EVAP) System and Monitor

HX

Test Step		Results / Action to Take						
HX31	CHECK THE CV SOLENOID RESISTANCE Note: For applications that use the engine off natural vacuum (EONV) EVAP leak check monitor, KAPWR provides voltage to the CV solenoid instead of VPWR. • Key in OFF position. • Measure the resistance between: <table><tr><td>(+) CV Solenoid Connector, Component Side</td><td>(-) CV Solenoid Connector, Component Side</td></tr><tr><td>KAPWR</td><td>CANV</td></tr><tr><td>VPWR</td><td>CANV</td></tr></table> • Are the resistances between 48 - 65 ohms?	(+) CV Solenoid Connector, Component Side	(-) CV Solenoid Connector, Component Side	KAPWR	CANV	VPWR	CANV	Yes Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z. No INSTALL a new CV solenoid. CLEAR the DTCs. REPEAT the self-test.
(+) CV Solenoid Connector, Component Side	(-) CV Solenoid Connector, Component Side							
KAPWR	CANV							
VPWR	CANV							
HX32	CHECK THE VPWR VOLTAGE TO THE CV SOLENOID Note: For applications that use the engine off natural vacuum (EONV) EVAP leak check monitor, KAPWR provides voltage to the CV solenoid instead of VPWR. • Measure the voltage between: <table><tr><td>(+) CV Solenoid Connector, Harness Side</td><td>(-)</td></tr><tr><td>KAPWR</td><td>Ground</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> • Are the voltages greater than 10 V?	(+) CV Solenoid Connector, Harness Side	(-)	KAPWR	Ground	VPWR	Ground	Yes GO to HX33. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) CV Solenoid Connector, Harness Side	(-)							
KAPWR	Ground							
VPWR	Ground							
HX33	CHECK THE CANV 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>(-) CV Solenoid Connector, Harness Side</td></tr><tr><td>CANV</td><td>CANV</td></tr></table> • Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) CV Solenoid Connector, Harness Side	CANV	CANV	Yes GO to HX34. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) PCM Connector, Harness Side	(-) CV Solenoid Connector, Harness Side							
CANV	CANV							
HX34	CHECK THE CANV CIRCUIT FOR A SHORT TO PWRGND IN THE HARNESS • Measure the resistance between: <table><tr><td>(+) CV Solenoid Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>CANV</td><td>Negative terminal</td></tr></table> • Is the resistance greater than 10K ohms?	(+) CV Solenoid Connector, Harness Side	(-) Vehicle Battery	CANV	Negative terminal	Yes GO to HX35. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) CV Solenoid Connector, Harness Side	(-) Vehicle Battery							
CANV	Negative terminal							

Evaporative Emission (EVAP) System and Monitor

HX

Test Step		Results / Action to Take			
HX35	CHECK THE CANV CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS	Yes GO to HX54. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.			
- Key ON, engine OFF. - Measure the voltage between:<table border="1"><tr><td>(+) CV Solenoid Connector, Harness Side</td><td>(-)</td></tr><tr><td>CANV</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?			(+) CV Solenoid Connector, Harness Side	(-)	CANV
(+) CV Solenoid Connector, Harness Side	(-)				
CANV	Ground				
HX36	DTCS P0461, P0462 AND P0463: CHECK THE INSTRUMENT CLUSTER (IC) MODULE FOR DTCS	Yes REFER to Instrument Panel, Gauges and Warning Indicators, Instrument Cluster to continue diagnosis. No GO to HX37.			
- Key ON, engine OFF. - Carry out the IC self-test. - Are any DTCs present?					
HX37	CHECK THE FLI PID	Yes GO to HX38. No GO to HX54.			
- Key ON, engine running. - Access the PCM and monitor the FLI PID. - Does the FLI PID match the fuel gauge?					
HX38	DTC P0460: CHECK FOR FUEL TANK FLOAT LEVEL RESPONSE	Yes Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z. No REFER to Instrument Panel, Gauges and Warning Indicators, Instrument Cluster to diagnose the incorrect fuel gauge indication symptom.			
Note: A dual-container (saddle type) fuel tank has 2 fuel level sensors. The FLI PID in the PCM is the average value of both fuel level sensors. Some dual-container tanks may require the fuel level to be greater 3/4 full before the fuel level equalizes. - Key ON, engine running. - Access the PCM and monitor the FLI PID. - Key in OFF position. - 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. - Key ON, engine running. - Access the PCM and monitor the FLI PID. - Does the FLI PID indicate a movement upward or downward as fuel is either added or drained?					

Evaporative Emission (EVAP) System and Monitor

HX

Test Step		Results / Action to Take
HX39	DTC P0451: CHECK THE FTP SENSOR FOR CORRECT OPERATION	Yes CHECK for kinks or bends in the fuel vapor hoses/tubes between the fuel tank and dust separator. CHECK the EVAP canister ports and canister vent hose assembly for contamination or debris. CHECK the dust separator for blockage. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No INSTALL a new FTP sensor. For some vehicles, the FTP sensor is integral to the fuel vapor tube assembly. CLEAR the DTCs. REPEAT the self-test.
	Note: For vehicles with a capless fuel filler pipe, instead of removing the fuel filler cap, install the supplemental refueling adaptor provided with the vehicle to open the capless fuel tank filler pipe. • Key in OFF position. • Remove the fuel filler cap. • Key ON, engine OFF. • Access the PCM and monitor the FTP PID. • Is the pressure between -0.42 and 0.42 kPa (-1.7 and 1.7 in-H₂O)?	
HX40	DTCS P0455 OR P0457: CHECK THE FUEL FILLER CAP OF CAPLESS FUEL TANK FILLER PIPE	Yes For repair verification, CARRY OUT the Smoke Machine PHASE 1 - Leak Verification Pressure Test. REPAIR as necessary. GO to HX46. No GO to HX41.
	Note: If the fuel filler cap or capless fuel tank filler pipe is suspected as an EVAP leak source during visual inspection, do not disturb the fuel filler cap or capless fuel tank filler pipe 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. For vehicles with a capless fuel tank filler pipe, install and remove the supplemental refueling adaptor provided with the vehicle to reseal the capless fuel tank filler pipe and repeat the test. This action isolates the fuel filler cap or capless fuel tank filler pipe from the rest of the EVAP system as a potential concern. • For vehicles with a fuel filler cap, visually inspect the fuel filler cap without initially disturbing it. — Verify the fuel filler cap tether is visible and free to move. — Check for missing or loose fuel filler cap. — Check the fuel filler cap for damage. • For vehicles with a capless fuel tank filler pipe, visually inspect the capless fuel tank filler pipe inlet without initially disturbing it. — Check the capless fuel tank filler pipe inlet for an obstruction that prevents it from sealing. — Check the capless fuel tank filler pipe for damage. • Is a concern present?	

Evaporative Emission (EVAP) System and Monitor

HX

Test Step		Results / Action to Take
HX41	CHECK FOR FLI DTCS	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to HX42 .
	• Key ON, engine OFF. • Check for self-test DTCS. • Are DTCS P0460, P0461, P0462 or P0463 present?	
HX42	CHECK THE OPERATION OF THE FUEL GAUGE	Yes GO to HX43 . No CHECK the functionality of the FLI circuit. RETURN to Symptom Charts for further direction.
	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 a fuel level input (FLI) concern. • Check operation of the fuel gauge. • Is the fuel gauge functioning properly?	
HX43	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 HX46 . No GO to HX44 .
	• Key in OFF position. • 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 — blocked vacuum hose between the EVAPCP valve and the engine intake manifold — damaged fuel tank or fuel filler pipe • Are there any concerns found during the visual inspection?	
HX44	CHECK THE FTP SENSOR VOLTAGE WITH THE FUEL FILLER CAP REMOVED OR THE CAPLESS FUEL TANK FILLER PIPE OPENED	Yes GO to HX45 . No INSTALL a new FTP sensor. For some vehicles, the FTP sensor is integral to the fuel vapor tube assembly. REPEAT the test and VERIFY the results. For repair verification, CARRY OUT the Smoke Machine PHASE 1 - Leak Verification Pressure Test. GO to HX46 .
	Note: For vehicles with a capless fuel filler pipe, instead of removing the fuel filler cap, install the supplemental refueling adaptor provided with the vehicle to open the capless fuel tank filler pipe. • Remove the fuel filler cap. • Key ON, engine OFF. • Access the PCM and monitor the FTP PID. • Is the voltage between 2.4 - 2.8 V?	

Evaporative Emission (EVAP) System and Monitor

HX

Test Step		Results / Action to Take
HX45	EVAP CANISTER PURGE VALVE TEST	
	Note: The EVAPCP valve PID name may vary by the vehicle. Use the EVAPPDC or EVMV PID to control the EVAPCP valve. • Key in OFF position. • Install the fuel filler cap or remove the supplemental refueling adaptor. • Key ON, engine running. • Access the PCM and monitor the EVAPCV, EVAPPDC, EVMV and FTP PIDs. • Close the CV solenoid 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 FTP PID decrease, the engine RPM change, or the engine stall as an indication that the EVAPCP valve is opening?	Yes GO to HX46. No 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 HX46.
HX46	DTCS P0442 OR P0456: HOOK UP THE SMOKE MACHINE (ROTUNDA VACUTEC)	
	 CAUTION: Removing the Schrader valve from the test port permanently damages the valve. Note: The smoke and air flow from the smoke machine will not pass through liquid fuel. Liquid fuel may be present in the fuel tank filler pipe. Note: Some vehicles are not equipped with an evaporative emission test port. Use a suitable hose adapter in the following diagnostic procedures. • Key in OFF position. • 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. • For vehicles not equipped with an evaporative emission test port: — Disconnect the fuel vapor to intake manifold line at the EVAPCP valve and cap the line. — Connect a suitable hose adapter to the fuel vapor to intake manifold connection at the EVAPCP valve. • For vehicles equipped with an evaporative emission test port: — Locate the evaporative emission test port and remove the green cap. The cap is located on or close to the EVAPCP valve. — Install the EVAP test port adapter (provided with the Vacutec Smoke Machine) to the test port. • Is the smoke machine hook up complete?	Yes For leak detection, GO to HX47. For leak repair verification, GO to HX48. No REFER to the smoke machine operator manual for additional instructions and for helpful tips.

Evaporative Emission (EVAP) System and Monitor

HX

	Test Step	Results / Action to Take
HX47	CARRY OUT SMOKE MACHINE PHASE 2 - LEAK DETECTION SMOKE TEST 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 valve, CV solenoid, EVAP canister, fuel tank, fuel filler pipe, around the fuel tank area, and at the fuel filler cap or capless fuel tank filler pipe inlet. — Wiggle the components and connections to simulate road bumps while looking for signs of leaking smoke. If the leak is in the fuel tank filler pipe between the check valve and the fuel filler cap or capless fuel tank filler pipe inlet, smoke under pressure may not reach the leak. If leaking smoke is not found, a thorough visual inspection of the fuel tank filler pipe and fuel filler cap or capless fuel tank filler pipe inlet should be done. • Set the smoke machine to SMOKE. • Remove the fuel filler cap or install the supplemental refueling adaptor. • Connect the smoke supply hose nozzle tip into the EVAP service port or suitable hose adapter. • Key ON, engine OFF. • Access the PCM and control the EVAPCV PID. • Close the CV solenoid by commanding the EVAPCV PID to ON (100% duty cycle). The CV solenoid reopens after 9 minutes of continuous operation. • For vehicles not equipped with an evaporative emission test port: — Start the smoke machine and verify the connection at the EVAPCP valve is correct and not leaking — Open the EVAPCP valve by commanding the EVAPPCD PID to 100% duty cycle or EVMV PID to 1,000 mA • Start the smoke machine. If smoke does not exit the fuel tank filler pipe after the system is pressurized, command the EVAPCV PID open to allow air to purge the CV solenoid. Once smoke is seen at the CV solenoid, command the EVAPCV PID close. — Install the fuel filler cap or remove the supplemental refueling adaptor once smoke is observed exiting the fuel tank neck area. — Continue to smoke 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). • Is the source of the EVAP leak located?	Yes REPAIR as necessary. CONNECT all the disconnected components. For repair verification, CARRY OUT the Smoke Machine PHASE 1 - Leak Verification Pressure Test. GO to HX48. No The test passed. CONNECT all the disconnected components. CARRY OUT the Smoke Machine PHASE 1 - Leak Verification Pressure Test. GO to HX48.

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

Test Step		Results / Action to Take
HX48	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 flowmeter using the 0.020 (DTC P0456) or 0.040 (DTC P0442) standard as follows: — Insert the air supply hose (transparent hose) nozzle tip into the appropriate 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 flowmeter indicator ball. — Position the flowmeter 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 or suitable hose adapter. • Key ON, engine OFF. • Access the PCM and control the EVAPCV PID. • Close the CV solenoid by commanding the EVAPCV PID to ON (100% duty cycle). • For vehicles not equipped with an evaporative emission test port, open the EVAPCP valve by commanding the EVAPPPDC PID to 100% duty cycle or EVMV PID to 1,000 mA. • 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 The test passed and no concerns are present. CLEAR the DTCs. REPEAT the self-test. No GO to HX47.

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

Test Step		Results / Action to Take
HX49	DTC P144A: CHECK FOR A BLOCKED FUEL VAPOR TUBE BETWEEN THE FTP SENSOR AND THE FUEL TANK	
	• Key in OFF position. • Remove the fuel vapor tube assembly. • Visually inspect the fuel vapor tube for a blockage between the FTP sensor and the connection to the fuel tank or fuel pump module. • Visually inspect the connection at the fuel tank or fuel pump module for a blockage. • Attempt to manually remove the blockage. • Is the blockage visible and can be removed?	Yes REMOVE the blockage. INSTALL the Fuel Vapor Tube assembly. CLEAR the DTCs. REPEAT the self-test. No INSTALL a new Fuel Vapor Tube assembly. CLEAR the DTCs. REPEAT the self-test.
HX50	DTC P260F: CHECK FOR THE PRESENCE OF ANY MODULE COMMUNICATION CONCERNS	
	• Key ON, engine OFF. • 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. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. For communication concerns in other modules, REFER to Testing for that System or Component to diagnose the communication DTC. No GO to HX51.
HX51	CHECK THE PERFORMANCE OF THE PROCESSOR	
	• Key in OFF position. • Disconnect the battery and wait for 1 minute. Refer to Battery, Mounting and Cables. • 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)?	Yes GO to HX53. No GO to HX52.

Evaporative Emission (EVAP) System and Monitor

HX

Test Step		Results / Action to Take
HX52	CHECK FOR SELF-TEST DTC P260F	Yes GO to HX53 . No RETURN the vehicle to the customer.
• Idle the engine for 2 minutes. • Carry out the self-test. • Is DTC P260F present?		
HX53	CHECK THE PCM FOR THE LATEST CALIBRATION	Yes GO to HX54 . 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?		
HX54	CHECK FOR CORRECT PCM OPERATION	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.
• 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?		

HX52-HX54

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)
- powertrain control module (PCM) (12A650)

Test Step		Results / Action to Take
HY1	CHECK THE GENERATOR CIRCUITRY AND OPERATION	
	Note: If the concern is still present after checking the generator circuitry in the testing for that system or component, return to Computers and Control Systems to continue generator diagnosis. • Check for any generator related DTCs. Refer to Charging System to diagnose any generator related DTCs. • Is the charging system diagnosed and repaired in Charging System?	Yes The system is operating correctly at this time. No GO to HY2.
HY2	CHECK THE GENERATOR MONITOR SIGNAL	
	• Key ON, engine running. • Access the PCM and monitor the GENMON PID. • Is the duty cycle between 5% and 97% and not excessively fluctuating?	Yes The system is operating correctly at this time. No GO to HY3.
HY3	CHECK FOR CORRECT PCM OPERATION	
	Note: When the battery (or PCM) is disconnected and connected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The charging system set point may also vary. The vehicle may need to be driven to relearn its strategy. • 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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

HY1-HY3

Test JB: Secondary Ignition (COP)

PINPOINT TEST JB: SECONDARY IGNITION (COP)

Secondary Ignition (COP)

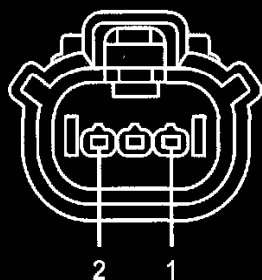
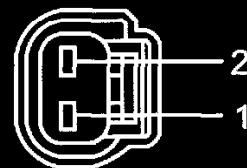
JB

 **CAUTION: A malfunctioning ignition system may cause high catalyst temperatures. Check the 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

Coil On Plug (COP) Connector

A**B**

N0048006

A0077505

Vehicle	Connector	Pin	Circuit
Edge, MKX, MKZ, Taurus, Taurus X, Sable	A	2	IGN START/RUN
Escape/Mariner, Focus, Fusion, Milan, Mustang 5.4L	B	2	IGN START/RUN
All other vehicles	B	1	IGN START/RUN

Caution And Coil On Plug (COP) Connector

Secondary Ignition (COP)**JB**

Vehicle	Firing Order for Coil On Plug Applications
BASE, 4-cylinder applications	1 3 4 2
BASE, 6-cylinder applications	1 4 2 5 3 6
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	CHECK FOR DTCs Are DTCs P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0309, P0310, or P050B present?	Yes For DTCs P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0309, P0310 or P0316, GO to JB3 . For DTC P050B, GO to JB13 . No For symptoms without DTCs, GO to JB2 . For all other DTCs, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
JB2	VISUAL INSPECTION OF THE IGNITION SYSTEM - 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?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to JB3 .

JB1-JB2

Secondary Ignition (COP)**JB**

Test Step		Results / Action to Take
JB3	DTC P0301 THROUGH P0310: MISFIRE ON CYLINDERS 1 THROUGH 10	
	Are DTCs P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0309, or P0310 present?	Yes For Edge, Escape/Mariner 3.0L, Explorer 4.6L, Explorer Sport Trac 4.6L, F-150 4.6L, F-150 5.4L, Fusion, Milan, MKX, Sable, Taurus, and Taurus X, GO to JB4. For all others, GO to JB5. No GO to JB6.
JB4	CHECK SPARK DURATION RELATIVENESS	
	- Monitor the spark duration PIDs. - Are the PIDs relative to each other?	Yes GO to JB10. No 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 2,000 ohms or higher than 20,000 ohms. If the coil boot(s) and spark plugs are OK, INSTALL a new COP(s) for the missing cylinders. CLEAR the DTCs. REPEAT the self-test.

Secondary Ignition (COP)

JB

Test Step		Results / Action to Take
JB5	CHECK FOR SPARK AT THE CYLINDER(S) INDICATED BY THE DTC(S)	
	• Key in OFF position. • 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. • Crank the engine while the accelerator pedal is fully applied. • Observe the spark tester while cranking the engine. • Is a bluish-white spark present?	Yes GO to JB8. No 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 2,000 ohms or higher than 20,000 ohms. GO to JB7.
JB6	CHECK FOR SPARK AT ALL CYLINDERS	
	• Key in OFF position. • 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. • Crank the engine while the accelerator pedal is fully applied. • Observe the spark tester at each cylinder while cranking the engine. • Is a bluish-white spark consistent between all cylinders?	Yes GO to JB8. No 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 2,000 ohms or higher than 20,000 ohms. RECORD the cylinder(s) with inconsistent spark. GO to JB7.
JB7	CHECK THE SECONDARY COIL RESISTANCE FOR THE MISSING CYLINDERS	
	• Key in OFF position. • Suspect coil connector disconnected. • Measure resistance between: Suspect coil connector, IGN START/RUN, component side and ignition coil spring, located in the ignition coil boot. • Is the resistance between 5,000 and 6,000 ohms?	Yes GO to Pinpoint Test Z. No INSTALL a new COP. CLEAR the DTCs. REPEAT the self-test.

Secondary Ignition (COP)

JB

Test Step		Results / Action to Take
JB8	CHECK THE SPARK PLUGS	
	- Key in OFF position. - Remove and inspect the plugs for damage, wear, carbon deposits, and proper plug gap. - Are the plugs OK?	Yes GO to JB9. No REPAIR the plug(s). ADJUST the gap or INSTALL a new spark plug(s) as necessary. CLEAR the DTCs. REPEAT the self-test.
JB9	CHECK THE SPARK PLUG RESISTANCE	
	- Measure the spark plug resistance. - Is the resistance between 2,000 and 20,000 ohms?	Yes For Edge, Escape/Mariner 3.0L, Explorer 4.6L, Explorer Sport Trac 4.6L, F-150 4.6L, F-150 5.4L, Fusion, Milan, MKX, Sable, Taurus, and Taurus X, GO to JB14. For all others, GO to JB10. No INSTALL a new spark plug. CLEAR the DTCs. REPEAT the self-test.
JB10	TEST DIRECTION FOR SYMPTOM CHARTS	
	Were you directed to this pinpoint test from Symptom Charts?	Yes RETURN to Symptom Charts for further direction. No GO to JB11.
JB11	TEST DIRECTION FOR PINPOINT TEST HD	
	Were you directed to this pinpoint test from pinpoint test step HD6?	Yes GO to HD7. No GO to JB12.

Secondary Ignition (COP)

JB

Test Step		Results / Action to Take
JB12	TEST DIRECTION FOR PINPOINT TEST A	
	Were you directed to this pinpoint test from pinpoint test step A8?	Yes GO to A9. No The concern is intermittent. GO to Pinpoint Test Z.
JB13	DTC P050B: COLD START PERFORMANCE	
	Are any other codes besides P050B present?	Yes REPAIR all other powertrain related diagnostic trouble codes (DTCs) first. No GO to JB14.
JB14	CHECK THE SPARK CAPTURE CIRCUIT	
	- Access the PCM and monitor the IGNPCM_F PID. - Is a concern indicated?	Yes GO to JB16. No GO to JB15.
JB15	CHECK THE IGNITION TIMING PID	
	- Access the PCM and monitor the IGNX_F PIDs. - Is a concern indicated?	Yes Visually inspect the COP harness for damage, exposed wiring, water contamination, corrosion, and correct assembly. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to JB16.
JB16	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

JB12-JB16

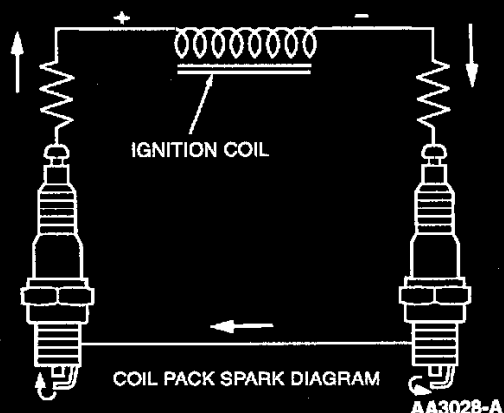
Test JC: Secondary Ignition (Coil Pack)
PINPOINT TEST JC: SECONDARY IGNITION (COIL PACK)

Secondary Ignition (Coil Pack)

JC

This pinpoint test is intended to diagnose the following:

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

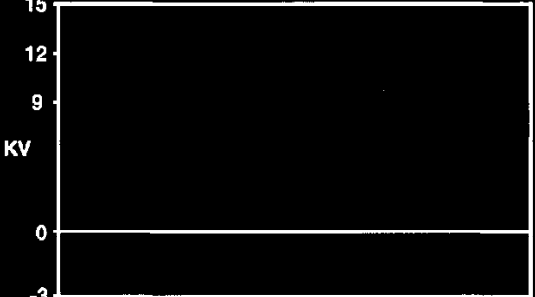
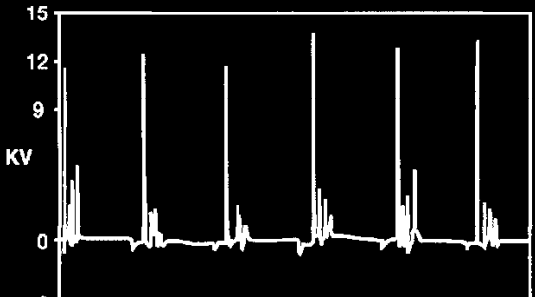


Explorer 4.0L, Explorer Sport Trac 4.0L, F150 4.2L, Mountaineer 4.0L, Mustang 4.0L, Ranger.

Test Step		Results / Action to Take
JC1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	
	• Are DTCs P0300, P0301, P0302, P0303, P0304, P0305, P0306 or P050B present?	Yes For DTCs P0301, P0302, P0303, P0304, P0305 or P0306, GO to JC13. For DTC P0300, GO to JC2. For DTC P050B, GO to JC18. No For all other DTCs, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
JC2	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 concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No For a coil pack using an engine analyzer, GO to JC3. For a coil pack not using an engine analyzer, GO to JC12.

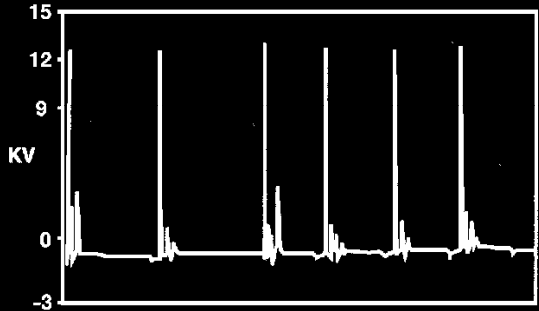
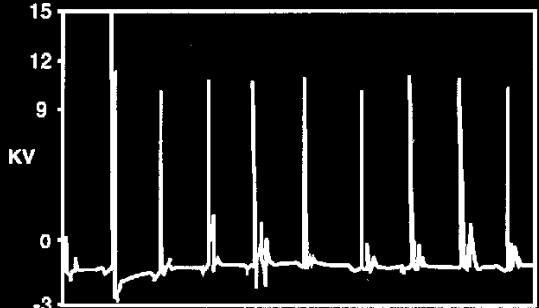
Secondary Ignition (Coil Pack)

JC

Test Step		Results / Action to Take
JC3	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 JC4. No REPEAT Step JC2.
JC4	CHECK FOR THE IGNITION PATTERN - Observe the pattern on a scope while cranking the engine.  A0027507 - Is the pattern flat, which indicates no spark on all cylinders?	Yes An IGN/START/RUN circuit concern. 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 a short to ground. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to JC5.
JC5	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. - Key ON, engine running. If no start, crank the engine.  A0027508 - 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 Pinpoint Test Z. No GO to JC6.

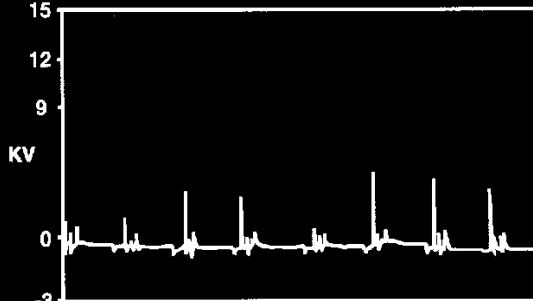
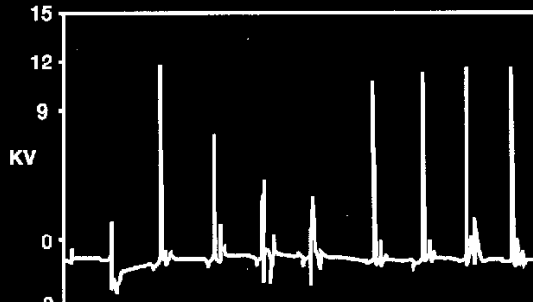
Secondary Ignition (Coil Pack)

JC

Test Step		Results / Action to Take
JC6	IGNITION PATTERN EVALUATION	Yes GO to JC7. No GO to JC8.
• Is the ignition pattern normal?		
JC7	TEST DIRECTION	Yes GO to A9. No GO to JC8.
• Were you directed to this pinpoint test from pinpoint test step A8?		
JC8	CHECK FOR MISSING SPARK PATTERNS	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). CLEAR the DTCs. REPEAT the self-test. GO to JE2. No GO to JC9.
• Observe for missing spark pattern.  A0027509 FIRING ORDER		
• Is the spark pattern inconsistent?		
JC9	CHECK FOR A HIGH SPARK PLUG FIRING VOLTAGE	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). CLEAR the DTCs. REPEAT the self-test. No GO to JC10.
• Observe for a high spark plug firing voltage.  A0027511 FIRING ORDER		
• Is the average value of the spark plug firing voltage greater than 15 Kv?		

Secondary Ignition (Coil Pack)

JC

Test Step		Results / Action to Take
JC10	CHECK FOR LOW SPARK PLUG FIRING VOLTAGE - Check the spark plug firing voltage average pattern.  A0027512 FIRING ORDER - 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. CLEAR the DTCs. REPEAT the self-test. No GO to JC11.
JC11	CHECK FOR EVENNESS BETWEEN CYLINDERS - Check the spark plug firing voltage average pattern.  A0027513 FIRING ORDER - 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 plug(s). INSTALL a new spark plug(s) if the resistance is lower than 2,000 or higher than 20,000 ohms. CLEAR the DTCs. REPEAT the self-test. No GO to Pinpoint Test Z.
JC12	DTCs P0301 THROUGH P0306: MISFIRE ON CYLINDERS 1 THROUGH 6 Are DTCs P0300, P0301, P0302, P0303, P0304, P0305, or P0306 present?	Yes GO to JC13. No GO to JC14.

Secondary Ignition (Coil Pack)

JC

Test Step		Results / Action to Take
JC13	CHECK FOR SPARK AT THE CYLINDER(S) INDICATED BY THE DTC(S)	
	• Key in OFF position. • 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. • Crank the engine while the accelerator pedal is fully applied. • Check for spark while cranking the engine. • Is the bluish-white spark present?	Yes GO to JC16. No 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 JC15.
JC14	CHECK FOR SPARK AT ALL CYLINDERS	
	• Key in OFF position. • 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. • Crank the engine while the accelerator pedal is fully applied. • Check for spark while cranking the engine. • Is the bluish-white spark present?	Yes GO to JC16. No 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 JC15.
JC15	CHECK THE SECONDARY COIL RESISTANCE FOR THE MISSING CYLINDERS	
	Note: Two adjacent coil towers share a common coil and are called a matched pair. For 6-tower coil pack (6 cylinder) applications, the matched pairs are 1 and 5, 2 and 6, and 3 and 4. For Mustang the matched pairs are 1 and 4, 2 and 5, and 3 and 6. For 4-tower coil pack (4 cylinder) applications, the matched pairs are 1 and 4, and 2 and 3. • Key in OFF position. • Ignition coil pack disconnected. • Disconnect spark plug wires from the coil pack. • Measure the resistance of each matched pair. • Is the resistance between 9,500 and 15,500 ohms?	Yes GO to Pinpoint Test Z. No INSTALL a new ignition coil pack. CLEAR the DTCs. REPEAT the self-test.

Secondary Ignition (Coil Pack)

JC

Test Step		Results / Action to Take
JC16	CHECK THE SPARK PLUGS	
	• Key in OFF position. • Check for damaged spark plugs or narrow spark plug gaps. • Are the plugs OK?	Yes GO to JC17. No REPAIR the spark plug(s). ADJUST the gap or INSTALL a new spark plug(s) as necessary. CLEAR the DTCs. REPEAT the self-test.
JC17	CHECK THE SPARK PLUG RESISTANCE	
	• Measure the spark plug resistance. • Is the resistance between 2,000 and 20,000 ohms?	Yes GO to Pinpoint Test Z. No INSTALL a new spark plug(s). CLEAR the DTCs. REPEAT the self-test.
JC18	DTC P050B: COLD START PERFORMANCE	
	• Are any other codes besides P050B present?	Yes REPAIR all other powertrain related diagnostic trouble codes (DTCs) first. No GO to JC19.
JC19	CHECK THE SPARK CAPTURE CIRCUIT	
	• Access the PCM and monitor the IGNPCM_F PID. • Is a concern indicated?	Yes GO to JC21. No GO to JC20.
JC20	CHECK THE IGNITION TIMING PID	
	• Access the PCM and monitor the IGNX_F PIDs. • Is a concern indicated?	Yes Visually inspect the coil pack harness for damage, exposed wiring, water contamination, corrosion, and correct assembly. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to JC21.

Secondary Ignition (Coil Pack)**JC**

Test Step		Results / Action to Take
JC21	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

JC21

Test JD: Crankshaft Position (CKP) Sensor
PINPOINT TEST JD: CRANKSHAFT POSITION (CKP) SENSOR

Crankshaft Position (CKP) Sensor

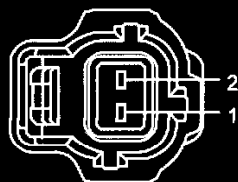
JD

⚠ WARNING: Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.

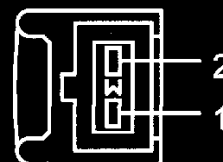
This pinpoint test is intended to diagnose the following:

- crankshaft position (CKP) sensor (6C315)
- harness circuits: CKP(+) and CKP(-)
- powertrain control module (PCM) (12A650)

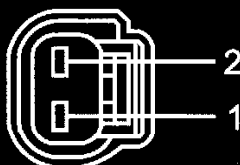
Crankshaft Position (CKP) Sensor Connector

A

A0077560

B

A0077522

C

A0077505

Warning And Crankshaft Position (CKP) Sensor Connector

Crankshaft Position (CKP) Sensor**JD**

Vehicle	Connector	Pin	Circuit
Escape/Mariner 2.3L, Focus, Fusion 2.3L, Milan 2.3L, Ranger 2.3L	A	2 1	CKP- CKP+
Explorer 4.0L, Explorer Sport Trac 4.0L, Mountaineer 4.0L, Mustang 4.0L, Ranger 4.0L	B	2 1	CKP- CKP+
All other vehicles	C	1 2	CKP- CKP+

Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
Edge, F-150, Mark LT, MKX, Sable, Taurus, Taurus X	190 Pin	E47 E46	CKP+ CKP-
Escape/Mariner	150 (50-50-50) Pin	E34 E45	CKP+ CKP-
Expedition, Fusion, Milan, MKZ, Navigator	140 Pin	E47 E46	CKP+ CKP-
Focus	190 Pin	E58 E42	CKP+ CKP-
All other vehicles	170 Pin	E47 E46	CKP+ CKP-

Crankshaft Position (CKP) Sensor Connector And Powertrain Control Module (PCM) Connector

Crankshaft Position (CKP) Sensor

JD

Test Step		Results / Action to Take					
JD1	CHECK THE CKP SENSOR SIGNAL SENT TO THE PCM	Yes For DTC P1336, GO to HD16 . For all others, the CKP, PCM, and harness are working properly. RETURN to Symptom Charts for further direction. No GO to JD2 .					
	Note: The battery should be fully charged and the starting system should be functioning properly. • Disable the inertia switch. • Key ON, engine OFF. • Access the PCM and monitor the RPM PID. • Crank the engine. • Is the RPM greater than 150 RPM?						
JD2	CHECK THE TIMING COVER, CKP SENSOR AND EXTERNAL TRIGGER WHEEL (OUTSIDE THE TIMING COVER) FOR OBVIOUS PHYSICAL DAMAGE	Yes REPAIR as necessary. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test. No GO to JD3 .					
	• 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?						
JD3	CHECK FOR PROPER CKP BIAS VOLTAGES IN THE PCM	Yes GO to JD4 . No GO to JD6 .					
	• CKP Sensor connector disconnected. • Key ON, engine OFF. • Measure the voltage between:<table><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 - 3 V?		(+) CKP Sensor Connector, Harness Side	(-) Vehicle Battery	CKP+	Negative terminal	CKP-
(+) CKP Sensor Connector, Harness Side	(-) Vehicle Battery						
CKP+	Negative terminal						
CKP-	Negative terminal						
JD4	CHECK THE CKP SENSOR RESISTANCE	Yes GO to JD5 . No INSTALL a new CKP sensor. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.					
	• 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> • Is the resistance between 250 - 1K ohms?		(+) CKP Sensor Connector, Component Side	(-) CKP Sensor Connector, Component Side	CKP+	CKP-	
(+) CKP Sensor Connector, Component Side	(-) CKP Sensor Connector, Component Side						
CKP+	CKP-						

Crankshaft Position (CKP) Sensor

JD

Test Step		Results / Action to Take						
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. Note: Carry out the following resistance measurement between the CKP shield and the ground. - Measure the resistance between: <table><tr><td>(+) CKP_SHLD Assembly Connector, Harness Side</td><td>(-)</td></tr><tr><td>CKP_SHLD</td><td>Ground</td></tr></table> - Is the resistance less than 5 ohms?	(+) CKP_SHLD Assembly Connector, Harness Side	(-)	CKP_SHLD	Ground	Yes GO to JD6. No REPAIR the open circuit. CHECK for a poor ground connection. CLEAR the DTCs. REPEAT the self-test.		
(+) CKP_SHLD Assembly Connector, Harness Side	(-)							
CKP_SHLD	Ground							
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. CLEAR the DTCs. REPEAT the self-test.		
(+) 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. CLEAR the DTCs. REPEAT the self-test.
(+) CKP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side							
CKP-	CKP-							
CKP+	CKP+							
JD8	CHECK THE CKP CIRCUIT(S) FOR A SHORT TO GROUND IN THE HARNESS - Measure the resistance between: <table><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 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. CLEAR the DTCs. REPEAT the self-test.
(+) CKP Sensor Connector, Harness Side	(-) Vehicle Battery							
CKP+	Negative terminal							
CKP-	Negative terminal							

Crankshaft Position (CKP) Sensor

JD

Test Step		Results / Action to Take						
JD9	CHECK THE CKP CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS • Key ON, engine OFF. • 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. CLEAR the DTCs. REPEAT the self-test. No GO to JD10.
(+) PCM Connector, Harness Side	(-) Vehicle Battery							
CKP+	Negative terminal							
CKP-	Negative terminal							
JD10	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.						

JD9-JD10

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

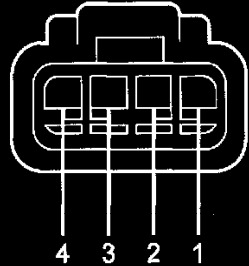
This pinpoint test is intended to diagnose the following:

- ignition coil packs (12029)
- ignition coil harness
- IGN START/RUN circuit to coil packs
- powertrain control module (PCM) (12A650)

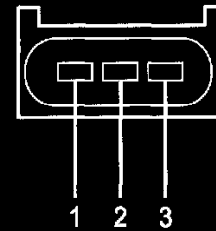
Pinpoint Test Schematics and Connectors

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

Coil Pack Assembly Connector

A

N0048012

B

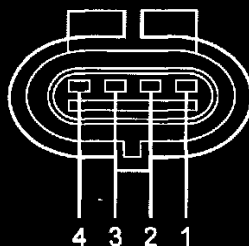
N0048010

Description, Pinpoint Test Schematics And Connectors And Coil Pack Assembly Connector

Integrated Ignition Coil Pack A, B, or C Failure

JE

C



N0048011

Vehicle	Connector	Pin	Circuit
F-150	A	2 3 1 4	CD C CD B CD A IGN START/RUN
Ranger 2.3L	B	3 1 2	CD B CD A IGN START/RUN
Ranger 3.0L	A	2 1 3 4	CD C CD B CD A IGN START/RUN
Ranger 4.0L	C	3 4 2 1	CD C CD B CD A IGN START/RUN
All other vehicles	C	3 2 4 1	CD C CD B CD A IGN START/RUN

IGNITION COIL TO CYLINDER CORRELATION

Vehicle	Related DTC	Cylinder Number	Ignition Coil	Coil Driver (CD)	PCM Pin
2.3L Ranger	P0351	1	A	A	E17
	P0352	2	B	B	E12
	P0352	3	B	B	E12
	P0351	4	A	A	E17
3.0L/4.0L Ranger	P0351	1	A	A	E12
	P0353	2	C	C	E16
	P0352	3	B	B	E17
	P0352	4	B	B	E17

(Continued)

Coil Pack Assembly Connector And Ignition Coil To Cylinder Correlation

Integrated Ignition Coil Pack A, B, or C Failure

JE

IGNITION COIL TO CYLINDER CORRELATION

Vehicle	Related DTC	Cylinder Number	Ignition Coil	Coil Driver (CD)	PCM Pin
	P0351	5	A	A	E12
	P0353	6	C	C	E16
All others	P0351	1	A	A	E17
	P0353	2	C	C	E16
	P0352	3	B	B	E12
	P0352	4	B	B	E12
	P0351	5	A	A	E17
	P0353	6	C	C	E16

Test Step		Results / Action to Take
JE1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	Yes GO to JE2. No For all other DTCs, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
	Are DTCs P0350, P0351, P0352, or P0353 present?	
JE2	DETERMINE WHICH COIL IS NOT FIRING PROPERLY	Yes GO to JE3. No To obtain the required information, REPEAT step JE2.
	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. - Is the suspect cylinder number, coil driver and PCM pin number recorded?	

JE1-JE2

Integrated Ignition Coil Pack A, B, or C Failure

JE

Test Step		Results / Action to Take				
JE3	DTC P0351, P0352, P0353: CHECK IGN START/RUN VOLTAGE TO THE COIL PACK - Suspect coil connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) Coil Pack Assembly Connector, Harness Side</td><td>(-)</td></tr><tr><td>IGN START/RUN</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) Coil Pack Assembly Connector, Harness Side	(-)	IGN START/RUN	Ground	Yes GO to JE4. No The IGN START/RUN has a circuit concern. 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 a short to ground. REPAIR as necessary. CARRY OUT the misfire monitor drive cycle. REFER to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle. CLEAR the DTCs. REPEAT the self-test.
(+) Coil Pack Assembly Connector, Harness Side	(-)					
IGN START/RUN	Ground					
JE4	CHECK THE FUNCTIONALITY OF THE SUSPECT COIL DRIVER (CD) CIRCUIT - Key in OFF position. - Connect a test lamp between IGN START/RUN and the suspect CD circuit (determined from the table) at the coil pack harness connector. - Crank the engine while the accelerator pedal is fully applied. - Observe the test lamp while cranking the engine. - Does the test lamp blink consistently?	Yes GO to JE8. No GO to JE5.				
JE5	CHECK THE SUSPECT CD CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) Coil Pack Assembly Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>Suspect coil driver</td><td>Suspect coil driver</td></tr></table> - Is the resistance less than 5 ohms?	(+) Coil Pack Assembly Connector, Harness Side	(-) PCM Connector, Harness Side	Suspect coil driver	Suspect coil driver	Yes GO to JE6. No REPAIR the open circuit. CARRY out the misfire monitor drive cycle. REFER to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle. CLEAR the DTCs. REPEAT the self-test.
(+) Coil Pack Assembly Connector, Harness Side	(-) PCM Connector, Harness Side					
Suspect coil driver	Suspect coil driver					

Integrated Ignition Coil Pack A, B, or C Failure

JE

Test Step		Results / Action to Take				
JE6	CHECK THE SUSPECT CD CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - Measure the voltage between:<table border="1"><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>Suspect coil driver</td><td>Ground</td></tr></table> - Is any voltage present?	(+) PCM Connector, Harness Side	(-)	Suspect coil driver	Ground	Yes REPAIR the short circuit. CARRY out the misfire monitor drive cycle. REFER to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle. CLEAR the DTCs. REPEAT the self-test. No GO to JE7.
(+) PCM Connector, Harness Side	(-)					
Suspect coil driver	Ground					
JE7	CHECK THE SUSPECT CD CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Key in OFF position. - Measure the resistance between:<table border="1"><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>Suspect coil driver</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-)	Suspect coil driver	Ground	Yes GO to JE9. No REPAIR the short circuit. CARRY out the misfire monitor drive cycle. REFER to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
Suspect coil driver	Ground					
JE8	CHECK THE SUSPECT COIL FOR DAMAGE - Key in OFF position. - Remove the spark plug wire from the suspect coil tower (as determined from the table). - Connect the Air Gap Spark Tester 303-D037 (D81P-6666-A) or equivalent to the suspect spark plug wire. - Crank the engine while the accelerator pedal is fully applied. - Observe the spark tester while cranking the engine. - Is a bluish-white spark present?	Yes GO to Pinpoint Test Z. 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. CLEAR the DTCs. REPEAT the self-test.				
JE9	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.				

JE6-JE9

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

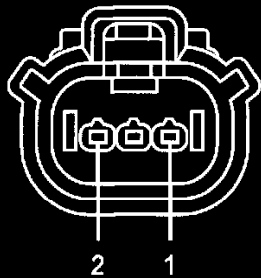
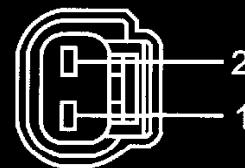
Integrated Ignition Coil On Plug Coil A Through J Failure

JF

This pinpoint test is intended to diagnose the following:

- ignition coils (12029)
- ignition coil harness
- ignition coils relay
- powertrain control module (PCM) (12A650)

Coil On Plug (COP) Connector

A**B**

N0048006

A0077505

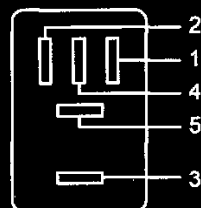
Vehicle	Connector	Pin	Circuit
Edge, MKX, MKZ, Taurus, Taurus X, Sable	A	1 2	COP IGN START/RUN
Escape/Mariner, Focus, Fusion, Milan, Mustang 5.4L	B	1 2	COP IGN START/RUN
All other vehicles	B	2 1	COP IGN START/RUN

Description And Coil On Plug (COP) Connector

Integrated Ignition Coil On Plug Coil A Through J Failure

JF

Ignition Coils Relay Connector



A0077584

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

IGNITION COIL TO CYLINDER CORRELATION

Vehicle	Related DTC	Cylinder Number	Ignition Coil	Coil Driver (CD)	PCM Pin
2.3L Escape, 2.3L Mariner	P0351	1	A	A	E1
	P0352	2	B	D	E12
	P0353	3	C	B	E24
	P0354	4	D	C	E35
Focus	P0351	1	A	A	E70
	P0352	2	B	D	E50
	P0353	3	C	B	E66
	P0354	4	D	C	E69
2.3L Fusion, 2.3L Milan	P0351	1	A	A	E17
	P0352	2	B	D	E11
	P0353	3	C	B	E12
	P0354	4	D	C	E16
6-Cylinder Applications	P0351	1	A	A	E17
	P0352	2	B	C	E16
	P0353	3	C	E	E15
	P0354	4	D	B	E12
	P0355	5	E	D	E11

(Continued)

Ignition Coils Relay Connector And Ignition Coil To Cylinder Correlation

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	F	E10
3.0L Escape, 3.0L Mariner	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
	P0356	6	F	F	E22
8-Cylinder Applications	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
10-Cylinder Applications	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

Test Step		Results / Action to Take
JF1	DETERMINE WHICH COIL IS NOT FIRING PROPERLY Note: Electronic ignition engine timing is entirely controlled by the PCM. Electronic ignition timing is NOT adjustable. Do not attempt to check base timing. You will receive false readings. - Determine which coil is not firing properly using 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. Is the suspect cylinder number, coil driver and PCM pin number recorded?	Yes GO to JF2. No REPEAT the test step to obtain the required information.

JF1

Integrated Ignition Coil On Plug Coil A Through J Failure

JF

Test Step		Results / Action to Take			
JF2	CHECK THE FUNCTIONALITY OF THE SUSPECT COIL DRIVER CIRCUIT	Yes GO to JF3. No GO to JF4.			
	- Key in OFF position. - Suspect coil connector disconnected. - Connect a non-powered test lamp between the IGN START/RUN and suspect coil driver, harness side. - Crank the engine while the accelerator pedal is fully applied. - Observe the test lamp while cranking the engine. - Is the test lamp blinking consistently?				
JF3	CHECK THE FUNCTIONALITY OF THE SUSPECT COIL	Yes GO to Pinpoint Test Z. No INSTALL a new suspect coil. If necessary, INSTALL a new spark plug. CLEAR the DTCs. REPEAT the self-test.			
	- Key in OFF position. - 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 equivalent. - Suspect coil connector connected. - Crank the engine. - Observe the spark tester while cranking the engine. - Is a bluish-white spark present?				
JF4	CHECK THE IGN START/RUN VOLTAGE TO THE SUSPECT COIL	Yes GO to JF5. No For Crown Victoria, Grand Marquis, and Town Car, GO to JF9. For all others, REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.			
	- Key ON, engine OFF. - Suspect coil connector disconnected. - Measure the voltage between:<table border="1"><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 V?		(+) COP Connector, Harness Side	(-) Vehicle Battery	IGN START/RUN
(+) COP Connector, Harness Side	(-) Vehicle Battery				
IGN START/RUN	Negative terminal				
JF5	CHECK THE SUSPECT COIL DRIVER CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to JF6. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.			
	- Key in OFF position. - PCM connector disconnected. - Suspect coil connector disconnected. - Measure the resistance between:<table border="1"><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
(+) PCM Connector, Harness Side	(-) COP Connector, Harness Side				
Suspect coil driver	COP				

Integrated Ignition Coil On Plug Coil A Through J Failure

JF

Test Step		Results / Action to Take				
JF6	CHECK THE SUSPECT COIL DRIVER CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - 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 GO to JF7. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
Suspect coil driver	Negative terminal					
JF7	CHECK THE SUSPECT COIL DRIVER CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Key in OFF position. - 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 GO to JF12. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. If the concern or DTC is still present, GO to JF8.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
Suspect coil driver	Negative terminal					
JF8	CHECK THE SUSPECT COIL FOR DAMAGE - PCM connector connected. - Connect the Air Gap Spark Tester 303-D037 (D81P-6666-A) or equivalent to the suspect coil. - Crank the engine while the accelerator pedal is fully applied. - Observe the spark tester while cranking the engine. - Is a bluish-white spark present?	Yes If necessary, INSTALL a new spark plug. CLEAR the DTCs. REPEAT the self-test. No INSTALL a new suspect coil. CLEAR the DTCs. REPEAT the self-test.				
JF9	CHECK VPWR CIRCUIT CONTINUITY BETWEEN THE SUSPECT COIL AND IGNITION COILS RELAY - Key in OFF position. - Ignition Coils Relay connector disconnected. - Measure the resistance between:<table><tr><td>(+) Ignition Coils Relay Connector, Harness Side</td><td>(-) Suspect coil Connector, Harness Side</td></tr><tr><td>VPWR - Pin 3</td><td>IGN START/RUN</td></tr></table> - Is the resistance less than 5 ohms?	(+) Ignition Coils Relay Connector, Harness Side	(-) Suspect coil Connector, Harness Side	VPWR - Pin 3	IGN START/RUN	Yes GO to JF10. No REPAIR the open circuit. The open is between the splice and the ignition coils relay. CLEAR the DTCs. REPEAT the self-test.
(+) Ignition Coils Relay Connector, Harness Side	(-) Suspect coil Connector, Harness Side					
VPWR - Pin 3	IGN START/RUN					

Integrated Ignition Coil On Plug Coil A Through J Failure

JF

Test Step		Results / Action to Take						
JF10	CHECK THE B+ AND IGN START/RUN VOLTAGE TO IGNITION COILS RELAY - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) Ignition Coils Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>B+ - Pin 5</td><td>Ground</td></tr><tr><td>IGN START/RUN - Pin 2</td><td>Ground</td></tr></table> - Are the voltages greater than 10 V?	(+) Ignition Coils Relay Connector, Harness Side	(-)	B+ - Pin 5	Ground	IGN START/RUN - Pin 2	Ground	Yes GO to JF11. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Ignition Coils Relay Connector, Harness Side	(-)							
B+ - Pin 5	Ground							
IGN START/RUN - Pin 2	Ground							
JF11	CHECK THE IGNITION COILS RELAY GND CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the voltage between:<table><tr><td>(+) Ignition Coils Relay Connector, Harness Side</td><td>(-) Ignition Coils Relay Connector, Harness Side</td></tr><tr><td>B+ - Pin 5</td><td>GND - Pin 1</td></tr></table> - Is the voltage greater than 10 V?	(+) Ignition Coils Relay Connector, Harness Side	(-) Ignition Coils Relay Connector, Harness Side	B+ - Pin 5	GND - Pin 1	Yes INSTALL a new Ignition Coils relay. CLEAR the DTCs. REPEAT the self-test. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) Ignition Coils Relay Connector, Harness Side	(-) Ignition Coils Relay Connector, Harness Side							
B+ - Pin 5	GND - Pin 1							
JF12	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.						

JF10-JF12

Test KA: Fuel Pump (FP) Relay

PINPOINT TEST KA: FUEL PUMP (FP) RELAY

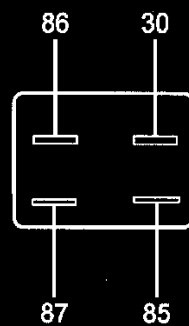
Fuel Pump (FP) Relay**KA**

This pinpoint test is intended to diagnose the following:

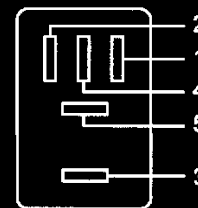
- fuel pump relay (9345)
- inertia fuel shutoff (IFS) switch (9341)
- harness circuits: B+, VPWR, FP, GND, FPM, and FP PWR
- powertrain control module (PCM) (12A650)

Fuel Pump (FP) Relay Connector

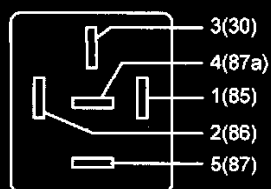
The VPWR and FP circuits may be reversed in the harness connector. Refer to Vehicle/Diagrams for schematic and connector information.

A

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B

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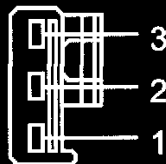
C

A0077582

Description And Fuel Pump (FP) Relay Connector

Fuel Pump (FP) Relay**KA**

Vehicle	Connector	Pin	Circuit
Expedition, Focus, Navigator, Sable, Taurus, Taurus X	A	30 87 85 86	B+ FPPWR FP VPWR
Ranger	B	3 5 1 2	B+ FPPWR FP VPWR
All other vehicles	C	3 5 1 2	B+ FPPWR FP VPWR

Inertia Fuel Shutoff (IFS) Switch Connector

A0077528

Pin	Circuit
1	FPPWR-B (Fuel Pump Power - B)
2	FPPWR-A (Fuel Pump Power - A)

Powertrain Control Module (PCM) Connector

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

Fuel Pump (FP) Relay**KA**

Vehicle	Connector	Pin	Circuit
Expedition, Fusion, Milan, MKZ, Navigator	140 Pin	B30 B62	FPM FP
Focus	190 Pin	B32 B19	FPM FP
Ranger	170 Pin	B21 B12	FPM FP
All other vehicles	190 Pin	B30 B62	FPM FP

Test Step		Results / Action to Take
KA1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs) Are DTCs P0230, P0231, P0232, or P1641 present?	Yes For KOEO and KOER DTCs P0230 or P1641, GO to KA2 . For continuous memory DTCs P0230 or P1641, GO to KA32 . For KOEO and KOER DTC P0231, GO to KA24 . For continuous memory DTC P0231, GO to KA31 . For KOEO and KOER DTC P0232, GO to KA12 . For continuous memory DTC P0232, GO to KA29 . No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
KA2	KOEO AND KOER DTCs P0230 AND P1641: CHECK FOR THE PRESENCE OF DTC P0685 OR P0690 - Check for self-test DTCs. - Are DTCs P0685 or P0690 present?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to KA3 .

KA1-KA2

Fuel Pump (FP) Relay

KA

Test Step		Results / Action to Take				
KA3	CHECK THE VPWR VOLTAGE TO FUEL PUMP RELAY - FP Relay connector disconnected. - Key ON, engine OFF. - 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 V?	(+) FP Relay Connector, Harness Side	(-)	VPWR	Ground	Yes GO to KA4. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FP Relay Connector, Harness Side	(-)					
VPWR	Ground					
KA4	CHECK THE FUEL PUMP RELAY - Key in OFF position. - Carry out the FP relay component test. - Does the FP relay pass the component test?	Yes GO to KA5. No INSTALL a new FP relay. CLEAR the DTCs. REPEAT the self-test.				
KA5	CHECK THE FP CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - PCM connector disconnected. - Key ON, engine OFF. - 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 GO to KA6. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FP Relay Connector, Harness Side	(-)					
FP	Ground					
KA6	CHECK THE FUEL PUMP CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Key in OFF position. - 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 KA7. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FP Relay Connector, Harness Side	(-)					
FP	Ground					
KA7	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</td></tr></table> - Is the resistance less than 5 ohms?	(+) FP Relay Connector, Harness Side	(-) PCM Connector, Harness Side	FP	FP	Yes GO to KA8. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FP Relay Connector, Harness Side	(-) PCM Connector, Harness Side					
FP	FP					

KA3-KA7

Fuel Pump (FP) Relay**KA**

Test Step		Results / Action to Take
KA8	CHECK FOR KOEO DTCS	Yes GO to KA9 . No GO to KA34 .
	- Check for KOEO DTCS. - Are DTCS P0231 or P0232 present?	
KA9	CHECK THE FP PRIMARY CIRCUIT INSIDE THE PCM	Yes GO to KA34 . No GO to KA10 .
	- PCM connector connected. - FP Relay connector connected. - Key ON, engine OFF. - Access the PCM and monitor the FPF PID. - Is the PID state YES?	
KA10	CHECK THE FUEL PUMP PRIMARY CIRCUIT INSIDE THE PCM WHILE CRANKING THE ENGINE	Yes GO to KA34 . No The fuel pump primary circuit is OK in the harness and PCM. GO to KA11 .
	- Access the PCM and monitor the FPF PID. - While observing the PID, crank the engine. - Does the PID display indicate a concern during crank?	
KA11	IS DTC P0231 PRESENT IN THE KOEO SELF-TEST?	Yes GO to KA24 . No GO to KA12 .
	- Check for KOEO DTCS. - Is DTC P0231 present?	
KA12	KOEO AND KOER DTC P0232: DOES THE ENGINE START?	Yes GO to KA13 . No GO to KA18 .
	Does the engine start?	
KA13	VERIFY THE FUEL PUMP IS OFF	Yes GO to KA15 . No GO to KA14 .
	- Key ON, engine OFF. - 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?	

KA8-KA13

Fuel Pump (FP) Relay

KA

Test Step		Results / Action to Take			
KA14	CHECK FOR FUEL PUMP RELAY CONTACTS ALWAYS CLOSED	Yes INSTALL a new FP relay. CLEAR the DTCs. REPEAT the self-test. No REPAIR the short circuit. The short circuit is between the FPPWR and FPM circuits or in the INJPWRM circuit. CLEAR the DTCs. REPEAT the self-test.			
	- FP Relay connector disconnected. - Key ON, engine OFF. - Is fuel pump off with the key ON?				
KA15	CHECK THE FPM CIRCUIT FOR AN OPEN IN THE HARNESS	Yes GO to KA16. No REPAIR the open circuit. The concern is between the splice and the PCM. CLEAR the DTCs. REPEAT the self-test.			
	- 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</td></tr></table> - Is the resistance less than 5 ohms?		(+) FP Relay Connector, Harness Side	(-) PCM Connector, Harness Side	FPPWR
(+) FP Relay Connector, Harness Side	(-) PCM Connector, Harness Side				
FPPWR	FPM				
KA16	IS KOEO DTC P0231 PRESENT?	Yes GO to KA34. No GO to KA17.			
	- Check for KOEO DTCs. - Is DTC P0231 present?				
KA17	CHECK THE FPM PRIMARY CIRCUIT INSIDE THE PCM	Yes The concern is not present at this time. The FPM circuit is OK in the harness and PCM. Disregard DTC P0232 at this time. RETURN to Symptom Charts for further direction. No GO to KA34.			
	- PCM connector connected. - FP Relay connector connected. - Key ON, engine OFF. - Access the PCM and monitor the FPM PID. - Is the PID state OFF?				
KA18	CHECK IF THE INERTIA FUEL SHUTOFF (IFS) SWITCH IS TRIPPED	Yes RESET the IFS switch. CLEAR the DTCs. REPEAT the self-test. No GO to KA19.			
	Is the IFS switch tripped?				

Fuel Pump (FP) Relay

KA

Test Step		Results / Action to Take				
KA19	CHECK THE INERTIA FUEL SHUTOFF - IFS Switch connector disconnected. - Measure the resistance between:<table><tr><td>(+) IFS Switch Connector, Component Side</td><td>(-) IFS Switch Connector, Component Side</td></tr><tr><td>FPPWR-A - Pin 2</td><td>FPPWR-B - Pin 1</td></tr></table> - Is the resistance less than 5 ohms?	(+) IFS Switch Connector, Component Side	(-) IFS Switch Connector, Component Side	FPPWR-A - Pin 2	FPPWR-B - Pin 1	Yes GO to KA20. No INSTALL a new IFS switch. CLEAR the DTCs. REPEAT the self-test.
(+) IFS Switch Connector, Component Side	(-) IFS Switch Connector, Component Side					
FPPWR-A - Pin 2	FPPWR-B - Pin 1					
KA20	CHECK THE FP PWR CIRCUIT FOR AN OPEN IN THE HARNESS - FP Relay connector disconnected. - Measure the resistance between:<table><tr><td>(+) IFS Switch Connector, Harness Side</td><td>(-) FP Relay Connector, Harness Side</td></tr><tr><td>FPPWR-A - Pin 2</td><td>FPPWR</td></tr></table> - Is the resistance less than 5 ohms?	(+) IFS Switch Connector, Harness Side	(-) FP Relay Connector, Harness Side	FPPWR-A - Pin 2	FPPWR	Yes GO to KA21. No REPAIR the open circuit. CHECK for an open circuit between the IFS switch and the FPM splice. REFER to Vehicle/Diagrams for schematic and connector information. CLEAR the DTCs. REPEAT the self-test.
(+) IFS Switch Connector, Harness Side	(-) FP Relay Connector, Harness Side					
FPPWR-A - Pin 2	FPPWR					
KA21	CHECK THE FUEL PUMP GROUND CIRCUIT FOR AN OPEN IN THE HARNESS - FP connector disconnected. - Measure the resistance between:<table><tr><td>(+) FP Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPGND</td><td>Ground</td></tr></table> - Is the resistance less than 5 ohms?	(+) FP Connector, Harness Side	(-)	FPGND	Ground	Yes GO to KA22. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FP Connector, Harness Side	(-)					
FPGND	Ground					
KA22	CHECK THE FP PWR CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) FP Connector, Harness Side</td><td>(-) IFS Switch Connector, Harness Side</td></tr><tr><td>FPPWR</td><td>FPPWR-B - Pin 1</td></tr></table> - Is the resistance less than 5 ohms?	(+) FP Connector, Harness Side	(-) IFS Switch Connector, Harness Side	FPPWR	FPPWR-B - Pin 1	Yes GO to KA23. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FP Connector, Harness Side	(-) IFS Switch Connector, Harness Side					
FPPWR	FPPWR-B - Pin 1					

Fuel Pump (FP) Relay

KA

Test Step		Results / Action to Take				
KA23	CHECK THE INTERNAL RESISTANCE OF THE FUEL PUMP - 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 The fuel pump circuit is OK in the harness and PCM. Disregard DTC P0232 at this time. RETURN to Symptom Charts for further direction. No INSTALL a new FP. CLEAR the DTCs. REPEAT the self-test.
(+) FP Connector, Har- ness Side	(-) FP Connector, Har- ness Side					
FPPWR	FPGND					
KA24	KOEO AND KOER DTC P0231: IS KOEO DTC P0230 ALSO PRESENT? - Check for KOEO DTCs. - Is DTC P0230 present?	Yes GO to KA3. No GO to KA25.				
KA25	DOES THE ENGINE START? Does the engine start?	Yes GO to KA15. No GO to KA26.				
KA26	CHECK IF THE IFS SWITCH IS TRIPPED Is the IFS switch tripped?	Yes RESET the IFS switch. CLEAR the DTCs. REPEAT the self-test. No GO to KA27.				
KA27	CHECK THE B+ CIRCUIT VOLTAGE TO THE FP RELAY - FP Relay connector disconnected. - Measure the voltage between:<table><tr><td>(+) FP Relay Connec- tor, Harness Side</td><td>(-)</td></tr><tr><td>B+</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) FP Relay Connec- tor, Harness Side	(-)	B+	Ground	Yes GO to KA28. No A B+ circuit concern is present. 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 a short to ground before installing a new fuse/fuse link. CLEAR the DTCs. REPEAT the self-test.
(+) FP Relay Connec- tor, Harness Side	(-)					
B+	Ground					

Fuel Pump (FP) Relay

KA

Test Step		Results / Action to Take				
KA28	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. CLEAR the DTCs. REPEAT the self-test. No REPAIR the open circuit. The open is between the splice and the FP relay. CLEAR the DTCs. REPEAT the self-test.
(+) FP Relay Connector, Harness Side	(-)					
FPPWR	Ground					
KA29	CONTINUOUS MEMORY DTC P0232: IS A CONTINUOUS DTC P0230 PRESENT? - Check for continuous memory DTCs. - Is DTC P0230 present?	Yes GO to KA33. No GO to KA30.				
KA30	CHECK THE FUEL PUMP SECONDARY CIRCUITS FOR A CONCERN Note: Be aware that DTC P0232 could be set if the IFS switch is tripped then reset, or if voltage is supplied to the FP PWR circuit when the PCM expects the fuel pump to be off. The fuel pump prime procedure produces this. Note: The FPM PID turns ON when a concern is present. - Key ON, engine OFF. - Access the PCM and monitor the FPM PID. - Observe the FPM PID for an indication of a concern while carrying out the following: - 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 - Shake, wiggle, and bend the INJPWRM 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 ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.				

KA28-KA30

Fuel Pump (FP) Relay**KA**

Test Step		Results / Action to Take								
KA31	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</td><td>Ground</td></tr></table> - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPM</td><td>Ground</td></tr></table> - The FP turns on and the voltage will be greater than 10 V. - Check for an indication of a concern while carrying out the following. The voltage changes suddenly when a concern is present. - Shake, wiggle, and bend the B+ supply to the FP relay - Shake, wiggle, and bend the FP PWR circuit between the FP relay and the FPM splice - Lightly tap on the FP relay to simulate road shock - Key in OFF position. - Visually inspect the FP relay and its loom connector for damage and corrosion. - Is a concern present?	Point A PCM Connector, Harness Side	Point B	FP	Ground	(+) PCM Connector, Harness Side	(-)	FPM	Ground	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.
Point A PCM Connector, Harness Side	Point B									
FP	Ground									
(+) PCM Connector, Harness Side	(-)									
FPM	Ground									
KA32	CONTINUOUS MEMORY DTC P0230: CHECK FOR THE PRESENCE OF DTC P0685 OR P0690 - Check for self-test DTCs. - Are DTCs P0685 or P0690 present?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to KA33.								

Fuel Pump (FP) Relay**KA**

Test Step		Results / Action to Take
KA33	CHECK THE FP PRIMARY CIRCUITS	
Note: The PID indicates YES when a concern is present. • Key ON, engine OFF. • Wait for 5 seconds. • Access the PCM and monitor the FPF PID. • Observe the FPF PID for an indication of a concern while carrying out the following: — Shake, wiggle, and bend the FP circuit between the PCM and the FP relay — Shake, wiggle, and bend the VPWR circuit between the electronic engine control power relay and the FP relay — Lightly tap on the FP relay to simulate road shock • Key in OFF position. • Visually inspect the PCM connector and wires as far back as the main loom for damage. • Visually inspect the FPR connector and wires as far back as the main loom for damage. • Is a concern present?		Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.
KA34	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

KA33-KA34

Test KB: Fuel Pump Driver Module

PINPOINT TEST KB: FUEL PUMP DRIVER MODULE

Fuel Pump Driver Module

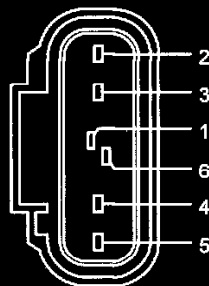
KB

⚠ WARNING: Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.

This pinpoint test is intended to diagnose the following:

- fuel pump driver module (FPDM) (9D370) and (9D372)
- FPDM power supply relay
- inertia fuel shutoff (IFS) switch (9341)
- harness circuits: B+, GND, FPC, FPM, FPM2, FP PWR, FP2PWR, FP RTN, FP2RTN, VPWR Fuel, VPWR Fuel 2, and PWRGND
- powertrain control module (PCM) (12A650)

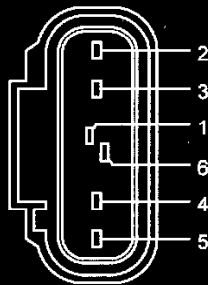
Fuel Pump Driver Module (FPDM) Connector



A0077514

Pin	Circuit
2	FPRTN (Fuel Pump Return)
4	FPPWR (Fuel Pump Power)
6	FPC (Fuel Pump Control)
1	FPM (Fuel Pump Monitor)
3	PWRGND (Power Ground)
5	VPWR Fuel

Warning And Fuel Pump Driver Module (FPDM) Connector

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

A0077514

Pin	Circuit
2	FP2RTN (Fuel Pump 2 Return)
4	FP2PWR (Fuel Pump 2 Power)
6	FPC (Fuel Pump Control)
1	FPM2 (Fuel Pump Monitor 2 - Rear/Secondary Pump)
3	PWRGND (Power Ground)
5	VPWR Fuel 2

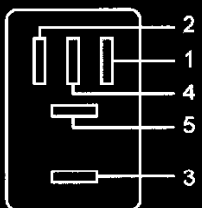
Fuel Pump Driver Module Power (FPDM PWR) Relay Connector

Refer to the Vehicle/Diagrams for schematic and connector information. For F-150 and Mark LT, the FPDM PWR relay is integral to the PDJB.

Fuel Pump Driver Module

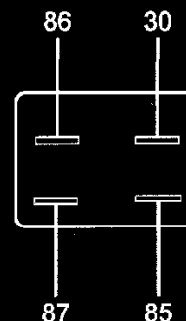
KB

A



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B



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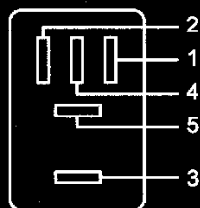
Vehicle	Connector	Pin	Circuit
Crown Victoria, Grand Marquis, Town Car	A	5 1 2 3	VPWR Fuel GND VPWR B+
Escape/Mariner, F-Super Duty	B	87 85 86 30	VPWR Fuel GND VPWR B+
All other vehicles	A	5 2 1 3	VPWR Fuel GND VPWR B+

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

Refer to the Vehicle/Diagrams for schematic and connector information.

Fuel Pump Driver Module

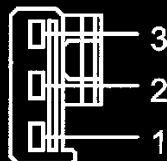
KB



A0077584

Pin	Circuit
5	VPWR Fuel 2
2	GND (Ground)
1	VPWR (Vehicle Power)
3	B+ (Battery Positive Voltage)

Inertia Fuel Shutoff (IFS) Switch Connector

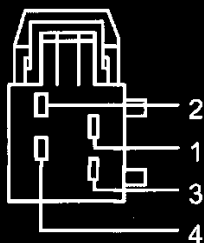


A0077528

Pin	Circuit
2	VPWR Fuel - A
1	VPWR Fuel - B

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

This applies to applications with an FPDM PWR relay integral to the PDJB.



A0077565

Pin	Circuit
3	VPWR Fuel

Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
Escape/Mariner	150 (50-50-50) Pin	B12 B21	FPC FPM
F-150, Mark LT	190 Pin	B62 B30	FPC FPM
Mustang 5.4L	170 Pin	T18 B12 B21	FPM2 FPC FPM
All other vehicles	170 Pin	B12 B21	FPC FPM

Power Distribution Junction Box (PDJB) Connector And Powertrain Control Module (PCM) Connector

Fuel Pump Driver Module**KB**

Test Step		Results / Action to Take
KB1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs) Are DTCs P1233, P1234, P1235, P1236, P1237, P1238, or P1641 present?	Yes For DTC P1233, GO to KB2 . For DTC P1234, GO to KB38 . For DTCs P1235 or P1641, GO to KB20 . For DTC P1236, GO to KB50 . For DTC P1237, GO to KB26 . For DTC P1238, GO to KB56 . No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
KB2	DTC P1233: IS DTC P1233 PRESENT IN THE KOEO SELF-TEST? Note: The Mustang 5.4L is equipped with 2 FPDMs. The DTC P1233 applies to the FPDM mounted on the driver side of the luggage compartment. - Check for KOEO DTCs. - Is DTC P1233 present?	Yes GO to KB3 . 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. For a no start (engine cranks), DISREGARD the DTC at this time. RETURN to Symptom Charts and continue as directed. After repairing the no start, to diagnose the intermittent causes of P1233, GO to KB19 . For all others, GO to KB19 .
KB3	DOES THE ENGINE START? Note: The Mustang 5.4L starts with 1 FPDM disabled. Does the engine start?	Yes For Mustang 5.4L, GO to KB4 . For all others, to check the FPM circuit, GO to KB15 . No VERIFY the IFS switch is set (button pressed). If OK, GO to KB4 .

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB4	CHECK THE VOLTAGE AND GROUND CIRCUITS TO THE FPDM - FPDM connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-) FPDM Connector, Harness Side</td></tr><tr><td>VPWR Fuel - Pin 5</td><td>PWRGND - Pin 3</td></tr></table> - Is the voltage greater than 10 V?	(+) FPDM Connector, Harness Side	(-) FPDM Connector, Harness Side	VPWR Fuel - Pin 5	PWRGND - Pin 3	Yes For Mustang 5.4L, to check the FPM circuit, GO to KB15 . For all others, INSTALL a new FPDM. CLEAR the DTCs. REPEAT the self-test. No GO to KB5 .
(+) FPDM Connector, Harness Side	(-) FPDM Connector, Harness Side					
VPWR Fuel - Pin 5	PWRGND - Pin 3					
KB5	CHECK THE VOLTAGE TO THE FPDM - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR Fuel - Pin 5</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) FPDM Connector, Harness Side	(-)	VPWR Fuel - Pin 5	Ground	Yes REPAIR the open circuit. The FPDM ground circuit is open. CLEAR the DTCs. REPEAT the self-test. No There is no voltage to the FPDM. For F-150, and Mark LT, GO to KB11 . For all others, GO to KB6 .
(+) FPDM Connector, Harness Side	(-)					
VPWR Fuel - Pin 5	Ground					
KB6	CHECK THE B+ VOLTAGE TO THE FPDM POWER SUPPLY RELAY - Key in OFF position. - 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+</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) FPDM PWR Relay Connector, Harness Side	(-)	B+	Ground	Yes GO to KB7 . No A B+ circuit concern is present. 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 a short to ground before installing a new fuse/fuse link. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM PWR Relay Connector, Harness Side	(-)					
B+	Ground					

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take								
KB7	CHECK THE VPWR VOLTAGE TO THE FPDM POWER SUPPLY RELAY - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) FPDM PWR Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) FPDM PWR Relay Connector, Harness Side	(-)	VPWR	Ground	Yes GO to KB8. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.				
(+) FPDM PWR Relay Connector, Harness Side	(-)									
VPWR	Ground									
KB8	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</td><td>Ground</td></tr></table> - Is the resistance less than 5 ohms?	(+) FPDM PWR Relay Connector, Harness Side	(-)	GND	Ground	Yes GO to KB9. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.				
(+) FPDM PWR Relay Connector, Harness Side	(-)									
GND	Ground									
KB9	CHECK THE VPWR FUEL 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>VPWR Fuel - Pin 5</td><td>VPWR Fuel</td></tr></table> - Is the resistance less than 5 ohms?	(+) FPDM Connector, Harness Side	(-) FPDM PWR Relay Connector, Harness Side	VPWR Fuel - Pin 5	VPWR Fuel	Yes INSTALL a new FPDM relay. CLEAR the DTCs. REPEAT the self-test. No GO to KB10.				
(+) FPDM Connector, Harness Side	(-) FPDM PWR Relay Connector, Harness Side									
VPWR Fuel - Pin 5	VPWR Fuel									
KB10	ISOLATE THE OPEN IN THE FPDM CIRCUIT - IFS Switch connector disconnected. - Measure the resistance between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-) IFS Switch Connector, Harness Side</td></tr><tr><td>VPWR Fuel - Pin 5</td><td>VPWR Fuel - B - Pin 1</td></tr></table> - Measure the resistance between:<table><tr><td>(+) FPDM PWR Relay Connector, Harness Side</td><td>(-) IFS Switch Connector, Harness Side</td></tr><tr><td>VPWR Fuel</td><td>VPWR Fuel - A - Pin 2</td></tr></table> - Is the resistance less than 5 ohms?	(+) FPDM Connector, Harness Side	(-) IFS Switch Connector, Harness Side	VPWR Fuel - Pin 5	VPWR Fuel - B - Pin 1	(+) FPDM PWR Relay Connector, Harness Side	(-) IFS Switch Connector, Harness Side	VPWR Fuel	VPWR Fuel - A - Pin 2	Yes INSTALL a new IFS switch. VERIFY the IFS switch is set (button pressed). CLEAR the DTCs. REPEAT the self-test. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM Connector, Harness Side	(-) IFS Switch Connector, Harness Side									
VPWR Fuel - Pin 5	VPWR Fuel - B - Pin 1									
(+) FPDM PWR Relay Connector, Harness Side	(-) IFS Switch Connector, Harness Side									
VPWR Fuel	VPWR Fuel - A - Pin 2									

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB11	CHECK THE FUEL PUMP FUSE Note: These steps are for applications with a FPDM PWR relay integral to the PDJB. • Key In OFF position. • Check the FPDM power supply relay fuse. Refer to the Vehicle/Diagrams for schematic and connector information. • Is the fuse OK?	Yes GO to KB12 . No INSTALL a new fuse. CHECK the associated circuits for a short to ground before installing the fuse. CLEAR the DTCs. REPEAT the self-test.				
KB12	CHECK FOR VOLTAGE TO THE IFS SWITCH • IFS Switch connector disconnected. • Key ON, engine OFF. • Measure the voltage between:<table><tr><td>(+) IFS Switch Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR Fuel - A - Pin 2</td><td>Ground</td></tr></table> • Is the voltage greater than 10 V?	(+) IFS Switch Connector, Harness Side	(-)	VPWR Fuel - A - Pin 2	Ground	Yes GO to KB14 . No GO to KB13 .
(+) IFS Switch Connector, Harness Side	(-)					
VPWR Fuel - A - Pin 2	Ground					
KB13	CHECK THE VPWR FUEL CIRCUIT FOR AN OPEN BETWEEN THE IFS AND PDJB • Key in OFF position. • PDJB connector disconnected. Refer to Vehicle/Diagrams for schematic and connector information. • Measure the resistance between:<table><tr><td>(+) IFS Switch Connector, Harness Side</td><td>(-) PDJB Connector, Harness Side</td></tr><tr><td>VPWR Fuel - A - Pin 2</td><td>VPWR Fuel - Pin 3</td></tr></table> • Is the resistance less than 5 ohms?	(+) IFS Switch Connector, Harness Side	(-) PDJB Connector, Harness Side	VPWR Fuel - A - Pin 2	VPWR Fuel - Pin 3	Yes CHECK the fuel pump fuse. REPAIR as necessary. If OK, INSTALL a new FP RLY/PDJB. CLEAR the DTCs. REPEAT the self-test. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) IFS Switch Connector, Harness Side	(-) PDJB Connector, Harness Side					
VPWR Fuel - A - Pin 2	VPWR Fuel - Pin 3					
KB14	CHECK THE IFS FOR AN OPEN • Key in OFF position. • Measure the resistance between:<table><tr><td>(+) IFS Switch Connector, Component Side</td><td>(-) IFS Switch Connector, Component Side</td></tr><tr><td>VPWR Fuel - A - Pin 2</td><td>VPWR Fuel - B - Pin 1</td></tr></table> • Is the resistance less than 5 ohms?	(+) IFS Switch Connector, Component Side	(-) IFS Switch Connector, Component Side	VPWR Fuel - A - Pin 2	VPWR Fuel - B - Pin 1	Yes REPAIR the open circuit. The VPWR fuel circuit is open. CLEAR the DTCs. REPEAT the self-test. No INSTALL a new IFS switch. CLEAR the DTCs. REPEAT the self-test.
(+) IFS Switch Connector, Component Side	(-) IFS Switch Connector, Component Side					
VPWR Fuel - A - Pin 2	VPWR Fuel - B - Pin 1					

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB15	CHECK THE FPM CIRCUIT FOR AN OPEN IN THE HARNESS - FPDM connector disconnected. - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>FPM - Pin 1</td><td>FPM</td></tr></table> - Is the resistance less than 5 ohms?	(+) FPDM Connector, Harness Side	(-) PCM Connector, Harness Side	FPM - Pin 1	FPM	Yes GO to KB16. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM Connector, Harness Side	(-) PCM Connector, Harness Side					
FPM - Pin 1	FPM					
KB16	CHECK THE FPM CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPM - Pin 1</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) FPDM Connector, Harness Side	(-)	FPM - Pin 1	Ground	Yes GO to KB17. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM Connector, Harness Side	(-)					
FPM - Pin 1	Ground					
KB17	CHECK THE FPM CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPM - Pin 1</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) FPDM Connector, Harness Side	(-)	FPM - Pin 1	Ground	Yes GO to KB18. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM Connector, Harness Side	(-)					
FPM - Pin 1	Ground					
KB18	CHECK FOR FPM OUTPUT FROM THE FPDM Note: It is OK for the voltage to cycle below this range and then return within range. - FPDM connector connected. - Key ON, engine OFF. - 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 - 1 V?	(+) PCM Connector, Harness Side	(-)	FPM	Ground	Yes GO to KB64. No INSTALL a new FPDM. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
FPM	Ground					

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB19	CHECK THE CIRCUITS THAT MAY CAUSE AN INTERMITTENT LOSS OF VOLTAGE TO THE FPDM Note: Be aware that P1233 could be set if the IFS switch is tripped then reset. Note: With no concern present, the FPDM sends a 50% duty cycle (all OK) to the PCM on the FPM circuit. Depending on the scan tool type, the FPM PID may display 50%, or a random value that is fluctuating between 85% and 115%. • Key ON, engine OFF. • Access the PCM and monitor the FPM PID. • Observe the FPM PID for an indication of a concern while carrying out the following: — Shake, wiggle, and bend the PWRGND circuit to the FPDM — Shake, wiggle, and bend the VPWR fuel circuit to the FPDM — Shake, wiggle, and bend the FPM circuit between the FPDM and the PCM — Shake, wiggle, and bend the B+ and ground circuits to the FPDM power supply relay — Lightly tap on the IFS switch 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 • Is a concern present?	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.				
KB20	DTC P1235: IS DTC P1235 PRESENT IN THE KOEO SELF-TEST? Note: The Mustang 5.4L is equipped with 2 FPDMs. The DTC P1235 applies to the FPDM mounted on the driver side of the luggage compartment. 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?	Yes GO to KB21 . No GO to KB25 .				
KB21	CHECK THE FPC CIRCUIT FOR AN OPEN IN THE HARNESS • FPDM connector disconnected. • PCM connector disconnected. • Measure the resistance between:<table border="1"><tr><td>(+) PCM Connector, Harness Side</td><td>(-) FPDM Connector, Harness Side</td></tr><tr><td>FPC</td><td>FPC - Pin 6</td></tr></table> • Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) FPDM Connector, Harness Side	FPC	FPC - Pin 6	Yes GO to KB22 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) FPDM Connector, Harness Side					
FPC	FPC - Pin 6					

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB22	CHECK THE FPC CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - FPDM2 connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPC - Pin 6</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) FPDM Connector, Harness Side	(-)	FPC - Pin 6	Ground	Yes GO to KB23. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM Connector, Harness Side	(-)					
FPC - Pin 6	Ground					
KB23	CHECK THE FPC CIRCUIT FOR A SHORT TO GROUND - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPC - Pin 6</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) FPDM Connector, Harness Side	(-)	FPC - Pin 6	Ground	Yes GO to KB24. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM Connector, Harness Side	(-)					
FPC - Pin 6	Ground					
KB24	CHECK THE FPC CIRCUIT IN THE FPDM - FPDM connector connected. - FPDM2 connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPC</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) PCM Connector, Harness Side	(-)	FPC	Ground	Yes GO to KB64. No INSTALL a new FPDM. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
FPC	Ground					
KB25	CHECK THE FPC CIRCUIT FOR AN INTERMITTENT OPEN OR SHORTS Note: With no concern present, the FPDM sends a 50% duty cycle (all OK) to the PCM on the FPM circuit. Depending on the scan tool type, the FPM PID may display 50%, or a random value that is fluctuating between 85% and 115%. - Key ON, engine OFF. - Access the PCM and monitor the FPM PID. - Observe the FPM PID for an indication of a concern while carrying out the following: - Shake, wiggle, and bend the FPC circuit between FPDM and the PCM - Lightly tap on the FPDM to simulate road shock - Is a concern present?	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.				

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take			
KB26	DTC P1237: IS DTC P1237 PRESENT IN THE KOEO SELF-TEST?	Yes GO to KB27. No DTC P1237 is possibly intermittent, GO to KB33.			
	Note: The Mustang 5.4L is equipped with 2 FPDMs. The DTC P1237 applies to the FPDM mounted on the driver side of the luggage compartment. • Check for KOEO DTCs. • Is DTC P1237 present?				
KB27	DOES THE ENGINE START?	Yes GO to KB36. No GO to KB28.			
	Note: The Mustang 5.4L starts with 1 FPDM disabled. • FPDM2 connector disconnected. • Does the engine start?				
KB28	CHECK THE FPPWR, FPRTN AND INTERNAL FUEL PUMP CIRCUIT RESISTANCE	Yes GO to KB29. No ISOLATE the concern, GO to KB32.			
	• Key in OFF position. • 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 - Pin 4</td><td>FPRTN - Pin 2</td></tr></table> • Is the resistance less than 10 ohms?		(+) FPDM Connector, Harness Side	(-) FPDM Connector, Harness Side	FPPWR - Pin 4
(+) FPDM Connector, Harness Side	(-) FPDM Connector, Harness Side				
FPPWR - Pin 4	FPRTN - Pin 2				
KB29	CHECK THE FPRTN CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS	Yes GO to KB30. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.			
	• Key ON, engine OFF. • Measure the voltage between: <table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPRTN - Pin 2</td><td>Ground</td></tr></table> • Is the voltage less than 1 V?		(+) FPDM Connector, Harness Side	(-)	FPRTN - Pin 2
(+) FPDM Connector, Harness Side	(-)				
FPRTN - Pin 2	Ground				
KB30	CHECK THE FPPWR CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS	Yes GO to KB31. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.			
	• FP connector disconnected. • Measure the resistance between: <table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPPWR - Pin 4</td><td>Ground</td></tr></table> • Is the resistance greater than 10K ohms?		(+) FPDM Connector, Harness Side	(-)	FPPWR - Pin 4
(+) FPDM Connector, Harness Side	(-)				
FPPWR - Pin 4	Ground				

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take										
KB31	CHECK FOR VOLTAGE TO FP Note: During output test mode, the fuel pump stays commanded on for only about 5 seconds. - FPDM connector connected. - FP connector disconnected. - Key ON, engine OFF. - 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, Har- ness Side</td><td>(-) FP Connector, Har- ness Side</td></tr><tr><td>FPPWR</td><td>FPRTN</td></tr></table> - Is the voltage greater than 10 V?	(+) FP Connector, Har- ness Side	(-) FP Connector, Har- ness Side	FPPWR	FPRTN	Yes INSTALL a new FP. CLEAR the DTCs. REPEAT the self-test. 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. REPEAT as necessary. If OK, INSTALL a new FPDM. CLEAR the DTCs. REPEAT the self-test.						
(+) FP Connector, Har- ness Side	(-) FP Connector, Har- ness Side											
FPPWR	FPRTN											
KB32	ISOLATE THE OPEN 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 - Pin 4</td></tr><tr><td>FPRTN</td><td>FPRTN - Pin 2</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 - Pin 4	FPRTN	FPRTN - Pin 2	(+) FP Connector, Component Side	(-) FP Connector, Com- ponent Side	FPPWR	FPRTN	Yes Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z. No REPAIR the open circuit. If the open is internal to the pump, INSTALL a new FP. CLEAR the DTCs. REPEAT the self-test.
(+) FP Connector, Har- ness Side	(-) FPDM Connector, Harness Side											
FPPWR	FPPWR - Pin 4											
FPRTN	FPRTN - Pin 2											
(+) FP Connector, Component Side	(-) FP Connector, Com- ponent Side											
FPPWR	FPRTN											
KB33	VERIFY THE DTC P1237 IS INTERMITTENT - Key ON, engine OFF. - Access the PCM and monitor the FPM PID. - Is the FPM PID 75% (or varying between 250% and 400%)?	Yes A concern is present. GO to KB27. No CHECK for an intermittent concern. GO to KB34.										

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB34	CHECK THE FPPWR AND FPRTN CIRCUIT FOR AN INTERMITTENT OPEN OR SHORTS Note: With no concern present, the FPDM sends a 50% duty cycle (all OK) to the PCM on the FPM circuit. Depending on the scan tool type, the FPM PID may display 50%, or a random value that is fluctuating between 85% and 115%. • Key ON, engine OFF. • Access the PCM and monitor the FPM PID. • Observe the FPM PID for an indication of a concern while carrying out the following: — 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 concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to KB35.				
KB35	CHECK THE FPPWR CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS Note: The lamp turns on when a concern is present. • Key in OFF position. • FPDM connector disconnected. • Connect a non-powered test lamp between:<table border="1"><tr><td>(+) FPDM Connector, Harness Side</td><td>(-) FPDM Connector, Harness Side</td></tr><tr><td>FPPWR - Pin 4</td><td>VPWR Fuel - Pin 5</td></tr></table> • Key ON, engine OFF. • Observe the test lamp for an indication of a concern. 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 - Pin 4	VPWR Fuel - Pin 5
(+) FPDM Connector, Harness Side	(-) FPDM Connector, Harness Side					
FPPWR - Pin 4	VPWR Fuel - Pin 5					
KB36	CHECK THE FPPWR CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS • FPDM connector disconnected. • Key ON, engine OFF. • Measure the voltage between:<table border="1"><tr><td>(+) FPDM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPPWR - Pin 4</td><td>Ground</td></tr></table> • Is the voltage less than 1 V?	(+) FPDM Connector, Harness Side	(-)	FPPWR - Pin 4	Ground	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.
(+) FPDM Connector, Harness Side	(-)					
FPPWR - Pin 4	Ground					

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB37	CHECK THE FPRTN CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - FPDM connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) FPDM Connector, Harness Side</td><td>(-) FPDM Connector, Harness Side</td></tr><tr><td>VPWR Fuel - Pin 5</td><td>FPRTN - Pin 2</td></tr></table> - Is the voltage less than 1 V?	(+) FPDM Connector, Harness Side	(-) FPDM Connector, Harness Side	VPWR Fuel - Pin 5	FPRTN - Pin 2	Yes INSTALL a new FPDM. CLEAR the DTCs. REPEAT the self-test. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM Connector, Harness Side	(-) FPDM Connector, Harness Side					
VPWR Fuel - Pin 5	FPRTN - Pin 2					
KB38	DTC P1234: IS DTC P1234 PRESENT IN THE KOEO SELF-TEST? Note: The Mustang 5.4L is equipped with 2 FPDMs. The DTC P1234 applies to the FPDM2 mounted on the passenger side of the luggage compartment. - Check for KOEO DTCs. - Is DTC P1234 present?	Yes GO to KB39. 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 KB49.				
KB39	CHECK THE VOLTAGE AND GROUND CIRCUITS TO THE FPDM2 - FPDM2 connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-) FPDM2 Connector, Harness Side</td></tr><tr><td>VPWR Fuel 2 - Pin 5</td><td>PWRGND - Pin 3</td></tr></table> - Is the voltage greater than 10 V?	(+) FPDM2 Connector, Harness Side	(-) FPDM2 Connector, Harness Side	VPWR Fuel 2 - Pin 5	PWRGND - Pin 3	Yes To check the FPM2 circuit, GO to KB45. No GO to KB40.
(+) FPDM2 Connector, Harness Side	(-) FPDM2 Connector, Harness Side					
VPWR Fuel 2 - Pin 5	PWRGND - Pin 3					
KB40	CHECK VOLTAGE TO FPDM2 - Measure the voltage between:<table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR Fuel 2 - Pin 5</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) FPDM2 Connector, Harness Side	(-)	VPWR Fuel 2 - Pin 5	Ground	Yes REPAIR the open circuit. The FPDM2 ground circuit is open. CLEAR the DTCs. REPEAT the self-test. No There is no voltage to the FPDM2. GO to KB41.
(+) FPDM2 Connector, Harness Side	(-)					
VPWR Fuel 2 - Pin 5	Ground					

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB41	CHECK THE B+ VOLTAGE TO THE FPDM2 POWER SUPPLY RELAY - Key in OFF position. - 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 V?	(+) FPDM2 PWR Relay Connector, Harness Side	(-)	B+ - Pin 3	Ground	Yes GO to KB42 . No A B+ circuit concern is present. 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 a short to ground before installing a new fuse/fuse link. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM2 PWR Relay Connector, Harness Side	(-)					
B+ - Pin 3	Ground					
KB42	CHECK THE VPWR VOLTAGE TO THE 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 V?	(+) FPDM2 PWR Relay Connector, Harness Side	(-)	VPWR - Pin 1	Ground	Yes GO to KB43 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM2 PWR Relay Connector, Harness Side	(-)					
VPWR - Pin 1	Ground					
KB43	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 KB44 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM2 PWR Relay Connector, Harness Side	(-)					
GND - Pin 2	Ground					
KB44	CHECK THE VPWR FUEL 2 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>VPWR Fuel 2 - Pin 5</td><td>VPWR Fuel 2 - Pin 5</td></tr></table> - Is the resistance less than 5 ohms?	(+) FPDM2 Connector, Harness Side	(-) FPDM2 PWR Relay Connector, Harness Side	VPWR Fuel 2 - Pin 5	VPWR Fuel 2 - Pin 5	Yes INSTALL a new FPDM2 PWR relay. CLEAR the DTCs. REPEAT the self-test. No GO to KB49 .
(+) FPDM2 Connector, Harness Side	(-) FPDM2 PWR Relay Connector, Harness Side					
VPWR Fuel 2 - Pin 5	VPWR Fuel 2 - Pin 5					

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB45	CHECK THE FPM2 CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - 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 KB46. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM2 Connector, Harness Side	(-) PCM Connector, Harness Side					
FPM2 - Pin 1	FPM2					
KB46	CHECK THE FPM2 CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - 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 GO to KB47. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM2 Connector, Harness Side	(-)					
FPM2 - Pin 1	Ground					
KB47	CHECK THE FPM2 CIRCUIT 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>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 KB48. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM2 Connector, Harness Side	(-)					
FPM2 - Pin 1	Ground					
KB48	CHECK FOR FPM2 OUTPUT FROM THE FPDM2 Note: It is OK for the voltage to cycle below this range and then return within range. - FPDM2 connector connected. - Key ON, engine OFF. - 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 - 1 V?	(+) PCM Connector, Harness Side	(-)	FPM2	Ground	Yes GO to KB64. No INSTALL a new FPDM2. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
FPM2	Ground					

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take				
KB49	CHECK CIRCUITS THAT MAY CAUSE AN INTERMITTENT LOSS OF VOLTAGE SUPPLY TO THE FPDM2 Note: Be aware that P1234 could be set if the IFS switch is tripped then reset. Note: With no concern present, the FPDM2 sends a 50% duty cycle (all OK) to the PCM on the FPM2 circuit. Depending on the scan tool type, the FPM2 PID may display 50%, or a random value that is fluctuating between 85% and 115%. • Key ON, engine OFF. • Access the PCM and monitor the FPM2 PID. • Observe the FPM2 PID for an indication of a concern while carrying out the following: — Shake, wiggle, and bend the PWRGND circuit to the FPDM2 — Shake, wiggle, and bend the VPWR fuel 2 circuit to the FPDM2 — Shake, wiggle, and bend the FPM2 circuit between the FPDM2 and the PCM — Shake, wiggle, and bend the B+ and ground circuits to the FPDM2 power supply relay — Lightly tap on the IFS switch 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 • Is a concern present?	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.				
KB50	DTC P1236: IS DTC P1236 PRESENT IN THE KOEO SELF-TEST? • The Mustang 5.4L is equipped with 2 FPDMs. The DTC P1236 applies to the FPDM2 mounted on the passenger side of the luggage compartment. • Check for KOEO DTCs. • Is DTC P1236 present?	Yes GO to KB51. No GO to KB55.				
KB51	CHECK THE FPC 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>FPC</td><td>FPC - Pin 6</td></tr></table> • Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) FPDM2 Connector, Harness Side	FPC	FPC - Pin 6	Yes GO to KB52. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) FPDM2 Connector, Harness Side					
FPC	FPC - Pin 6					

Fuel Pump Driver Module

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Test Step		Results / Action to Take				
KB52	CHECK THE FPC CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - FPDM connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPC - Pin 6</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) FPDM2 Connector, Harness Side	(-)	FPC - Pin 6	Ground	Yes GO to KB53. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM2 Connector, Harness Side	(-)					
FPC - Pin 6	Ground					
KB53	CHECK THE FPC CIRCUIT FOR A SHORT TO GROUND - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) FPDM2 Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPC - Pin 6</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) FPDM2 Connector, Harness Side	(-)	FPC - Pin 6	Ground	Yes GO to KB54. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM2 Connector, Harness Side	(-)					
FPC - Pin 6	Ground					
KB54	CHECK THE FPC CIRCUIT IN THE FPDM2 - FPDM2 connector connected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>FPC</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) PCM Connector, Harness Side	(-)	FPC	Ground	Yes GO to KB64. No INSTALL a new FPDM2. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
FPC	Ground					
KB55	CHECK THE FPC CIRCUIT FOR AN INTERMITTENT OPEN OR SHORTS Note: With no concern present, the FPDM2 sends a 50% duty cycle (all OK) to the PCM on the FPM2 circuit. Depending on the scan tool type, the FPM2 PID may display 50%, or a random value that is fluctuating between 85% and 115%. - Key ON, engine OFF. - Access the PCM and monitor the FPM2 PID. - Observe the FPM2 PID for an indication of a concern while carrying out the following: - Shake, wiggle, and bend the FPC circuit between FPDM2 and the PCM - Lightly tap on the FPDM2 to simulate road shock - Is a concern present?	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.				

Fuel Pump Driver Module

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Test Step		Results / Action to Take						
KB56	DTC P1238: IS DTC P1238 PRESENT IN THE KOEO SELF-TEST?							
Note: The Mustang 5.4L is equipped with 2 FPDMs. The DTC P1238 applies to the FPDM2 mounted on the passenger side of the luggage compartment. - Check for KOEO DTCs. Is DTC P1238 present?		Yes GO to KB57. No CHECK for an intermittent concern, GO to KB63.						
KB57	CHECK THE 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 KB58. No ISOLATE the concern, GO to KB62.		
(+) FPDM2 Connector, Harness Side	(-) FPDM2 Connector, Harness Side							
FP2PWR - Pin 4	FP2RTN - Pin 2							
KB58	CHECK THE FP2PWR AND FP2RTN CIRCUIT(S) FOR A SHORT TO VOLTAGE IN THE HARNESS							
- Key in OFF position. - FP connector disconnected. Refer to Vehicle/Diagrams for schematic and connector information. - Key ON, engine OFF. - 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 KB59. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM2 Connector, Harness Side	(-)							
FP2PWR - Pin 4	Ground							
FP2RTN - Pin 2	Ground							
KB59	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 KB60. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FPDM2 Connector, Harness Side	(-)							
FP2PWR - Pin 4	Ground							
FP2RTN - Pin 2	Ground							

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take										
KB60	CHECK FOR A SHORT BETWEEN THE FP2PWR AND FP2RTN CIRCUITS - Measure the resistance between: <table border="1"> <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	Yes GO to KB61. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.						
(+) FPDM2 Connector, Harness Side	(-) FPDM2 Connector, Harness Side											
FP2PWR - Pin 4	FP2RTN - Pin 2											
KB61	CHECK FOR VOLTAGE TO THE FP Note: During output test mode, the fuel pump stays commanded on for only about 5 seconds. - FPDM2 connector connected. - Key ON, engine OFF. - 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>(+) 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	Yes INSTALL a new FP. CLEAR the DTCs. REPEAT the self-test. 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. REPEAT as necessary. If OK, INSTALL a new FPDM2. CLEAR the DTCs. REPEAT the self-test.						
(+) FP Connector, Harness Side	(-) FP Connector, Harness Side											
FP2PWR	FP2RTN											
KB62	ISOLATE THE OPEN CIRCUIT - FP connector disconnected. Refer to Vehicle/Diagrams for schematic and connector information. - Measure the resistance between: <table border="1"> <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 border="1"> <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	FP2RTN	Yes Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z. No REPAIR the open circuit. If the open is internal to the pump, INSTALL a new FP. CLEAR the DTCs. REPEAT the self-test.
(+) 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											

Fuel Pump Driver Module

KB

Test Step		Results / Action to Take
KB63	CHECK THE FP2PWR AND FP2RTN CIRCUIT FOR AN INTERMITTENT OPEN OR SHORTS	
	Note: With no concern present, the FPDM2 sends a 50% duty cycle (all OK) to the PCM on the FPM2 circuit. Depending on the scan tool type, the FPM2 PID may display 50%, or a random value that is fluctuating between 85% and 115%. • Key ON, engine OFF. • Access the PCM and monitor the FPM2 PID. • Observe the FPM2 PID for an indication of a concern while carrying out the following: — 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 concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to Pinpoint Test Z.
KB64	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

KB63-KB64

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

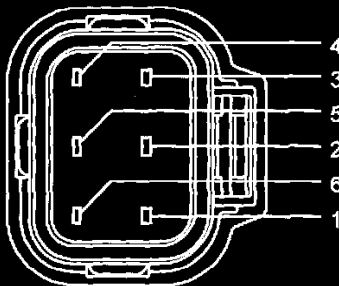
Electric Exhaust Gas Recirculation (EEGR) System

KD

This pinpoint test is intended to diagnose the following:

- EEGR system
- EEGR stepper motor (9D475)
- harness circuits: EGRMC1, EGRMC2, EGRMC3, EGRMC4 and VPWR
- powertrain control module (PCM) (12A650)

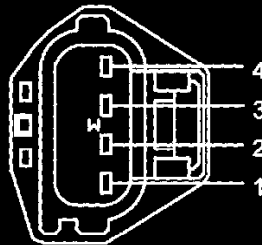
Electric Exhaust Gas Recirculation (EEGR) Assembly Connector



A0077511

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

Description And Electric Exhaust Gas Recirculation (EEGR) Assembly Connector

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

A0077519

Pin	Circuit
1	MAP (Manifold Absolute Pressure)
4	SIGRTN (Signal Return)
2	VREF (Reference Voltage)

Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
Escape/Mariner	150 (50-50-50) Pin	B35 E11 E10 E9 E8	VPWR EGRMC4 EGRMC3 EGRMC2 EGRMC1
Focus	190 Pin	B67 E56 E54 E37 E36	VPWR EGRMC4 EGRMC3 EGRMC2 EGRMC1

(Continued)

Manifold Absolute Pressure (MAP) Sensor Connector And Powertrain Control Module (PCM) Connector

Electric Exhaust Gas Recirculation (EEGR) System

KD

Vehicle	Connector	Pin	Circuit
Ranger	170 Pin	B35 E56 E39 E13 E8	VPWR EGRMC4 EGRMC3 EGRMC2 EGRMC1
All other vehicles	140 Pin	B51 E9 E8 E7 E6	VPWR EGRMC4 EGRMC3 EGRMC2 EGRMC1

Test Step		Results / Action to Take				
KD1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs) Are DTCs P0400, P0403, or P1408 present?	Yes For DTCs P0400 and P1408, GO to KD9 . For DTC P0403, GO to KD2 . No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.				
KD2	DTC P0403: EGR CONTROL CIRCUIT - CHECK THE CONNECTION OF THE EEGR HARNESS CONNECTOR TO THE EEGR 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 correctly seated?	Yes GO to KD3 . No REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.				
KD3	CHECK FOR VPWR AT THE EEGR HARNESS CONNECTOR - Key ON, engine OFF. - EEGR Assembly connector disconnected. - Measure the voltage between:<table border="1"><tr><td>(+) EEGR Assembly Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>VPWR</td><td>Negative terminal</td></tr></table> - Are the voltages greater than 10 V?	(+) EEGR Assembly Connector, Harness Side	(-) Vehicle Battery	VPWR	Negative terminal	Yes GO to KD4 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) EEGR Assembly Connector, Harness Side	(-) Vehicle Battery					
VPWR	Negative terminal					

Electric Exhaust Gas Recirculation (EEGR) System

KD

Test Step		Results / Action to Take														
KD4	CHECK THE EEGR CIRCUIT(S) FOR AN OPEN IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Measure the resistance between:<table><tr><th>(+) EEGR Assembly Connector, Harness Side</th><th>(-) PCM Connector, Harness Side</th></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	EGRMC4	Yes GO to KD5. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.				
(+) 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															
KD5	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 KD6. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.				
(+) 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															
KD6	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 KD7. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side															
EGRMC3	EGRMC1															
EGRMC3	EGRMC2															
EGRMC3	EGRMC4															
EGRMC1	EGRMC2															
EGRMC1	EGRMC4															
EGRMC2	EGRMC4															

Electric Exhaust Gas Recirculation (EEGR) System

KD

Test Step		Results / Action to Take										
KD7	CHECK THE EEGR CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS • Key ON, engine OFF. • 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. CLEAR the DTCs. REPEAT the self-test. No GO to KD8 .
(+) 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											
KD8	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</td></tr><tr><td>EGRMC2 - Pin 3</td><td>VPWR - Pin 2</td></tr><tr><td>EGRMC3 - Pin 4</td><td>VPWR - Pin 5</td></tr><tr><td>EGRMC4 - Pin 6</td><td>VPWR - Pin 5</td></tr></table> • Are the resistances between 15 - 24 ohms?	(+) EEGR Assembly Connector, Component Side	(-) EEGR Assembly Connector, Component Side	EGRMC1 - Pin 1	VPWR - Pin 2	EGRMC2 - Pin 3	VPWR - Pin 2	EGRMC3 - Pin 4	VPWR - Pin 5	EGRMC4 - Pin 6	VPWR - Pin 5	Yes GO to KD12 . No INSTALL a new EEGR assembly. CLEAR the DTCs. REPEAT the self-test.
(+) EEGR Assembly Connector, Component Side	(-) EEGR Assembly Connector, Component Side											
EGRMC1 - Pin 1	VPWR - Pin 2											
EGRMC2 - Pin 3	VPWR - Pin 2											
EGRMC3 - Pin 4	VPWR - Pin 5											
EGRMC4 - Pin 6	VPWR - Pin 5											

Electric Exhaust Gas Recirculation (EEGR) System

KD

Test Step		Results / Action to Take										
KD9	DTCS P0400 AND P1408: CHECK FOR STUCK OR STICKY EGR VALVE OPERATION BY COMPARING ACTUAL MAP VOLTAGE TO MAP 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 - Pin 2</td><td>VREF - Pin 2</td></tr><tr><td>SIGRTN - Pin 4</td><td>SIGRTN - Pin 4</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 - Pin 1</td><td>Negative terminal</td></tr></table> • Is the voltage between 1 - 2 V?	Point A MAP Sensor Connector, Harness Side	Point B MAP Sensor Connector, Component Side	VREF - Pin 2	VREF - Pin 2	SIGRTN - Pin 4	SIGRTN - Pin 4	(+) MAP Sensor Connector, Component Side	(-) Vehicle Battery	MAP - Pin 1	Negative terminal	Yes GO to KD10 . No CHECK the MAP harness for open and short circuits.
Point A MAP Sensor Connector, Harness Side	Point B MAP Sensor Connector, Component Side											
VREF - Pin 2	VREF - Pin 2											
SIGRTN - Pin 4	SIGRTN - Pin 4											
(+) MAP Sensor Connector, Component Side	(-) Vehicle Battery											
MAP - Pin 1	Negative terminal											
KD10	COMPARE ACTUAL MAP VOLTAGE TO MAP PID VOLTAGE EGR • Key in OFF position. • Remove the jumper wires. • MAP Sensor connected. • Record the actual MAP voltage values at KOEO, idle, 1,000 and 2,000 RPM. • Key ON, engine OFF. • Access the PCM and monitor the MAP PID. • Note the MAP PID voltage. • Key ON, engine running. • Note the MAP PID voltage. • Increase engine speed to 1,000 RPM. Note the MAP PID voltage. • Increase engine speed to 2,000 RPM. Note the MAP PID voltage. • Does the MAP PID voltage stay within 0.5 V of the actual MAP voltage?	Yes The concern is not present at this time. Make sure the MAP sensor is correctly seated and the vacuum source is not blocked. No GO to KD11 .										

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

Test Step		Results / Action to Take
KD11	CARRY OUT THE KOER SELF-TEST	
	Is DTC P1408 retrieved again?	Yes INSTALL a new EEGR assembly. CLEAR the DTCs. REPEAT the self-test. No REFER to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index.
KD12	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

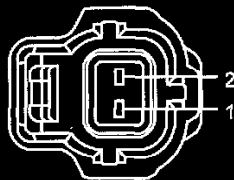
KD11-KD12

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

Pin	Circuit
2	IAC (Idle Air Control)
1	PWR (POWER)

Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
Escape/Mariner	150 (50-50-50) Pin	E39	IAC
Ranger	170 Pin	E33	IAC

Description And Idle Air Control (IAC) Connector And Powertrain Control Module (PCM) Connector

Idle Air Control (IAC) Valve

KE

Test Step		Results / Action to Take			
KE1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	Yes For DTCs P0505, P0506, P0511, P1504 or P1507, GO to KE2 . For DTCs P0507 or P1506, GO to KE15 . No For all other symptoms without DTCs, GO to KE2 .			
	Are DTCs P0505, P0506, P0507, P0511, P1504, P1506, or P1507 present?				
KE2	DTCs P0505, P0506, P0511, P1504 OR P1507: CHECK FOR INLET AIR LEAKS (OR STARTS ONLY AT PART THROTTLE)	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to KE3 .			
	- With the engine running at idle (if possible), listen for vacuum leaks. - Inspect the entire intake air system from the mass air flow (MAF) sensor to the intake manifold for leaks such as: - 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?				
KE3	CHECK FOR VOLTAGE TO THE IAC SOLENOID	Yes GO to KE4 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.			
	Note: If EGR DTC P0402 is output during the self-test, diagnose it first before continuing with this pinpoint test. - IAC connector disconnected. - Key ON, engine OFF. - Measure the voltage between: <table><tr><td>(+) IAC Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>PWR - Pin 1</td><td>Negative terminal</td></tr></table> - Is the voltage greater than 10 V?		(+) IAC Connector, Harness Side	(-) Vehicle Battery	PWR - Pin 1
(+) IAC Connector, Harness Side	(-) Vehicle Battery				
PWR - Pin 1	Negative terminal				
KE4	CHECK THE RESISTANCE OF THE IAC VALVE	Yes GO to KE5 . No INSTALL a new IAC valve. CLEAR the DTCs. REPEAT the self-test.			
	- Key in OFF position. - IAC connector disconnected. - Measure the resistance between: <table><tr><td>(+) IAC Connector, Component Side</td><td>(-) IAC Connector, Component Side</td></tr><tr><td>PWR - Pin 1</td><td>IAC - Pin 2</td></tr></table> - Is the resistance between 6 ohms - 15 ohms?		(+) IAC Connector, Component Side	(-) IAC Connector, Component Side	PWR - Pin 1
(+) IAC Connector, Component Side	(-) IAC Connector, Component Side				
PWR - Pin 1	IAC - Pin 2				

KE1-KE4

Idle Air Control (IAC) Valve

KE

Test Step		Results / Action to Take				
KE5	CHECK THE IAC VALVE FOR AN INTERNAL SHORT TO THE IAC CASE - Measure the resistance between:<table><tr><td>(+) IAC Connector, Component Side</td><td>(-) IAC Connector, Component Side</td></tr><tr><td>IAC - Pin 2</td><td>IAC Case</td></tr></table> - Is the resistance greater than 10K ohms?	(+) IAC Connector, Component Side	(-) IAC Connector, Component Side	IAC - Pin 2	IAC Case	Yes GO to KE6. No INSTALL a new IAC valve. CLEAR the DTCs. REPEAT the self-test.
(+) IAC Connector, Component Side	(-) IAC Connector, Component Side					
IAC - Pin 2	IAC Case					
KE6	CHECK THE IAC CIRCUIT FOR AN OPEN IN THE HARNESS - 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 - Pin 2</td><td>IAC</td></tr></table> - Is the resistance less than 5 ohms?	(+) IAC Connector, Harness Side	(-) PCM Connector, Harness Side	IAC - Pin 2	IAC	Yes For IAC-RC applications, GO to KE7. For all others, GO to KE8. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) IAC Connector, Harness Side	(-) PCM Connector, Harness Side					
IAC - Pin 2	IAC					
KE7	CHECK IAC-RC FOR VOLTAGE - 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 V?	(+) PCM Connector, Harness Side	(-)	IAC-RC	Ground	Yes GO to KE8. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
IAC-RC	Ground					
KE8	CHECK THE IAC CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - 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	Negative terminal	Yes GO to KE9. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
IAC	Negative terminal					
KE9	CHECK THE IAC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Key in OFF position. - 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	Ground	Yes GO to KE10. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
IAC	Ground					

Idle Air Control (IAC) Valve

KE

Test Step		Results / Action to Take
KE10	CHECK FOR A DROP IN IDLE RPM WITH THE IAC DISCONNECTED	Yes GO to KE12. No GO to KE11.
• 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?		
KE11	CHECK FOR A STUCK IAC PINTLE	Yes GO to KE12. No INSTALL a new IAC valve. CLEAR the DTCs. REPEAT the self-test.
• Key in OFF position. • 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?		
KE12	VERIFY THE DTC	Yes GO to KE22. No GO to KE13.
• Is DTC P0511 or P1504 present in continuous memory or from the KOER self-test?		
KE13	CHECK THE IAC SIGNAL FROM THE PCM	Yes GO to KE14. No INSTALL a new IAC valve. CLEAR the DTCs. REPEAT the self-test.
Note: If stalling occurs, place a shim under the hard stop screw to maintain idle conditions. Note: With the engine at normal operating temperature, closed throttle and all accessories off, the IAC duty cycle should be between approximately 22% and 65%. • PCM connector connected. • IAC connector connected. • Key ON, engine running. • Access the PCM and monitor the RPM PID. • Access the PCM and monitor the IAC PID. • 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%?		

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

Test Step		Results / Action to Take
KE14	VERIFY THE DTC	
	Is DTC P0506, P0511, P1504 or P1507 present in continuous memory?	Yes GO to KE20. No INSPECT the 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).
KE15	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 intake air 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 REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to KE16.
KE16	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. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to KE17.

Idle Air Control (IAC) Valve

KE

Test Step		Results / Action to Take				
KE17	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 GO to KE18. No INSPECT the 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). CLEAR the DTCs. REPEAT the self-test.				
KE18	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. • Key in OFF position. • Scan tool connector disconnected. • PCM connector disconnected. • Measure the resistance between: <table border="1"><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 KE19. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
IAC	Negative terminal					
KE19	VERIFY THE SYMPTOM • Is a fast idle symptom currently present?	Yes GO to KE22. No GO to KE20.				

Idle Air Control (IAC) Valve

KE

Test Step		Results / Action to Take
KE20	CHECK THE IAC SYSTEM FOR AN INTERMITTENT OPEN OR SHORT	Yes ISOLATE the concern. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to KE21.
	- 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 carrying out 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 concern?	
KE21	VERIFY THE SYMPTOM	Yes INSTALL a new IAC valve. CLEAR the DTCs. REPEAT the self-test. No RETURN to Symptom Charts. No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index to diagnose fast idle concerns.
	Is an idle quality, starting or stalling symptom currently present?	
KE22	CHECK FOR CORRECT PCM OPERATION	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.
	- 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?	

KE20-KE22

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:

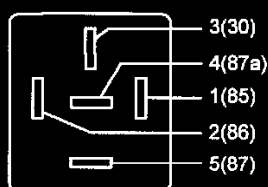
- LFC, MFC, HFC relays
- harness circuits: HFC, LFC, MFC, VPWR
- powertrain control module (PCM) (12A650)

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, Engine Control Components.

Low Fan Control (LFC) Relay Connector

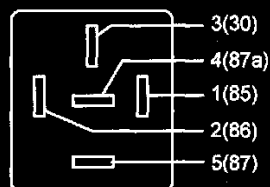


A0077582

Pin	Circuit
2	LFC (Low Fan Control)
1	VPWR (Vehicle Power)

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.

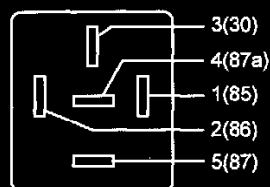
Description, Three Speed Fan Operation And Low Fan Control (LFC) Relay Connector

Fan Control (FC) Relays**KF****Medium Fan Control (MFC) Relay Connector**

A0077582

Pin	Circuit
2	MFC (Medium Fan Control)
1	VPWR (Vehicle Power)

NOTE: The VPWR and 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

Medium Fan Control (MFC) Relay Connector And High Fan Control (HFC) Relay Connector

Fan Control (FC) Relays

KF

Pin	Circuit
2	HFC (High Fan Control)
1	VPWR (Vehicle Power)

NOTE: The VPWR and 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	Pin	Circuit
Escape/Mariner 2.3L	B38 B17 B39	HFC MFC LFC
Focus	B18 B34	HFC LFC
Mustang	E4 E7	HFC LFC
Ranger	E7	LFC
All other vehicles	B38 B39	HFC LFC

Test Step		Results / Action to Take
KF1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs)	
	Are DTCs P0480, P0481, P0482, P1474, P1477 or P1479 present?	Yes For KOEO and KOER DTCs P0480 or P1474, GO to KF3. For continuous memory DTCs P0480 or P1474, GO to KF36. For DTCs P0481, P0482, P1477 or P1479, GO to KF2. No For fans always on: components, GO to KF47. For fans always on: all others, GO to KF46. For cooling fan circuits, GO to KF47. For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.

KF1

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF2	DTCS P0481, P0482, P1477 OR P1479: CHECK FOR THE PRESENCE OF THESE DTCS					
	Are DTCs P0481, P0482, P1477, or P1479 present?	Yes For KOEO and KOER DTCs P0481 or P1479, Escape 3.0L, Mariner 3.0L. GO to KF27. For continuous memory DTCs P0481 or P1479, Escape 3.0L, Mariner 3.0L. GO to KF44. For KOEO and KOER DTCs P0481 or P1479, all others, GO to KF13. For continuous memory DTCs P0481 or P1479, all others, GO to KF38. No For KOEO and KOER DTCs P0482 or P1477, Focus, GO to KF18. For continuous memory DTCs P0482 or P1477, Focus, GO to KF42. For KOEO and KOER DTCs P0482 or P1477, all others, GO to KF8. For continuous memory DTCs P0482 or P1477, all others, GO to KF40.				
KF3	KOEO AND KOER DTCS P0480 OR P1474: CHECK THE VPWR VOLTAGE TO THE LOW SPEED FC RELAY					
	- LFC Relay connector disconnected. - Key ON, engine OFF. - 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 V?	(+) LFC Relay Connector, Harness Side	(-)	VPWR - Pin 1	Ground	Yes GO to KF4. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) LFC Relay Connector, Harness Side	(-)					
VPWR - Pin 1	Ground					

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF4	CHECK FOR LFC CIRCUIT CYCLING • Key ON, engine OFF. • 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 INSTALL a new LFC relay. CLEAR the DTCs. REPEAT the self-test. No GO to KF5.
(+) LFC Relay Connector, Harness Side	(-) LFC Relay Connector, Harness Side					
VPWR - Pin 1	LFC - Pin 2					
KF5	CHECK THE LFC CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS • Remove the test lamp. • PCM connector disconnected. • Key ON, engine OFF. • 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 GO to KF6. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) LFC Relay Connector, Harness Side	(-)					
LFC - Pin 2	Ground					
KF6	CHECK THE LFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS • 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 KF7. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) LFC Relay Connector, Harness Side	(-)					
LFC - Pin 2	Ground					
KF7	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 GO to KF59. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) LFC Relay Connector, Harness Side	(-) PCM Connector, Harness Side					
LFC - Pin 2	LFC					

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF8	KOEO AND KOER DTCS P0482 OR P1477: CHECK THE VPWR VOLTAGE TO THE MEDIUM SPEED FC RELAY - MFC Relay connector disconnected. - Key ON, engine OFF. - 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 V?	(+) MFC Relay Connector, Harness Side	(-)	VPWR - Pin 1	Ground	Yes GO to KF9. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) MFC Relay Connector, Harness Side	(-)					
VPWR - Pin 1	Ground					
KF9	CHECK FOR MFC CIRCUIT CYCLING - Key ON, engine OFF. - 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 INSTALL a new MFC relay. CLEAR the DTCs. REPEAT the self-test. No GO to KF10.
(+) MFC Relay Connector, Harness Side	(-) MFC Relay Connector, Harness Side					
VPWR - Pin 1	MFC - Pin 2					
KF10	CHECK THE MFC CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Remove the test lamp. - PCM connector disconnected. - Key ON, engine OFF. - 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 GO to KF11. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) MFC Relay Connector, Harness Side	(-)					
MFC - Pin 2	Ground					
KF11	CHECK THE MFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Key in OFF position. - 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 KF12. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) MFC Relay Connector, Harness Side	(-)					
MFC - Pin 2	Ground					

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KF

Test Step		Results / Action to Take				
KF12	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 GO to KF59. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) MFC Relay Connector, Harness Side	(-) PCM Connector, Harness Side					
MFC - Pin 2	MFC					
KF13	KOEO AND KOER DTCS P0481 OR P1479: CHECK THE VPWR VOLTAGE TO THE HIGH SPEED FC RELAY - HFC Relay connector disconnected. - Key ON, engine OFF. - 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 V?	(+) HFC Relay Connector, Harness Side	(-)	VPWR - Pin 1	Ground	Yes GO to KF14. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) HFC Relay Connector, Harness Side	(-)					
VPWR - Pin 1	Ground					
KF14	CHECK FOR HFC CIRCUIT CYCLING - Key ON, engine OFF. - 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 INSTALL a new HFC relay. CLEAR the DTCs. REPEAT the self-test. No GO to KF15.
(+) HFC Relay Connector, Harness Side	(-) HFC Relay Connector, Harness Side					
VPWR - Pin 1	HFC - Pin 2					
KF15	CHECK THE HFC CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Remove the test lamp. - PCM connector disconnected. - Key ON, engine OFF. - 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 GO to KF16. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) HFC Relay Connector, Harness Side	(-)					
HFC - Pin 2	Ground					

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF16	CHECK THE HFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Key in OFF position. - 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 KF17. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) HFC Relay Connector, Harness Side	(-)					
HFC - Pin 2	Ground					
KF17	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 GO to KF69. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) HFC Relay Connector, Harness Side	(-) PCM Connector, Harness Side					
HFC - Pin 2	HFC					
KF18	KOEO AND KOER DTCS P0482 OR P1477: CHECK THE VPWR VOLTAGE TO THE MFC1 RELAY 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 ON, engine OFF. - 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 V?	(+) MFC1 Relay Connector, Harness Side	(-)	VPWR	Ground	Yes GO to KF19. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) MFC1 Relay Connector, Harness Side	(-)					
VPWR	Ground					
KF19	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 relay at the end of diagnostics. Leave the relay disconnected. CLEAR the DTCs. REPEAT the self-test. GO to KF24. No Leave the test lamp connected. GO to KF20.
(+) MFC1 Relay Connector, Harness Side	(-) MFC1 Relay Connector, Harness Side					
VPWR	MFC					

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF20	CHECK FOR MFC CIRCUIT CYCLING WITH THE MFC2 RLY DISCONNECTED - Connect a non-powered test lamp between:<table><tr><td>(+) MFC1 Relay Con- nector, Harness Side</td><td>(-) MFC1 Relay Con- nector, 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 Con- nector, Harness Side	(-) MFC1 Relay Con- nector, Harness Side	VPWR	MFC	Yes INSTALL a new MFC2 relay. CLEAR the DTCs. REPEAT the self-test. No GO to KF21.
(+) MFC1 Relay Con- nector, Harness Side	(-) MFC1 Relay Con- nector, Harness Side					
VPWR	MFC					
KF21	CHECK THE MFC CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - PCM connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) MFC1 Relay Con- nector, Harness Side</td><td>(-)</td></tr><tr><td>MFC</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) MFC1 Relay Con- nector, Harness Side	(-)	MFC	Ground	Yes GO to KF22. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) MFC1 Relay Con- nector, Harness Side	(-)					
MFC	Ground					
KF22	CHECK THE MFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) MFC1 Relay Con- nector, Harness Side</td><td>(-)</td></tr><tr><td>MFC</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) MFC1 Relay Con- nector, Harness Side	(-)	MFC	Ground	Yes GO to KF23. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) MFC1 Relay Con- nector, Harness Side	(-)					
MFC	Ground					
KF23	CHECK THE MFC CIRCUIT FOR AN OPEN IN THE HARNESS - Measure the resistance between:<table><tr><td>(+) MFC1 Relay Con- nector, 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 Con- nector, Harness Side	(-) PCM Connector, Harness Side	MFC	MFC	Yes GO to KF59. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) MFC1 Relay Con- nector, Harness Side	(-) PCM Connector, Harness Side					
MFC	MFC					

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF24	VERIFY THERE IS NOT AN OPEN IN THE CIRCUIT SPECIFIC TO THE MFC2 RELAY - Access the PCM and monitor the MFC_F 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 concern (yes) when either the high or low speed cooling fan output is commanded on and off?	Yes GO to KF25. No INSTALL a new MFC relay. CLEAR the DTCs. REPEAT the self-test.				
KF25	CHECK THE VPWR VOLTAGE TO THE MFC2 RELAY - MFC2 Relay connector disconnected. - Key ON, engine OFF. - 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 V?	(+) MFC2 Relay Connector, Harness Side	(-)	VPWR	Ground	Yes GO to KF26. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) MFC2 Relay Connector, Harness Side	(-)					
VPWR	Ground					
KF26	CHECK THE MFC CIRCUIT BETWEEN THE MEDIUM SPEED FC RELAY(S) - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) MFC1 Relay Connector, Harness Side</td><td>(-) MFC2 Relay 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	(-) MFC2 Relay Connector, Harness Side	MFC	MFC	Yes INSTALL a new MFC relay(s). CLEAR the DTCs. REPEAT the self-test. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) MFC1 Relay Connector, Harness Side	(-) MFC2 Relay Connector, Harness Side					
MFC	MFC					
KF27	KOEO AND KOER DTCS P0481 OR P1479: CHECK THE VPWR VOLTAGE TO THE HFC1 RELAY 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 ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) HFC1 Relay Connector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) HFC1 Relay Connector, Harness Side	(-)	VPWR	Ground	Yes GO to KF28. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) HFC1 Relay Connector, Harness Side	(-)					
VPWR	Ground					

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF28	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 relay at the end of diagnostics. Leave the relay disconnected. CLEAR the DTCs. REPEAT the self-test. GO to KF33 . No Leave the test lamp connected. GO to KF29 .
(+) HFC1 Relay Con- nector, Harness Side	(-) HFC1 Relay Con- nector, Harness Side					
VPWR	HFC					
KF29	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. CLEAR the DTCs. REPEAT the self-test. No GO to KF30 .
(+) HFC1 Relay Con- nector, Harness Side	(-) HFC1 Relay Con- nector, Harness Side					
VPWR	HFC					
KF30	CHECK THE HFC CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - PCM connector disconnected. - Key ON, engine OFF. - 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 GO to KF31 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) HFC1 Relay Con- nector, Harness Side	(-)					
HFC	Ground					
KF31	CHECK THE HFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Key in OFF position. - 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 KF32 . No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) HFC1 Relay Con- nector, Harness Side	(-)					
HFC	Ground					

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF32	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 GO to KF59 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) HFC1 Relay Con- nector, Harness Side	(-) PCM Connector, Harness Side					
HFC	HFC					
KF33	VERIFY THERE IS NOT AN OPEN IN THE CIRCUIT SPECIFIC TO THE HFC2 RELAY - Access the PCM and monitor the HFC_F 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 concern (yes) when either the high or low speed cooling fan output is commanded on and off?	Yes GO to KF34 . No INSTALL a new HFC1 relay. CLEAR the DTCs. REPEAT the self-test.				
KF34	CHECK THE VPWR VOLTAGE TO HFC2 RLY - HFC2 Relay connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) HFC2 Relay Con- nector, Harness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> - Is the voltage greater than 10 V?	(+) HFC2 Relay Con- nector, Harness Side	(-)	VPWR	Ground	Yes GO to KF35 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) HFC2 Relay Con- nector, Harness Side	(-)					
VPWR	Ground					
KF35	CHECK THE HFC CIRCUIT BETWEEN THE HIGH SPEED FC RELAY(S) - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) HFC1 Relay Con- nector, Harness Side</td><td>(-) HFC2 Relay Con- nector, 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	(-) HFC2 Relay Con- nector, Harness Side	HFC	HFC	Yes INSTALL a new HFC relay(s). CLEAR the DTCs. REPEAT the self-test. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) HFC1 Relay Con- nector, Harness Side	(-) HFC2 Relay Con- nector, Harness Side					
HFC	HFC					

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KF

Test Step		Results / Action to Take				
KF36	CONTINUOUS MEMORY DTCS P0480 OR P1474: CHECK THE LFC CIRCUIT FOR AN INTERMITTENT OPEN OR SHORT TO VOLTAGE					
Note: If the test lamp does not turn on, command the high speed fan on. • A/C and defrost off. • Left Fan Motor connector disconnected. • Right 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 ON, engine OFF. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the low speed fan ON. • Observe the test lamp for an indication of a concern while carrying out the following. Note that the lamp turns off when a concern is detected. — Shake, wiggle, and bend the LFC circuit(s). — Shake, wiggle, and bend the VPWR circuit to the LFC relay. — Inspect the LFC relay component for signs of damage. • Is a concern present?		(+) LFC Relay Connector, Harness Side	(-) LFC Relay Connector, Harness Side	VPWR - Pin 1	LFC - Pin 2	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to KF37.
(+) LFC Relay Connector, Harness Side	(-) LFC Relay Connector, Harness Side					
VPWR - Pin 1	LFC - Pin 2					
KF37	CHECK THE LFC CIRCUIT FOR AN INTERMITTENT SHORT TO GROUND					
• Key ON, engine OFF. • Command the outputs OFF. • Observe the test lamp for an indication of a concern while carrying out the following. Note that the lamp turns on when a concern is detected. — Shake, wiggle, and bend the LFC circuit — Lightly tap on the LFC RLY to simulate road shock • Is a concern present?		Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.				

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Test Step		Results / Action to Take				
KF38	CONTINUOUS MEMORY DTCS P0481 OR P1479: CHECK THE HFC CIRCUIT FOR AN INTERMITTENT OPEN OR SHORT TO VOLTAGE					
Note: If the test lamp does not turn on, command the low speed fan ON. • A/C and defrost off. • Left Fan Motor connector disconnected. • Right Fan Motor connector disconnected. • HFC Relay connector disconnected. • Connect a non-powered test lamp between: <table border="1"><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 ON, engine OFF. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the high speed fan ON. • Observe the test lamp for an indication of a concern while carrying out the following. Note that the lamp turns off when a concern 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 concern present?		(+) HFC Relay Connector, Harness Side	(-) HFC Relay Connector, Harness Side	VPWR - Pin 1	HFC - Pin 2	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to KF39.
(+) HFC Relay Connector, Harness Side	(-) HFC Relay Connector, Harness Side					
VPWR - Pin 1	HFC - Pin 2					
KF39	CHECK THE HFC CIRCUIT FOR AN INTERMITTENT SHORT TO GROUND					
• Key ON, engine OFF. • Command the outputs OFF. • Observe the test lamp for an indication of a concern. Note that the lamp illuminates when a concern is detected. Wiggle, shake, and bend the HFC circuit(s). Shake, wiggle, and bend the PCM on both high speed FC relays. • Is a concern present?		Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.				

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Test Step		Results / Action to Take				
KF40	CONTINUOUS MEMORY DTCS P0482 OR P1477: CHECK THE MFC CIRCUIT FOR AN INTERMITTENT OPEN OR SHORT TO VOLTAGE					
Note: If the test lamp does not turn on, command the high speed fan on. • A/C and defrost off. • Left Fan Motor connector disconnected. • Right Fan Motor connector disconnected. • MFC Relay connector disconnected. • Connect a non-powered test lamp between: <table border="1"><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 ON, engine OFF. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the low speed fan ON. • Observe the test lamp for an indication of a concern while carrying out the following. Note that the lamp turns off when a concern 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 concern present?		(+) MFC Relay Connector, Harness Side	(-) MFC Relay Connector, Harness Side	VPWR - Pin 1	MFC - Pin 2	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to KF41.
(+) MFC Relay Connector, Harness Side	(-) MFC Relay Connector, Harness Side					
VPWR - Pin 1	MFC - Pin 2					
KF41	CHECK THE MFC CIRCUIT FOR AN INTERMITTENT SHORT TO GROUND					
• Key ON, engine OFF. • Command the outputs OFF. • Observe the test lamp for an indication of a concern. Note that the lamp illuminates when a concern is detected. Wiggle, shake, and bend the HFC circuit(s). Shake, wiggle, and bend the PCM on both high speed FC relays. • Is a concern present?		Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.				

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF42	CONTINUOUS MEMORY DTCS P0482 OR P1477: CHECK THE MFC CIRCUIT FOR AN INTERMITTENT OPEN OR SHORT TO VOLTAGE 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. Note: If the test lamp does not turn on, command the high speed fan ON. • AC and defroster OFF. • Left Fan Motor connector disconnected. • Right 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>	(+) MFC1 Relay Connector, Harness Side	(-) MFC1 Relay Connector, Harness Side	VPWR	MFC	
(+) MFC1 Relay Connector, Harness Side	(-) MFC1 Relay Connector, Harness Side					
VPWR	MFC					
	• Key ON, engine OFF. • Enter output test mode. Refer to Diagnostic Methods Output Test Mode (OTM). • Command the low speed fan ON. • Observe the test lamp for an indication of a concern while carrying out the following. Note that the lamp turns off when a concern 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 concern present?	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to KF43.				
KF43	CHECK THE MFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS • Key ON, engine OFF. • Command the outputs OFF. • Exit output test mode. • Observe the test lamp for an indication of a concern. Note that the lamp illuminates when a concern is detected. Wiggle, shake, and bend the MFC circuit(s). • Inspect the medium speed FC relay that is disconnected for intermittent concerns. • Is a concern present?	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to Pinpoint Test Z.				

Fan Control (FC) Relays**KF**

Test Step		Results / Action to Take				
KF44	CONTINUOUS MEMORY DTCS P0481 OR P1479: CHECK THE HFC CIRCUIT FOR AN INTERMITTENT OPEN OR SHORT TO VOLTAGE 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. Note: If the test lamp does not turn on, command the high speed fan ON. • A/C and defroster OFF. • Left Fan Motor connector disconnected. • Right Fan Motor connector disconnected. • HFC1 Relay connector disconnected. • Connect a non-powered test lamp between:<table><tr><td>(+) HFC1 Relay Connector, Harness Side</td><td>(-) HFC1 Relay Connector, Harness Side</td></tr><tr><td>VPWR</td><td>HFC</td></tr></table> • Key ON, engine OFF. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the low speed fan ON. • Observe the test lamp for an indication of a concern while carrying out the following. Note that the lamp turns off when a concern is detected. — Shake, wiggle, and bend 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 concern present?	(+) HFC1 Relay Connector, Harness Side	(-) HFC1 Relay Connector, Harness Side	VPWR	HFC	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to KF45.
(+) HFC1 Relay Connector, Harness Side	(-) HFC1 Relay Connector, Harness Side					
VPWR	HFC					
KF45	CHECK THE HFC CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS • Key ON, engine OFF. • Command the outputs OFF. • Exit output test mode. • Observe the test lamp for an indication of a concern. Note that the lamp illuminates when a concern is detected. Wiggle, shake, and bend the HFC circuit(s) between the PCM and on both high speed FC relays. • Inspect the high speed FC relay that is disconnected for intermittent concerns. • Is a concern present?	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to Pinpoint Test Z.				

Fan Control (FC) Relays**KF**

Test Step		Results / Action to Take
KF46	THE COOLING FAN ALWAYS RUNS (NO DTCS): VERIFY THE FAN IS NOT ON BECAUSE OF A/C HIGH PRESSURE SWITCH INPUT TO THE PCM	Yes The PCM turns the fan on when the medium pressure, normally open contacts of the ACHP switch are closed. GO to KF57 . No The input is OK. GO to KF47 .
	• Key ON, engine running. • Access the PCM and monitor the ACP PID. • Is the PID state CLOSED?	
KF47	COOLING FAN CONCERN (NO DTCS): CHECK THE FAN CONTROL PRIMARY CIRCUITS	Yes A concern is present in the primary circuit(s). GO to KF48 . No For all except Ranger, the PCM primary circuit(s) is OK. To check for secondary wiring, REFER to Cooling System, Engine Cooling, for cooling system diagnosis. For Ranger: GO to KF50 .
	Note: Chose the PIDs below as appropriate, according to which circuits the vehicle has. • Verify that the A/C is OFF. • Verify engine temperature is below the temperature where the cooling fan comes on. • Key ON, engine OFF. • Access the PCM and monitor the LFC_F, MFC_F and HFC_F PIDs. • Does either PID indicate a concern?	
KF48	DOES THE LFCF PID INDICATE A CONCERN?	Yes The low fan control (LFC) circuitry has a primary circuit concern. GO to KF3 . No GO to KF49 .
	• Does the LFCF PID indicate a concern?	

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF49	DOES THE MFCF PID INDICATE A CONCERN? Does the MFCF PID indicate a concern?	Yes The medium fan control (MFC) primary circuitry has a circuit concern. For Focus, GO to KF18 . For all others, GO to KF8 . No The high fan control (HFC) primary circuitry has a circuit concern. For Escape 3.0L, and Mariner 3.0L, GO to KF27 . For all others, GO to KF13 .				
KF50	IS THE SYMPTOM: COOLING FAN ALWAYS RUNS? Is the symptom: cooling fan always runs?	Yes GO to KF56 . No GO to KF51 .				
KF51	ELECTRIC COOLING FAN CONCERN (WITH NO DTCS): ELECTRIC COOLING FAN FUNCTIONAL CHECK - Key ON, engine OFF. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the low speed fan ON. - Does the fan operate?	Yes All cooling fan circuit checks are OK. RETURN to Symptom Charts to continue diagnosis. No GO to KF52 .				
KF52	FAN INOPERATIVE: COMMAND THE LOW SPEED FAN ON AND CHECK FOR VOLTAGE TO THE CF - Key in OFF position. - CF Motor connector disconnected. - Key ON, engine OFF. - 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 V?	(+) CF Motor Connector, Harness Side	(-)	FAN PWR	Ground	Yes GO to KF53 . No GO to KF54 .
(+) CF Motor Connector, Harness Side	(-)					
FAN PWR	Ground					

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF53	CHECK THE GROUND CIRCUIT TO THE COOLING FAN - Key in OFF position. - 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. CLEAR the DTCs. REPEAT the self-test. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) CF Motor Connector, Harness Side	(-)					
GND	Ground					
KF54	CHECK THE B+ VOLTAGE TO THE FC RELAY - 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 V?	(+) FC Relay Connector, Harness Side	(-)	B+	Ground	Yes GO to KF55 . No REPAIR the open circuit. There is a B+ circuit concern. 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 a short to ground before replacing the fuse/fuse link. CLEAR the DTCs. REPEAT the self-test.
(+) FC Relay Connector, Harness Side	(-)					
B+	Ground					
KF55	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. CLEAR the DTCs. REPEAT the self-test. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) FC Relay Connector, Harness Side	(-) CF Motor Connector, Harness Side					
FAN PWR	FAN PWR					
KF56	CHECK FOR FC RLY CONTACTS ALWAYS CLOSED Note: Verify the A/C and defrost are off. - FC Relay connector disconnected. - Key ON, engine OFF. - Does the fan run with the key in the ON position?	Yes REPAIR the short circuit to PWR. CLEAR the DTCs. REPEAT the self-test. No INSTALL a new FC relay. CLEAR the DTCs. REPEAT the self-test.				

Fan Control (FC) Relays

KF

Test Step		Results / Action to Take				
KF57	CHECK THE A/CHPSW (MEDIUM PRESSURE, NORMALLY OPEN CONTACTS) • A/CHPSW connector disconnected. • Key ON, engine OFF. • Access the PCM and monitor the ACP PID. • Is the PID state CLOSED?	Yes GO to KF58 . No CONNECT the A/CHPSW. REFER to Heating and Air Conditioning, Climate Control System, to diagnose the A/C system pressure. If OK, INSTALL a new A/CHPSW. CLEAR the DTCs. REPEAT the self-test.				
KF58	CHECK THE A/CPSW CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS • Key in OFF position. • 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. No REPAIR the short circuit to GND. CLEAR the DTCs. REPEAT the self-test.
(+) A/CHPSW Connector, Harness Side	(-)					
A/CPSW	Ground					
KF59	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.				

KF57-KF59

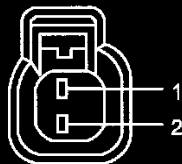
Test KG: Fuel Injector

PINPOINT TEST KG: FUEL INJECTOR

Fuel Injector**KG**

This pinpoint test is intended to diagnose the following:

- fuel injector(s) (9F593)
- harness circuits: VPWR and INJ 1 - 10
- powertrain control module (PCM) (12A650)

Injector (INJ) Connector

A0077568

Vehicle	Connector	Pin	Circuit
Fusion 3.0L, Milan 3.0L	A	2 1	INJ VPWR
All other vehicles	A	1 2	INJ VPWR

Powertrain Control Module (PCM) Connector

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

Description, Injector (INJ) Connector And Powertrain Control Module (PCM) Connector

Fuel Injector**KG**

Vehicle	Connector	Pin	Circuit
E-Series 6.8L, F-Super Duty 6.8L	170 Pin	E52 E35 E53 E36 E54 E37 E55 E38 E56 E39	INJ1 INJ2 INJ3 INJ4 INJ5 INJ6 INJ7 INJ8 INJ9 INJ10
Edge, F-150 4.2L, MKX, Sable, Taurus, Taurus X	190 Pin	E52 E35 E53 E36 E54 E37	INJ1 INJ2 INJ3 INJ4 INJ5 INJ6
Escape/Mariner 3.0L	150 (50-50-50) Pin	E2 E5 E13 E4 E3 E15	INJ1 INJ2 INJ3 INJ4 INJ5 INJ6
Escape/Mariner 2.3L	150 (50-50-50) Pin	E2 E3 E4 E5	INJ1 INJ2 INJ3 INJ4
Expedition, Navigator	140 Pin	E52 E35 E53 E36 E54 E37 E55 E38	INJ1 INJ2 INJ3 INJ4 INJ5 INJ6 INJ7 INJ8
Explorer 4.0L, Explorer Sport Trac 4.0L, Mountaineer 4.0L, Mustang 4.0L, Ranger 4.0L, Ranger 3.0L	170 Pin	E52 E35 E53 E36 E54 E37	INJ1 INJ2 INJ3 INJ4 INJ5 INJ6
F-150 4.6L, F-150 5.4L, Mark LT	190 Pin	E52 E35 E53 E36 E54 E37 E55 E38	INJ1 INJ2 INJ3 INJ4 INJ5 INJ6 INJ7 INJ8
Focus	190 Pin	E1 E2 E3 E4	INJ1 INJ2 INJ3 INJ4

(Continued)

Powertrain Control Module (PCM) Connector Continued

Fuel Injector

KG

Vehicle	Connector	Pin	Circuit
Fusion 3.0L, Milan 3.0L, MKZ	140 Pin	E52 E35 E53 E36 E54 E37	INJ1 INJ2 INJ3 INJ4 INJ5 INJ6
Fusion 2.3L, Milan 2.3L	140 Pin	E52 E35 E53 E36	INJ1 INJ2 INJ3 INJ4
Ranger 2.3L	170 Pin	E52 E35 E53 E36	INJ1 INJ2 INJ3 INJ4
All other vehicles	170 Pin	E52 E35 E53 E36 E54 E37 E55 E38	INJ1 INJ2 INJ3 INJ4 INJ5 INJ6 INJ7 INJ8

Test Step		Results / Action to Take			
KG1	DTCS P0201 THROUGH P0210 OR SYMPTOMS WITHOUT DTCS: 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.					
Note: On some vehicles, the injector voltage is only present when the fuel pump relay is energized. Measure the injector voltage within 2 seconds of the key ON. • Key in OFF position. • INJ connector disconnected. • Key ON, engine OFF. • Measure the voltage between: <table><tr><td>(+) INJ Connector, Har- ness Side</td><td>(-)</td></tr><tr><td>VPWR</td><td>Ground</td></tr></table> • Is the voltage greater than 10 V?			(+) INJ Connector, Har- ness Side	(-)	VPWR
(+) INJ Connector, Har- ness Side	(-)				
VPWR	Ground				
		Yes GO to KG2. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.			

KG1

Fuel Injector

KG

Test Step		Results / Action to Take				
KG2	CHECK THE INJ 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>(-) INJ Connector, Har-ness Side</td></tr><tr><td>Suspect INJ</td><td>INJ</td></tr></table> • Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) INJ Connector, Har-ness Side	Suspect INJ	INJ	Yes GO to KG3. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) INJ Connector, Har-ness Side					
Suspect INJ	INJ					
KG3	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</td><td>Ground</td></tr></table> • Is the resistance greater than 10K ohms?	(+) INJ Connector, Har-ness Side	(-)	INJ	Ground	Yes GO to KG4. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) INJ Connector, Har-ness Side	(-)					
INJ	Ground					
KG4	CHECK THE INJ CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS • Key ON, engine OFF. • Measure the voltage between:<table><tr><td>(+) INJ Connector, Har-ness Side</td><td>(-)</td></tr><tr><td>INJ</td><td>Ground</td></tr></table> • Is any voltage present?	(+) INJ Connector, Har-ness Side	(-)	INJ	Ground	Yes REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. No GO to KG5.
(+) INJ Connector, Har-ness Side	(-)					
INJ	Ground					
KG5	CHECK THE RESISTANCE OF THE FUEL INJECTOR • 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>VPWR</td><td>INJ</td></tr></table> • Is the resistance between 11 - 18 ohms?	(+) INJ Connector, Component Side	(-) INJ Connector, Component Side	VPWR	INJ	Yes GO to KG6. No INSTALL a new fuel injector. RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM). REPEAT the self-test.
(+) INJ Connector, Component Side	(-) INJ Connector, Component Side					
VPWR	INJ					

Fuel Injector

KG

Test Step		Results / Action to Take				
KG6	CHECK THE FUNCTIONALITY OF THE INJ CIRCUIT - PCM connector connected. - Key ON, engine OFF. - Connect a non-powered test lamp between:<table><tr><td>(+) INJ Connector, Har- ness Side</td><td>(-) INJ Connector, Har- ness Side</td></tr><tr><td>VPWR</td><td>INJ</td></tr></table> - Key ON, engine running. - Is the test lamp blinking?	(+) INJ Connector, Har- ness Side	(-) INJ Connector, Har- ness Side	VPWR	INJ	Yes GO to KG7. No GO to KG8.
(+) INJ Connector, Har- ness Side	(-) INJ Connector, Har- ness Side					
VPWR	INJ					
KG7	CARRY OUT A THOROUGH WIGGLE TEST ON THE FUEL INJECTOR HARNESS - Key in OFF position. - INJ connector connected. - Key ON, engine running. - Engine at normal operating temperature. - Access the PCM and monitor the INJ_F 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?	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.				
KG8	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.				

KG6-KG8

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 actuator
- vacuum hoses

Test Step		Results / Action to Take
KJ1	CHECK FOR DTCS	Yes GO to KJ2 . No For lack/loss of power, GO to KJ3 . For all other symptoms without DTCS, GO to KJ2 .
	Note: DTCS P1227 and P1228 are for informational purposes only and are usually accompanied by other DTCS. If concerns are present with the mass air flow (MAF) sensor, the exhaust gas recirculation (EGR) valve, or the manifold absolute pressure (MAP) sensor, DTCS P1227 or P1228 may be set. Diagnose all other DTCS before diagnosing DTCS P1227 or P1228. • Are DTCS P1227, or P1228 present?	
KJ2	DTCS P1227 OR P1228: VERIFY THE DTC	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to KJ4 .
	• Record and clear the DTCS. • Drive the vehicle at normal operating temperature with the engine exceeding 2,000 RPM. • Check for DTCS. • Are any other DTCS present?	
KJ3	CHECK THE IAT2 PID	Yes CHECK for low fluid level in the charge air cooler (CAC) system. CHECK for damaged CAC lines. REFER to Cooling System, Supercharger Cooling to diagnose a loss of coolant. No GO to KJ4 .
	 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. Failure to follow these instructions may result in personal injury. • Key ON, engine running. • Access the PCM and monitor the IAT2 PID. • Is the temperature greater than 110°C (230°F)?	
KJ4	CHECK THE SUPERCHARGER BYPASS ACTUATOR VACUUM HOSES	Yes REPAIR or INSTALL new vacuum lines as necessary. CLEAR the DTCS. REPEAT the self-test. No GO to KJ5 .
	Note: For vehicle specific vacuum hose routing, refer to the VECI label located in the front of the engine compartment. • Check for holes, cracks, bends or kinks in the vacuum lines going to the supercharger bypass actuator. • Check for any disconnected hoses at the supercharger bypass actuator. • Are any concerns present?	

KJ1-KJ4

Supercharger Bypass Control

KJ

Test Step		Results / Action to Take
KJ5	CHECK THE BYPASS VALVE ACTUATOR	
Note: Additional DTCs may set as a result of disconnecting the vacuum line in this step. • Visually inspect the bypass valve actuator for damage. • Key in OFF position. • Note the position of the supercharger bypass actuator linkage. • Key ON, engine running. • Note the position of the supercharger bypass actuator linkage. • Disconnect the supercharger bypass actuator upper vacuum hose. • Does the supercharger bypass actuator linkage move when the engine is started, and return to the original position when the supercharger bypass actuator vacuum line is disconnected?		Yes The concern is not present at this time. RETURN to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index to diagnose lack/loss of power concerns. No INSTALL a new supercharger bypass actuator. CLEAR the DTCs. REPEAT the self-test.

KJ5**Test KM: Air Conditioning Clutch (A/CC) Relay Circuit****PINPOINT TEST KM: AIR CONDITIONING CLUTCH (A/CC) RELAY CIRCUIT**

Air Conditioning Clutch (A/CC) Relay Circuit

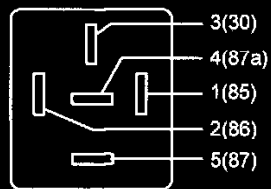
KM

⚠ WARNING: Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.

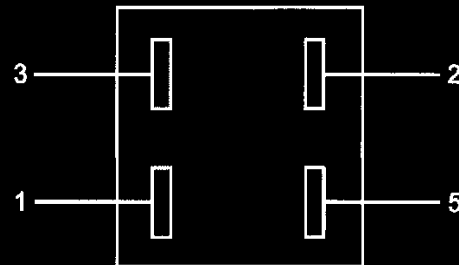
This pinpoint test is intended to diagnose the following:

- A/CC relay
- harness circuits: VPWR, A/CCR, A/CCS
- powertrain control module (PCM) (12A650)

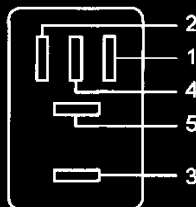
Air Conditioning Clutch (A/CC) Relay Connector

A

A0077582

B

N0072977

C

A0077584

Warning And Air Conditioning Clutch (A/CC) Relay Connector

Air Conditioning Clutch (A/CC) Relay Circuit

KM

Vehicle	Connector	Pin	Circuit
Expedition, F-150, Mark LT, Navigator	A	1 2	A/CCR VPWR
Focus	B	2 1	A/CCR VPWR
All other vehicles	C	1 2	A/CCR VPWR

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.

Vehicle	Connector	Pin	Circuit
E-Series, F-Super Duty	170 Pin	E3	A/CCR
Edge, F-150, Mark LT, MKX, Sable, Taurus, Taurus X	190 Pin	B18	A/CCR
Escape/Mariner	150 (50-50-50) Pin	B25	A/CCR
Expedition, Navigator	140 Pin	B18	A/CCR
Focus	190 Pin	B2	A/CCR
Fusion, Milan, MKZ	140 Pin	B64	A/CCR
All other vehicles	170 Pin	B14	A/CCR

Air Conditioning Clutch (A/CC) Relay Connector And Powertrain Control Module (PCM) Connector

Air Conditioning Clutch (A/CC) Relay Circuit

KM

Test Step		Results / Action to Take				
KM1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs) Are DTCs P0534, P0645, P1460, P1464 or P1469 present?	Yes For KOEO and KOER DTCs P0645 or P1460, GO to KM2 . For continuous memory DTCs P0645 or P1460, GO to KM10 . For KOEO and KOER DTC P1464, GO to KM8 . For continuous memory DTCs P0534 or P1469, GO to KM12 . No For all others, GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.				
KM2	KOEO AND KOER DTCs P1460 OR P0645: VERIFY THAT THE ACCS PID IS OFF Note: Verify the A/C and the defrost are off during KOEO/KOER self-tests. If the vehicle is not equipped with A/C, the A/CCR circuit is not used and DTC P1460/P0645 can be ignored. - Key ON, engine running. - A/C and defroster OFF. - Access the PCM and monitor the ACCS PID. - Is the PID state OFF?	Yes GO to KM3 . No REFER to Heating and Air Conditioning, Climate Control System and diagnose the air conditioning (A/C) is inoperative/does not operate correctly symptom.				
KM3	CHECK THE VPWR VOLTAGE TO THE A/CC RELAY - Key in OFF position. - A/CC Relay connector disconnected. - Key ON, engine OFF. - 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 V?	(+) A/CC Relay Connector, Harness Side	(-)	VPWR	Ground	Yes GO to KM4 . No REPAIR the open circuit. START the engine. TURN on the A/C switch. WAIT for 15 seconds. TURN off the A/C switch. REPEAT the self-test.
(+) A/CC Relay Connector, Harness Side	(-)					
VPWR	Ground					
KM4	CHECK THE A/CC RELAY - Key in OFF position. - Carry out the A/CC relay component test. - Does the A/CC relay pass the component test?	Yes GO to KM5 . No INSTALL a new A/CC relay. START the engine. TURN on the A/C switch. WAIT for 15 seconds. TURN off the A/C switch. CLEAR the DTCs. REPEAT the self-test.				

KM1-KM4

Air Conditioning Clutch (A/CC) Relay Circuit

KM

Test Step		Results / Action to Take				
KM5	CHECK THE A/CCR (WAC) CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - PCM connector disconnected. - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) A/CC Relay Con- nector, 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 Con- nector, Harness Side	(-)	A/CCR	Ground	Yes GO to KM6. No REPAIR the short circuit. START the engine. TURN on the A/C switch. WAIT for 15 seconds. TURN off the A/C switch. REPEAT the self-test.
(+) A/CC Relay Con- nector, Harness Side	(-)					
A/CCR	Ground					
KM6	CHECK THE A/CCR (WAC) CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) A/CC Relay Con- nector, 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 Con- nector, Harness Side	(-)	A/CCR	Ground	Yes GO to KM7. No REPAIR the short circuit. START the engine. TURN on the A/C switch. WAIT for 15 seconds. TURN off the A/C switch. REPEAT the self-test.
(+) A/CC Relay Con- nector, Harness Side	(-)					
A/CCR	Ground					
KM7	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 GO to KM14. No REPAIR the open circuit. START the engine. TURN on the A/C switch. WAIT for 15 seconds. TURN off the A/C switch. REPEAT the self-test.
(+) A/CC Relay Con- nector, Harness Side	(-) PCM Connector, Harness Side					
A/CCR	A/CCR					
KM8	KOEO AND KOER DTC P1464: VERIFY THE A/C AND DEFROST ARE OFF DURING THE SELF-TEST - Verify the A/C and defrost are off during the self-test. - Are the A/C and defrost off during the self-test?	Yes GO to KM9. No Turn the A/C and defrost off. REPEAT the self-test where DTC P1464 was retrieved.				

Air Conditioning Clutch (A/CC) Relay Circuit

KM

Test Step		Results / Action to Take
KM9	CHECK THE ACCS PID	
	• Key ON, engine OFF. • A/C and defroster OFF. • Access the PCM and monitor the ACCS PID. • Is the PID state ON?	Yes The ACCS PID indicates the PCM is being requested to turn the A/C on. REFER to Heating and Air Conditioning, on Climate Control System and diagnose the air conditioning (A/C) is inoperative/does not operate correctly symptom. No The ACCS PID indicates that the ACCS input to the PCM is low. VERIFY the test step results. Turn off the A/C and defrost. REPEAT the self-test.
KM10	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. Note: The A/C clutch clicks on when a concern is present. • Key ON, engine OFF. • Check the A/CCR (WAC) circuit for short to ground while carrying out the following: — Wiggle, shake, and bend small sections of the wiring harness while working from the component to the module — Lightly tap on the A/CC relay to simulate road shock • Is a concern present?	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. START the engine. TURN on the A/C switch. WAIT for 15 seconds. TURN off the A/C switch. REPEAT the self-test. No GO to KM11.
KM11	CHECK THE A/CCR (WAC) FOR AN OPEN OR SHORT CIRCUIT TO VOLTAGE	
	Note: The A/C clutch clicks off if a concern is present. • Key ON, engine OFF. • Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). • Command the outputs ON. • Check the A/CCR (WAC) circuit for an open or short to voltage while carrying out the following: — Wiggle, shake, and bend small sections of the wiring harness while working from the component to the module — Lightly tap on the A/CC relay to simulate road shock • Is a concern present?	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. START the engine. TURN on the A/C switch. WAIT for 15 seconds. TURN off the A/C switch. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.

Air Conditioning Clutch (A/CC) Relay Circuit

KM

Test Step		Results / Action to Take
KM12	CONTINUOUS MEMORY DTCS P0534 OR P1469: CHECK FOR CAUSES OF FAST A/CCS CYCLING	
	- Check the following: - A/C system pressure - A/CCS cycle times - REFER to Heating and Air Conditioning, Climate Control System and diagnose the air conditioning (A/C) is inoperative/does not operate correctly symptom. - Is a concern present?	Yes ISOLATE the concern and REPAIR as necessary. No GO to KM13.
KM13	CHECK FOR INTERMITTENT OPEN IN THE A/CCS CIRCUIT	
	Note: The ACCS PID turns off and on quickly when a concern is present, indicating an intermittent open. - Key ON, engine OFF. - Access the PCM and monitor the ACCS PID. - Turn on the A/C switch. - Check the A/CCR (WAC) circuit for an open or short to voltage while carrying out the following: - Wiggle, shake, and bend small sections of the wiring harness while working from the component to the module. - Lightly tap on the pressure switch (PS) (to simulate road shock). - Inspect the A/CCS connector. - Is a concern present?	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. START the engine. TURN on the A/C switch. WAIT for 15 seconds. TURN off the A/C switch. REPEAT the self-test. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.
KM14	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

KM12-KM14

Test KN: Variable Speed Electric Cooling Fan

PINPOINT TEST KN: VARIABLE SPEED ELECTRIC COOLING FAN

Variable Speed Electric Cooling Fan

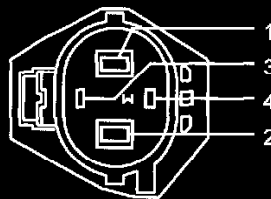
KN

 **WARNING:** Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.

This pinpoint test is intended to diagnose the following:

- variable speed electric cooling fan (8T00)
- harness circuits: FCV, B+, GND
- powertrain control module (PCM) (12A650)

Cooling Fan (CF) Motor Connector



A0077538

Pin	Circuit
4	FCV (Fan Control Variable)
2	GND (Ground)
1	B+ (Battery Positive Voltage)

Powertrain Control Module (PCM) Connector

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

Warning, Cooling Fan (CF) Motor Connector And Powertrain Control Module (PCM) Connector

Variable Speed Electric Cooling Fan

KN

Vehicle	Connector	Pin	Circuit
Crown Victoria, Grand Marquis, Town Car	170 Pin	E7	FCV
Fusion, Milan, MKZ	140 Pin	B8	FCV
All other vehicles	190 Pin	B48	FCV

Test Step		Results / Action to Take				
KN1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCs) Is DTC P0480 or P0483 present?	Yes For KOEO and KOER DTC P0480, GO to KN2 . For continuous memory DTC P0480, GO to KN8 . For continuous memory DTC P0483, GO to KN13 . No For electric cooling fan(s) does not operate (low, medium, high or variable speed), GO to KN10 .				
KN2	KOEO AND KOER 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 border="1"><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-) CF Motor Connector, Harness Side</td></tr><tr><td>B+ - Pin 1</td><td>GND - Pin 2</td></tr></table> - Is the voltage greater than 10 V?	(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side	B+ - Pin 1	GND - Pin 2	Yes GO to KN4 . No GO to KN3 .
(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side					
B+ - Pin 1	GND - Pin 2					

KN1-KN2

Variable Speed Electric Cooling Fan

KN

Test Step		Results / Action to Take				
KN3	CHECK THE VOLTAGE TO THE FAN MOTOR USING GROUND AS A REFERENCE - Measure the voltage between: <table border="1"> <tr> <td>(+) CF Motor Connector, Harness Side</td> <td>(-)</td> </tr> <tr> <td>B+ - Pin 1</td> <td>Ground</td> </tr> </table> - Is the voltage greater than 10 V?	(+) CF Motor Connector, Harness Side	(-)	B+ - Pin 1	Ground	Yes REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test. No A B+ circuit concern is present. 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 a short to ground before installing a new fuse/fuse link.
(+) CF Motor Connector, Harness Side	(-)					
B+ - Pin 1	Ground					
KN4	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 ON, engine OFF. - Check for KOEO DTCs. - Is DTC P0480 present?	Yes GO to KN5. No INSTALL a new cooling fan motor. CLEAR the DTCs. REPEAT the self-test.				
KN5	CHECK THE FCV CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key in OFF position. - PCM connector disconnected. - Key ON, engine OFF. - Measure the voltage between: <table border="1"> <tr> <td>(+) CF Motor Connector, Harness Side</td> <td>(-)</td> </tr> <tr> <td>FCV - Pin 4</td> <td>Ground</td> </tr> </table> - Is the voltage less than 1 V?	(+) CF Motor Connector, Harness Side	(-)	FCV - Pin 4	Ground	Yes GO to KN6. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) CF Motor Connector, Harness Side	(-)					
FCV - Pin 4	Ground					
KN6	CHECK THE FCV CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Key in OFF position. - Measure the resistance between: <table border="1"> <tr> <td>(+) CF Motor Connector, Harness Side</td> <td>(-)</td> </tr> <tr> <td>FCV - Pin 4</td> <td>Ground</td> </tr> </table> - Is the resistance greater than 10K ohms?	(+) CF Motor Connector, Harness Side	(-)	FCV - Pin 4	Ground	Yes GO to KN7. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) CF Motor Connector, Harness Side	(-)					
FCV - Pin 4	Ground					

KN3-KN6

Variable Speed Electric Cooling Fan

KN

Test Step		Results / Action to Take				
KN7	CHECK FOR AN OPEN CIRCUIT BETWEEN THE PCM AND FAN MOTOR - 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 - Pin 4</td></tr></table> - Is the resistance less than 5 ohms?	(+) PCM Connector, Harness Side	(-) CF Motor Connector, Harness Side	FCV	FCV - Pin 4	Yes GO to KN14. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) CF Motor Connector, Harness Side					
FCV	FCV - Pin 4					
KN8	CONTINUOUS MEMORY DTC P0480: CHECK THE B+ AND 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+ - Pin 1</td><td>GND - Pin 2</td></tr></table> - Observe the test lamp for an indication of a concern while carrying out the following. Note that the lamp turns off when a concern is present. - Shake, wiggle, and bend the B+ and GND circuits to the CF - Shake, wiggle, and bend the associated fuse - Is a concern present?	(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side	B+ - Pin 1	GND - Pin 2	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to KN9.
(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side					
B+ - Pin 1	GND - Pin 2					
KN9	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 - Pin 4</td><td>Ground</td></tr></table> - Key ON, engine OFF. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the low speed fan ON. - Observe the digital multimeter (DMM) for an indication of a concern while shaking, wiggling, and bending the FCV circuit between the CF motor and the PCM. Note that voltage changes suddenly when a concern is detected. - Is a concern present?	(+) CF Motor Connector, Harness Side	(-)	FCV - Pin 4	Ground	Yes ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to Pinpoint Test Z.
(+) CF Motor Connector, Harness Side	(-)					
FCV - Pin 4	Ground					

Variable Speed Electric Cooling Fan

KN

Test Step		Results / Action to Take				
KN10	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 The concern is elsewhere. RETURN to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index for further direction. No GO to KN11.				
KN11	CHECK THE B+ AND GND CIRCUITS TO THE 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+ - Pin 1</td><td>GND - Pin 2</td></tr></table> Is the voltage greater than 10 V?	(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side	B+ - Pin 1	GND - Pin 2	Yes INSTALL a new cooling fan motor. CLEAR the DTCs. REPEAT the self-test. No GO to KN12.
(+) CF Motor Connector, Harness Side	(-) CF Motor Connector, Harness Side					
B+ - Pin 1	GND - Pin 2					
KN12	CHECK THE VOLTAGE TO THE COOLING FAN USING GROUND AS A REFERENCE - Measure the voltage between:<table><tr><td>(+) CF Motor Connector, Harness Side</td><td>(-)</td></tr><tr><td>B+ - Pin 1</td><td>Ground</td></tr></table> Is the voltage greater than 10 V?	(+) CF Motor Connector, Harness Side	(-)	B+ - Pin 1	Ground	Yes REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test. No A B+ circuit concern is present. 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 a short to ground before installing a new fuse/fuse link. CLEAR the DTCs. REPEAT the self-test.
(+) CF Motor Connector, Harness Side	(-)					
B+ - Pin 1	Ground					
KN13	CONTINUOUS MEMORY DTC P0483: CHECK FOR A COOLING FAN MOTOR OBSTRUCTION OR A COOLING FAN MOTOR MECHANICAL FAILURE Is a cooling fan motor obstruction or a cooling fan motor mechanical failure present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No CLEAR the DTCs. REPEAT the self-test.				

Variable Speed Electric Cooling Fan**KN**

Test Step		Results / Action to Take
KN14	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

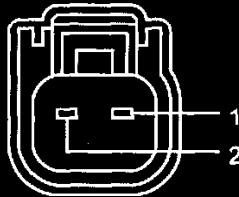
KN14

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:

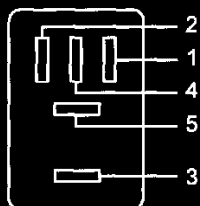
- CAC pump relay (14B192)
- CAC pump (8501)
- harness circuits: CAC, VPWR and GND
- powertrain control module (PCM) (12A650)

Charge Air Cooler (CAC) Pump Connector

A0077552

Pin	Circuit
2	GND (Ground)
1	PUMPPWR (Pump Power)

Description And Charge Air Cooler (CAC) Pump Connector

Charge Air Cooler (CAC) Pump**KP****Charge Air Cooler (CAC) Relay Connector**

A0077584

Pin	Circuit
5	PUMPPWR (Pump Power)
3	B+ (Battery Positive Voltage)
2	CAC (Charge Air Cooler)
1	VPWR (Vehicle Power)

Powertrain Control Module (PCM) Connector

Pin	Circuit
E64	CAC (Charge Air Cooler)

Charge Air Cooler (CAC) Relay Connector And Powertrain Control Module (PCM) Connector

Charge Air Cooler (CAC) Pump

KP

Test Step		Results / Action to Take				
KP1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCS) Is DTC P1229 present?	Yes For DTC P1229, GO to KP2. No For a boost gauge indicates higher than normal boost, GO to KP9.				
KP2	DTC P1229: CHECK THE VOLTAGE TO THE CAC PUMP RELAY COIL - Key in OFF position. - CAC Relay connector disconnected. - Key ON, engine OFF. - 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 V?	(+) CAC Relay Connector, Harness Side	(-)	VPWR - Pin 1	Ground	Yes GO to KP3. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) CAC Relay Connector, Harness Side	(-)					
VPWR - Pin 1	Ground					
KP3	CHECK THE CAC PUMP RELAY - Key in OFF position. - 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 - 100 ohms?	(+) CAC Relay Connector, Component Side	(-) CAC Relay Connector, Component Side	CAC - Pin 2	VPWR - Pin 1	Yes GO to KP4. No INSTALL a new CAC relay. CLEAR the DTCs. REPEAT the self-test.
(+) CAC Relay Connector, Component Side	(-) CAC Relay Connector, Component Side					
CAC - Pin 2	VPWR - Pin 1					
KP4	CHECK THE CAC PUMP RELAY - Carry out the CAC pump relay component test. - Does the CAC pump relay pass the component test?	Yes GO to KP5. No INSTALL a new CAC relay. CLEAR the DTCs. REPEAT the self-test.				
KP5	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 E64</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 E64	CAC - Pin 2	Yes GO to KP6. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) CAC Relay Connector, Harness Side					
CAC - Pin E64	CAC - Pin 2					

KP1-KP5

Charge Air Cooler (CAC) Pump

KP

Test Step		Results / Action to Take				
KP6	CHECK FOR A SHORT TO VOLTAGE BETWEEN THE PCM AND THE CAC RELAY - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) PCM Connector, Harness Side</td><td>(-) Vehicle Battery</td></tr><tr><td>CAC - Pin E64</td><td>Negative terminal</td></tr></table> - Is the voltage less than 0.5 V?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	CAC - Pin E64	Negative terminal	Yes GO to KP7. No REPAIR the short circuit to PWR. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
CAC - Pin E64	Negative terminal					
KP7	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 E64</td><td>Negative terminal</td></tr></table> - Is the resistance greater than 10K ohms?	(+) PCM Connector, Harness Side	(-) Vehicle Battery	CAC - Pin E64	Negative terminal	Yes GO to KP8. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) Vehicle Battery					
CAC - Pin E64	Negative terminal					
KP8	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, CAC hoses are not reversed and DTC P1229 is present in KOEO and KOER, GO to KP15. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.				
KP9	CHECK THE CAC FOR MECHANICAL OPERATION - Key ON, engine OFF. - Enter output test mode. Refer to Diagnostic Methods, Output Test Mode (OTM). - Command the outputs ON. - Observe the CAC pump. - Command the outputs OFF. - Does the CAC pump run?	Yes CHECK for low fluid level in the CAC system. CHECK for cracked or incorrectly routed CAC lines or airflow blockage at the CAC radiator. REPAIR the system as necessary. If the symptom still exists, RETURN to Symptom Charts No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index to diagnose boost gauge indicates higher than normal boost. No GO to KP10.				

Charge Air Cooler (CAC) Pump

KP

Test Step		Results / Action to Take				
KP10	CHECK THE VOLTAGE AND GROUND CIRCUITS AT THE CAC PUMP - Charge Air Cooler (CAC) Pump 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>(+) Charge Air Cooler (CAC) Pump Connector, Harness Side</td><td>(-) Charge Air Cooler (CAC) Pump 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?	(+) Charge Air Cooler (CAC) Pump Connector, Harness Side	(-) Charge Air Cooler (CAC) Pump Connector, Harness Side	PUMPPWR - Pin 1	GND - Pin 2	Yes INSTALL a new Charge Air Cooler (CAC) Pump. CLEAR the DTCs. REPEAT the self-test. No GO to KP11.
(+) Charge Air Cooler (CAC) Pump Connector, Harness Side	(-) Charge Air Cooler (CAC) Pump Connector, Harness Side					
PUMPPWR - Pin 1	GND - Pin 2					
KP11	CHECK THE CAC VOLTAGE CIRCUIT TO GND - Measure the voltage between:<table><tr><td>(+) Charge Air Cooler (CAC) Pump 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?	(+) Charge Air Cooler (CAC) Pump Connector, Harness Side	(-) Vehicle Battery	PUMPPWR - Pin 1	Negative terminal	Yes GO to KP12. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Charge Air Cooler (CAC) Pump Connector, Harness Side	(-) Vehicle Battery					
PUMPPWR - Pin 1	Negative terminal					
KP12	CHECK THE INTEGRITY OF THE CAC PUMP GROUND CONNECTION - Charge Air Cooler (CAC) Pump connector disconnected. - Measure the resistance between:<table><tr><td>(+) Charge Air Cooler (CAC) Pump 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?	(+) Charge Air Cooler (CAC) Pump Connector, Harness Side	(-) Vehicle Battery	GND - Pin 2	Negative terminal	Yes GO to KP13. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) Charge Air Cooler (CAC) Pump Connector, Harness Side	(-) Vehicle Battery					
GND - Pin 2	Negative terminal					
KP13	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 KP14. No REPAIR the open circuit. CHECK the fuses. CLEAR the DTCs. REPEAT the self-test.
(+) CAC Relay Connector, Harness Side	(-)					
B+ - Pin 3	Ground					

Charge Air Cooler (CAC) Pump

KP

Test Step		Results / Action to Take				
KP14	CHECK FOR AN OPEN CAC PUMP CIRCUIT - Measure the resistance between:<table><tr><td>(+) CAC Relay Connector, Harness Side</td><td>(-) Charge Air Cooler (CAC) Pump 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	(-) Charge Air Cooler (CAC) Pump Connector, Harness Side	PUMPPWR - Pin 5	PUMPPWR - Pin 1	Yes INSTALL a new CAC pump relay. CLEAR the DTCs. REPEAT the self-test. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) CAC Relay Connector, Harness Side	(-) Charge Air Cooler (CAC) Pump Connector, Harness Side					
PUMPPWR - Pin 5	PUMPPWR - Pin 1					
KP15	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), Programming the VID Block for a Replacement PCM. 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.				

KP14-KP15

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	
	• Verify all 2-way radio installations. Carefully follow the manufacturer's installation instructions regarding the routing of the antenna and voltage leads. • Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to NC2 .
NC2	NO START CONCERN	
	• Is the customer complaint no start?	Yes GO to Pinpoint Test A. No GO to NC3 .
NC3	INTERMITTENT CONDITION	
	• Is this an intermittent condition?	Yes GO to Pinpoint Test Z. No GO to Pinpoint Test JD.

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 DTCs 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 on-board diagnostics (OBD) system is OK. RETURN the vehicle to customer with information about the DTC. No REFER to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index. If there are no other symptoms, RETURN the vehicle to the customer with information about the DTC.

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

QA

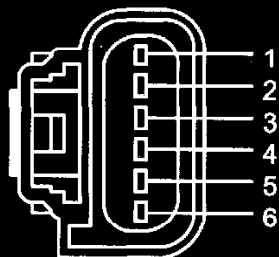
This pinpoint test is intended to diagnose the following:

- unable to communicate with PCM
- unable to activate the PCM self-test.
- incorrect self-test procedure
- harness circuits: ISP-R, PCMRC, PWRGND and VPWR

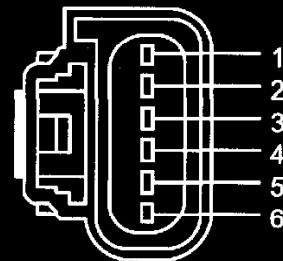
VREF Information Table

Application	Engine	Measure the PCM VREF at:
Edge/MKX	All	ETBTPS
Escape/Mariner	All	TP Sensor or FRPT
Expedition/Navigator	All	ETBTPS
Focus	All	ETBTPS
Fusion/Milan/MKZ	All	ETBTPS
Ranger	All	TP Sensor
Taurus/Taurus X/Sable	All	ETBTPS
All Others	All	FRPT

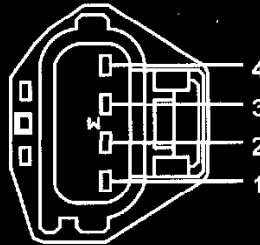
Electronic Throttle Body Throttle Position Sensor (ETBTPS) Connector

A

A0077520

B

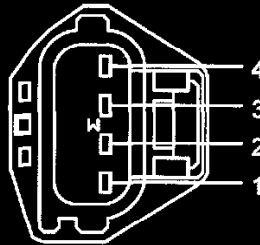
A0094772

**Unable to Activate Self-Test/Network
Communication Error****QA****C**

A0077519

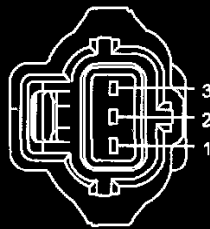
Vehicle	Connector	Pin	Circuit
E-Series 4.6L, Edge, F-150 4.2L, F-150 4.6L, Focus, MKX, MKZ, Sable, Taurus, Taurus X	A	2 3	ETCRTN ETCREF
Fusion 2.3L, Milan 2.3L	B	3 5	ETCRTN ETCREF
Fusion 3.0L, Milan 3.0L	B	4 5	ETCRTN ETCREF
All other vehicles	C	3 2	ETCRTN ETCREF

Electronic Throttle Body Throttle Position Sensor (ETBTPS) Connector Continued

**Unable to Activate Self-Test/Network
Communication Error****QA****Fuel Rail Pressure Temperature (FRPT) Sensor
Connector**

A0077567

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

Throttle Position (TP) Sensor Connector**A**

A0077554

B

A0077555

Fuel Rail Pressure Temperature (FRPT) Sensor Connector And Throttle Position (TP) Sensor Connector

Unable to Activate Self-Test/Network Communication Error

QA

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

Powertrain Control Module (PCM) Connector

Vehicle	Connector	Pin	Circuit
Edge, MKX, Sable, Taurus, Taurus X	190 Pin	B67, B68, B69, B70 B51, B52, B53 B8 B7	PWRGND VPWR PCMRC ISP-R
Escape/Mariner	150 (50-50-50) Pin	B47, B48, B49, B50 B35, B36	PWRGND VPWR
Expedition, Navigator	140 Pin	B67, B68, B69, B70 B51, B52, B53 B8 B7	PWRGND VPWR PCMRC ISP-R
Explorer, Explorer Sport Trac, Mountaineer, Mustang	170 Pin	B47, B48, B49, B50 B35, B36 B37 B46	PWRGND VPWR PCMRC ISP-R
F-150, Mark LT	190 Pin	B67, B68, B69, B70 B51, B52, B53 B40 B17	PWRGND VPWR PCMRC ISP-R
F-Super Duty	170 Pin	B47, B48, B49, B50 B35, B36 B37 B31	PWRGND VPWR PCMRC ISP-R
Focus	190 Pin	B69, B70 B67, B68 B38 B42	PWRGND VPWR PCMRC ISP-R
Fusion, Milan, MKZ	140 Pin	B67, B68, B69 B51, B52 B35 B37	PWRGND VPWR PCMRC ISP-R
All other vehicles	170 Pin	B47, B48, B49, B50 B35, B36	PWRGND VPWR

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

**Unable to Activate Self-Test/Network
Communication Error****QA**

Test Step		Results / Action to Take
QA1	CARRY OUT A VEHICLE INSPECTION AND VERIFY THE SELF-TEST PROCEDURE	Yes GO to QA2. No REFER to Diagnostic Methods, Scan Tool Setup and Functionality.
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 test. • 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 scan tool. Refer to Diagnostic Methods, Scan Tool Setup and Functionality. • Was the correct self-test procedure used?		
QA2	CARRY OUT THE NETWORK TEST	Yes REFER to Symptom Charts, GO to Pinpoint Test QT. No If only PCM indicates fail, GO to QA3. For network test or all other modules indicates fail, REFER to Information Bus (Module Communications Network), Communications Module Network to diagnose The Powertrain Control Module (PCM) Does Not Respond To The Scan Tool Or No High Speed Controller Area Network (HS-CAN) Communication Symptom.
• Key ON, engine OFF. • Carry out the network test. • Do all modules indicate pass?		

Unable to Activate Self-Test/Network Communication Error

QA

Test Step		Results / Action to Take								
QA3	CHECK FOR VREF VOLTAGE AT A SENSOR Note: PCM voltage and ground can be determined by measuring VREF voltage at a sensor. Refer to the 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 ON, engine OFF. • 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 - 5.5 V?	Yes REFER to Information Bus (Module Communications Network), Module Communications Network to diagnose The Powertrain Control Module (PCM) Does Not Respond To The Scan Tool Or No High Speed Controller Area Network (HS-CAN) Communication Symptom. No For Crown Victoria, Grand Marquis, E-Series, Escape/Mariner, Ranger, and Town Car, GO to QA6 . For all others, GO to QA4 .								
QA4	CHECK THE ISP-R VOLTAGE AT THE PCM HARNESS CONNECTOR • Key in OFF position. • PCM connector disconnected. • Key ON, engine OFF. • Measure the voltage between: <table><tr><td>(+) PCM Connector, Harness Side</td><td>(-)</td></tr><tr><td>ISP-R</td><td>Ground</td></tr></table> • Is the voltage greater than 10 V?	(+) PCM Connector, Harness Side	(-)	ISP-R	Ground	Yes GO to QA5 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.				
(+) PCM Connector, Harness Side	(-)									
ISP-R	Ground									
QA5	CHECK THE PCM VPWR CIRCUITS FOR VOLTAGE • Key in OFF position. • Disconnect the PCM. • 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>PCMRC</td><td>Ground</td></tr></table> • Key ON, engine OFF. • Measure the voltage between: <table><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 V?	Point A PCM Connector, Harness Side	Point B	PCMRC	Ground	(+) PCM Connector, Harness Side	(-)	VPWR	Ground	Yes GO to QA7 . No GO to Pinpoint Test B.
Point A PCM Connector, Harness Side	Point B									
PCMRC	Ground									
(+) PCM Connector, Harness Side	(-)									
VPWR	Ground									

Unable to Activate Self-Test/Network Communication Error

QA

Test Step		Results / Action to Take				
QA6	CHECK THE PCM VPWR CIRCUITS FOR VOLTAGE • Key in OFF position. • Disconnect the PCM. • Key ON, engine OFF. • 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 V?	(+) PCM Connector, Harness Side	(-)	VPWR	Ground	Yes GO to QA7 . No GO to Pinpoint Test B.
(+) PCM Connector, Harness Side	(-)					
VPWR	Ground					
QA7	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 GO to QA8 . No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
PWRGND	Ground					
QA8	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 network 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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.				

QA6-QA8

Test QB: DTCs P0603 or P1633: Keep Alive Power (KAPWR)

PINPOINT TEST QB: DTCs P0603 OR P1633: KEEP ALIVE POWER (KAPWR)

DTCs P0603 or P1633: Keep Alive Power (KAPWR)**QB**

This pinpoint test is intended to diagnose the following:

- battery terminal condition
- KAPWR wire routing
- harness circuit: KAPWR
- powertrain control module (PCM) (12A650)

Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
Edge, F-150, Mark LT, MKX, Sable, Taurus, Taurus X	190 Pin	B54	KAPWR
Escape/Mariner	150 (50-50-50) Pin	B45	KAPWR
Expedition, Fusion, Milan, MKZ, Navigator	140 Pin	B54	KAPWR
Focus	190 Pin	B62	KAPWR
All other vehicles	170 Pin	B45	KAPWR

Test Step		Results / Action to Take
QB1	CHECK THE 12-VOLT BATTERY TERMINALS	
Note: If the 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. Note: If DTC P0603 occurred right after or during an unsuccessful reprogramming of the PCM, clear the DTCs and repeat the PCM self-test. If DTC P0603 is retrieved again, continue with this pinpoint test. • Inspect the 12-volt battery cables for loose connections and for corrosion. • Are the 12-volt battery terminal connections in good condition?		Yes GO to QB2. No REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.

Yes
GO to **QB2**.

No
REPAIR as necessary.
CLEAR the DTCs. REPEAT the self-test.

QB1

DTCs P0603 or P1633: Keep Alive Power (KAPWR)

QB

Test Step		Results / Action to Take			
QB2	INSPECT THE ENGINE COMPARTMENT FOR CORRECT WIRE ROUTING	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to QB3.			
	- Inspect the electronic engine control (EEC) system wiring for correct 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 the wiring and connectors. - Is a concern present?				
QB3	CHECK KAPWR TO THE PCM	Yes GO to QB4. No ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.			
	- Key in OFF position. - PCM connector disconnected. - Measure the voltage between:<table border="1"><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 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 GO to QB5. No Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.			
	- 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?				
QB5	CHECK FOR CORRECT PCM OPERATION	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.			
	- 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?				

QB2-QB5

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 individual driving patterns. To complete this requirement in the shortest amount of time, refer to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle.

It is not necessary to clear DTC P1000 from the powertrain control module (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 is disconnected.
- An OBD monitor concern occurred before completion of an OBD drive cycle.
- The PCM DTCs have been cleared with a scan tool as part of a repair process.
- The PCM has been flashed and the vehicle has not yet completed an OBD drive cycle.
- DTC P1000 may not clear if the vehicle is equipped with a power take off (PTO) and the PTO is engaged or damaged.

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. DIAGNOSE the next DTC. GO to DTC Index, 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. • Are any other DTCs received with P1000?	
QC2	CHECK FOR PTO	Yes GO to QC3 . No GO to QC4 .
	• Is the vehicle equipped with PTO?	

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 FB2 .
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. REFER to Diagnostic Methods, On Board Diagnostic (OBD) Drive Cycle. No 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 passive anti-theft system (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 is 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 Anti Theft and Alarm Systems, Anti-Theft to diagnose any PATS related DTCs.
	- Repair all PATS DTCs before P1260. - Are all PATS DTCs diagnosed?	
QD2	CHECK FOR ANY OTHER POWERTRAIN DTCs	Yes GO to QD3 . No DISREGARD DTC P1260. DIAGNOSE all other powertrain DTCs. REFER to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions.
	- Repair all powertrain DTCs other than P1260. - Are all other powertrain DTCs diagnosed?	
QD3	ATTEMPT TO START THE ENGINE	Yes No system concerns exist at the present time. For intermittent no start or start stalls, CHECK for intermittent PATS concerns. (PATS cannot stall the engine after 1 second of operation). For intermittent stalls while driving, VERIFY scan 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, or a damaged EEC PWR diode. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No DTC P1260 is not the cause of the No Start. REFER to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index.
	- 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?	

QD1-QD3

Test QE: Electronic Throttle Control (ETC) System
PINPOINT TEST QE: ELECTRONIC THROTTLE CONTROL (ETC) SYSTEM

Electronic Throttle Control (ETC) System

QE

Note: Diagnose and repair the following DTCs through DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions and testing for that system or component respectively before entering this pinpoint test:

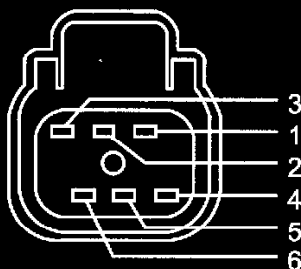
- P0715
- P0720
- P0731-P0735
- P0102-P0104
- P0321
- C1165
- U1027

This pinpoint test is intended to diagnose the informational powertrain control module (PCM) diagnostic trouble codes (DTCs).

The informational DTCs are the result of limited operating strategy (LOS) or failure mode effects management (FMEM) operating strategy that maintains limited vehicle function in the event of a PCM, harness, or component concern.

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

Note And EGR System Module (ESM) Connector

Electronic Throttle Control (ETC) System

QE

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

Test Step		Results / Action to Take
QE1	CHECK FOR DTCS	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No For Focus with DTC P0600, GO to QE2. For all others with DTC P0600, GO to QE18. For DTCs P060A, P060C, P060D, P061D, P1674 or U0300, GO to QE2. For DTC P060B, GO to QE3. For DTC P061B, GO to QE13. For DTC P061C, GO to QE5. For DTC P061F, GO to QE7. For DTCs P062C, P2104, P2105 or P2110, GO to QE8.
QE2	DTCS P060A, P060C, P060D, P061D, P1674 OR U0300: CHECK THE PCM FOR THE LATEST CALIBRATION	
	- Program the PCM to the latest calibration. - Key in OFF position. - Key ON, engine OFF. - Key in OFF position. - Key ON, engine running. - Use the customer information to recreate the concern. - Carry out the self-test. Are DTCs P060A, P060C, P060D, P061D, P1674 or U0300 present?	
QE3	DTC P060B: CHECK FOR REFERENCE VOLTAGE CONCERNS	Yes GO to QE18. No The concern is not present at this time.
	- Inspect the PCM harness for damage. - Verify the correct operation of the sensors using ETCREF, VREF and related circuits. GO to Pinpoint Test C and follow the pinpoint test direction. Is a concern present?	
		Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to QE4.

QE1-QE3

**Electronic Throttle Control (ETC)
System****QE**

Test Step		Results / Action to Take
QE4	CHECK FOR AN INTERMITTENT CONCERN	
	• Clear the DTCs. • Carry out the self-test. • Is DTC P060B present?	Yes GO to QE18 . No The concern is not present at this time.
QE5	DTC P061C: CHECK THE CKP SENSOR FOR CORRECT OPERATION	
	• Verify correct operation of the CKP sensor and related circuits. GO to Pinpoint Test JD and follow the pinpoint test direction. • Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to QE6 .
QE6	CHECK THE CMP SENSOR FOR CORRECT OPERATION	
	• Verify correct operation of the CMP sensor and related circuits. GO to Pinpoint Test DR and follow the pinpoint test direction. • Is a concern present?	Yes REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to QE7 .
QE7	DTC P061F: VERIFY THE CUSTOMER CONCERN	
	• Clear the DTCs. • Use the customer information to recreate the concern. • Carry out the self-test. • Are DTCs P061C or P061F present?	Yes GO to QE18 . No The concern is not present at this time.
QE8	DTCS P062C, P2104, P2105 OR P2110: 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 vehicle system to diagnose the DTC. No GO to QE9 .

QE4-QE8

**Electronic Throttle Control (ETC)
System****QE**

Test Step		Results / Action to Take
QE9	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. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. For communication concerns in other modules, REFER to Testing for that System or Component to diagnose the communication DTC. No For DTC P062C, GO to QE16 . For DTC P2104, GO to QE10 . For DTC P2105, GO to QE11 . For DTC P2110, GO to QE15 .
QE10	DTC P2104: CHECK FOR THE PRESENCE OF PCM DTCs • Clear the PCM DTCs. • Check for self-test DTCs. • Are any DTCs present other than P2104?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to Pinpoint Test DK.
QE11	DTC P2105: CHECK FOR THE PRESENCE OF PCM DTCs Note: P2105 sets in combination with other DTCs. • Clear the PCM DTCs. • Check for self-test DTCs. • Are any DTCs present other than P2105?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to QE12 .
QE12	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 concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. No GO to QE18 .

Electronic Throttle Control (ETC) System

QE

Test Step		Results / Action to Take				
QE13	DTC P061B: CHECK FOR THE PRESENCE OF PCM DTCS Note: An intermittent CKP sensor or harness concern may cause DTC P061B to set. Check for intermittent CKP sensor and harness concerns. • Clear the PCM DTCs. • Check for self-test DTCs. • Are any DTCs present other than P061B?	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No For Crown Victoria, E-Series 4.6L, Explorer 4.0L, Explorer Sport Trac 4.0L, F-150 4.2L, F-150 4.6L, F-Super Duty 6.8L, Grand Marquis, Mountaineer 4.0L, Mustang 4.0L, Mustang 5.4L, and Town Car, GO to QE14 . For all others, CHECK for an intermittent concern with an ETC related harness or sensor. GO to Pinpoint Test Z.				
QE14	CHECK THE MAP INPUT 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 4.0L, Explorer Sport Trac 4.0L, Mountaineer 4.0L, and Town Car, GO to QE16 . 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. CLEAR the DTCs. REPEAT the self-test.
(+) ESM Connector, Component Side	(-) ESM Connector, Component Side					
VREF - Pin 2	SIGRTN - Pin 6					

QE13-QE14

Electronic Throttle Control (ETC) System

QE

Test Step		Results / Action to Take
QE15	DTC P2110: CHECK FOR THE PRESENCE OF PCM DTCS	Yes DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Index, Diagnostic Trouble Code (DTC) Charts and Descriptions. No GO to QE18 .
	Note: P2110 sets in combination with other DTCs. • Clear the PCM DTCs. • Check for self-test DTCs. • Are any DTCs present other than P2110?	
QE16	CHECK FOR ABS AND WHEEL SPEED SENSOR CONCERNS	Yes For Explorer 4.0L, Explorer Sport Trac 4.0L, F-150 5.4L, Mark LT, and Mountaineer 4.0L, GO to QE17 . For all others, CHECK for an intermittent concern with an ETC related harness or sensor. GO to Pinpoint Test Z. No REFER to Vehicle Dynamic Systems to diagnose any ABS 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 ISS_SRC, OSS_SRC, TSS 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?	
QE17	CHECK FOR A TRANSFER CASE MECHANICAL CONCERN	Yes CHECK for an intermittent concern with an ETC related harness or sensor. GO to Pinpoint Test Z. No REFER to Four Wheel Drive (4WD) Systems to diagnose any transfer case concerns.
	• Stop the vehicle. • Select 4WD Low. • Does the vehicle shift into 4WD Low?	

**Electronic Throttle Control (ETC)
System****QE**

Test Step		Results / Action to Take
QE18	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

QE18

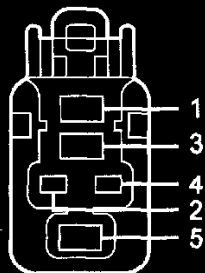
Test TA: Clutch Pedal Position (CPP) Switch

PINPOINT TEST TA: CLUTCH PEDAL POSITION (CPP) SWITCH

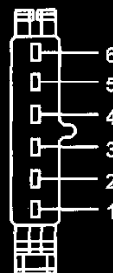
Clutch Pedal Position (CPP) Switch**TA**

This pinpoint test is intended to diagnose the following:

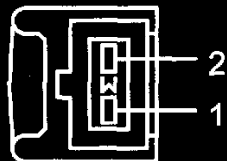
- CPP (11A152/7C534)
- harness circuits: CPP / CPP BT and SIGRTN / GND
- powertrain control module (PCM) (12A650)

Clutch Pedal Position (CPP) Switch Connector**A**

N0047960

B

A0077530

C

A0077522

D

A0077523

Vehicle	Connector	Pin	Circuit
Escape/Mariner	A	2 4	SIGRTN CPP
F-150	B	2 1	GND CPP

(Continued)

Description And Clutch Pedal Position (CPP) Switch Connector

Clutch Pedal Position (CPP) Switch

TA

Vehicle	Connector	Pin	Circuit
Mustang	C	2 1	GND CPP
Ranger	B	5 6	GND CPP
All other vehicles	D	2 1	GND CPP

Powertrain Control Module (PCM) Connector

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

Vehicle	Connector	Pin	Circuit
Escape/Mariner	150 (50-50-50) Pin	B41, E41, T41 T27	SIGRTN CPP
F-150	190 Pin	B39 B58, E58, T43	CPP-BT SIGRTN
F-Super Duty	170 Pin	B34 B41, E58, T41	CPP-BT SIGRTN
Focus	190 Pin	T26 B58, E64, T40	CPP-BT SIGRTN
Fusion, Milan	140 Pin	B18 B58, E58	CPP-BT SIGRTN
All other vehicles	170 Pin	B41, E58, T41 B33	SIGRTN CPP

Test Step		Results / Action to Take
TA1	DTC P0704, P0830: CHECK THE CPP SWITCH	
 CAUTION: Apply the vehicle park brake. Make sure the vehicle is secured with wheel chocks. Note: During self-test, the clutch pedal must be down and gearshift lever in NEUTRAL. • Key ON, engine OFF. • Access the PCM and monitor the CPP PID. • Does the reading cycle when the CPP switch is activated?		Yes This may be an intermittent circuit concern. INSPECT connectors for signs of damage, water intrusion, corrosion. REPAIR as necessary. No GO to TA2.

TA1

Clutch Pedal Position (CPP) Switch

TA

Test Step		Results / Action to Take								
TA2	CHECK THE SWITCH CIRCUIT RESISTANCE Note: The CPP switch is located near the clutch pedal. Note: Measure the CPP switch resistance with the clutch pedal pressed down. - Inspect the switches and brackets for damage. Repair as necessary. - CPP Switch connector disconnected. - For Focus or Escape, - Measure the resistance between: <table><tr><td>(+) CPP Switch Connector, Component Side</td><td>(-) CPP Switch Connector, Component Side</td></tr><tr><td>CPP</td><td>SIGRTN</td></tr></table> - For all others, - Measure the resistance between: <table><tr><td>(+) CPP Switch Connector, Component Side</td><td>(-) CPP Switch Connector, Component Side</td></tr><tr><td>CPP</td><td>GND</td></tr></table> - Is the resistance less than 5 ohms?	(+) CPP Switch Connector, Component Side	(-) CPP Switch Connector, Component Side	CPP	SIGRTN	(+) CPP Switch Connector, Component Side	(-) CPP Switch Connector, Component Side	CPP	GND	Yes GO to TA3. No INSTALL a new CPP switch. CLEAR the DTCs. REPEAT the self-test.
(+) CPP Switch Connector, Component Side	(-) CPP Switch Connector, Component Side									
CPP	SIGRTN									
(+) CPP Switch Connector, Component Side	(-) CPP Switch Connector, Component Side									
CPP	GND									
TA3	CHECK THE CPP FOR INTERNAL SHORTS Note: Measure the CPP switch resistance with the clutch pedal released. - For Focus or Escape, - Measure the resistance between: <table><tr><td>(+) CPP Switch Connector, Component Side</td><td>(-) CPP Switch Connector, Component Side</td></tr><tr><td>CPP</td><td>SIGRTN</td></tr></table> - For all others, - Measure the resistance between: <table><tr><td>(+) CPP Switch Connector, Component Side</td><td>(-) CPP Switch Connector, Component Side</td></tr><tr><td>CPP</td><td>GND</td></tr></table> - Is the resistance greater than 10K ohms?	(+) CPP Switch Connector, Component Side	(-) CPP Switch Connector, Component Side	CPP	SIGRTN	(+) CPP Switch Connector, Component Side	(-) CPP Switch Connector, Component Side	CPP	GND	Yes For Focus or Escape, GO to TA5. For all others, GO to TA4. No INSTALL a new CPP switch. CLEAR the DTCs. REPEAT the self-test.
(+) CPP Switch Connector, Component Side	(-) CPP Switch Connector, Component Side									
CPP	SIGRTN									
(+) CPP Switch Connector, Component Side	(-) CPP Switch Connector, Component Side									
CPP	GND									

Clutch Pedal Position (CPP) Switch

TA

Test Step		Results / Action to Take								
TA4	CHECK THE CPP AND GROUND CIRCUITS FOR AN OPEN IN THE HARNESS - PCM connector disconnected. - Measure the resistance between:<table><tr><td>(+) CPP Switch Connector, Harness Side</td><td>(-) PCM Connector, Harness Side</td></tr><tr><td>CPP</td><td>CPP</td></tr></table> - Measure the resistance between:<table><tr><td>(+) CPP Switch Connector, Harness Side</td><td>(-)</td></tr><tr><td>GND</td><td>Ground</td></tr></table> - Is the resistance less than 5 ohms?	(+) CPP Switch Connector, Harness Side	(-) PCM Connector, Harness Side	CPP	CPP	(+) CPP Switch Connector, Harness Side	(-)	GND	Ground	Yes GO to TA6. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) CPP Switch Connector, Harness Side	(-) PCM Connector, Harness Side									
CPP	CPP									
(+) CPP Switch Connector, Harness Side	(-)									
GND	Ground									
TA5	CHECK THE CPP 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>(-) CPP Switch Connector, Harness Side</td></tr><tr><td>CPP</td><td>CPP</td></tr><tr><td>SIGRTN</td><td>SIGRTN</td></tr></table> - Are the resistances less than 5 ohms?	(+) PCM Connector, Harness Side	(-) CPP Switch Connector, Harness Side	CPP	CPP	SIGRTN	SIGRTN	Yes GO to TA6. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.		
(+) PCM Connector, Harness Side	(-) CPP Switch Connector, Harness Side									
CPP	CPP									
SIGRTN	SIGRTN									
TA6	CHECK THE CPP CIRCUIT FOR A SHORT TO VOLTAGE - Key ON, engine OFF. - Measure the voltage between:<table><tr><td>(+) CPP Switch Connector, Harness Side</td><td>(-)</td></tr><tr><td>CPP</td><td>Ground</td></tr></table> - Is the voltage less than 1 V?	(+) CPP Switch Connector, Harness Side	(-)	CPP	Ground	Yes GO to TA7. No REPAIR the short circuit to PWR. CLEAR the DTCs. REPEAT the self-test.				
(+) CPP Switch Connector, Harness Side	(-)									
CPP	Ground									
TA7	CHECK THE CPP CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Key in OFF position. - Measure the resistance between:<table><tr><td>(+) CPP Switch Connector, Harness Side</td><td>(-)</td></tr><tr><td>CPP</td><td>Ground</td></tr></table> - Is the resistance greater than 10K ohms?	(+) CPP Switch Connector, Harness Side	(-)	CPP	Ground	Yes GO to TA8. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.				
(+) CPP Switch Connector, Harness Side	(-)									
CPP	Ground									

Clutch Pedal Position (CPP) Switch**TA**

Test Step		Results / Action to Take
TA8	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

TA8

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	Pin	Circuit
E-Series	170 Pin	B43 B27	TCIL TCS
Edge, MKX, Sable, Taurus, Taurus X	190 Pin	B16	TCS
Escape/Mariner	150 (50-50-50) Pin	B27	TCS
F-150, Mark LT	190 Pin	B45	TCS
F-Super Duty	170 Pin	B27	TCS
Focus	190 Pin	T30	TCS
Fusion	140 Pin	B16	TCS
All other vehicles	170 Pin	B29	TCS

Description And Powertrain Control Module (PCM) Connector

Transmission Control Switch (TCS)/ Transmission Control Indicator Lamp (TCIL)

TB

Test Step		Results / Action to Take				
TB1	CHECK FOR DIAGNOSTIC TROUBLE CODES (DTC) Is DTC P1780 present?	Yes GO to TB2. No For TCIL never on, GO to TB10. For TCIL always on, GO to TB8.				
TB2	DTC P1780: CHECK THE TCS FUNCTION Note: Verify the TCS was cycled during self-test. - Key ON, engine OFF. - Access the PCM and monitor 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 is applied?	Yes REPEAT the KOER self-test and cycle the TCS during the test. No GO to TB3.				
TB3	CHECK THE TCS VOLTAGE - Key in OFF position. - PCM connector disconnected. - Key ON, engine OFF. - 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 GO to TB12. No GO to TB4.
(+) PCM Connector, Harness Side	(-)					
TCS	Ground					
TB4	CHECK THE TCS CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS - Key in OFF position. - 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 TB5. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-)					
TCS	Ground					
TB5	CHECK FOR VOLTAGE TO THE TCS - Key ON, engine OFF. - 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 V?	(+) TCS Connector, Harness Side	(-)	VPWR	Ground	Yes GO to TB6. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) TCS Connector, Harness Side	(-)					
VPWR	Ground					

Transmission Control Switch (TCS)/ Transmission Control Indicator Lamp (TCIL)

TB

Test Step		Results / Action to Take				
TB6	CHECK THE TCS CIRCUIT FOR AN OPEN IN THE HARNESS - Key in OFF position. - 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 TB7. No REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
(+) PCM Connector, Harness Side	(-) TCS Connector, Harness Side					
TCS	TCS					
TB7	CHECK THE TCS CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS - Key ON, engine OFF. - 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. CLEAR the DTCs. REPEAT the self-test. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
(+) TCS Connector, Harness Side	(-)					
TCS	Ground					
TB8	TCIL ALWAYS ON: CHECK THE TCIL FUNCTION - Key ON, engine OFF. - Apply and release the TCS. - Does the TCIL change state?	Yes Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z. No GO to TB9.				
TB9	CHECK THE TCIL CIRCUIT(S) FOR A SHORT TO GROUND IN THE HARNESS Note: The TCIL turns off when the PCM is disconnected. - Key in OFF position. - PCM connector disconnected. - Key ON, engine OFF. - Does the TCIL change state?	Yes GO to TB12. No REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.				
TB10	TCIL NEVER ON: CHECK FOR KOER P1780 - Check the PCM for KOER DTCs. - Is DTC P1780 present?	Yes REPAIR the DTC. CLEAR the DTCs. REPEAT the self-test. GO to TB2. No GO to TB11.				

**Transmission Control Switch (TCS)/
Transmission Control Indicator Lamp
(TCIL)****TB**

Test Step		Results / Action to Take				
TB11	CHECK FOR VOLTAGE TO THE TCIL • Key in OFF position. • PCM connector disconnected. • Key ON, engine OFF. • 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> • Does the TCIL illuminate?	Point A PCM Connector, Harness Side	Point B Vehicle Battery	TCIL	Negative terminal	Yes GO to TB12 . 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. CLEAR the DTCs. REPEAT the self-test.
Point A PCM Connector, Harness Side	Point B Vehicle Battery					
TCIL	Negative terminal					
TB12	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), Programming the VID Block for a Replacement PCM. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.				

TB11-TB12

Test Z: Intermittent
PINPOINT TEST Z: INTERMITTENT

Intermittent**Z**

 **WARNING: Crown Victoria Police Interceptor vehicles equipped with fire suppression system, refer to Fire Suppression System for Important Safety Warnings. Failure to follow these instructions may result in personal injury.**

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 has 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
ACCS	A/CCS	input
ACET	ACET	input
ACP	ACPSW	input
AIR	AIR	output
AIRM	AIRM	input
APP1	APPS	input
APP2	APPS	input
APP3	APPS	input
BPP/BOO	BPP	input
BPA	BPS	input
CCS	CCS	output
Use DMM	CD A-J (primary)	output
CHT	CHT	input
CKP	CKP	input
CMP	CMP	input
CPP/PNP	CPP	input
CTO	CTO	output
DPFEGR	DPFE	input
ECT	ECT	input
EGRMC1	EGRMC1	output
EGRMC2	EGRMC2	output
EGRMC3	EGRMC3	output
EGRMC4	EGRMC4	output
EGRMDS	EGRMC	output
EVR	EVR	output

(Continued)

Intermittent**Z****PCM PIDS/SIGNALS**

PCM/TCM PIDS/SIGNALS	Associated Circuit	Test Type
EOT	EOT	input
EPC, EPCV	EPC	output
EVAPCV	CV	output
EVAPPDC	VMV	output
EVAPPF	VMV	output
FANDC	VDF	output
FANSS	FANSS	input
FLI	FLI	input
FP	FP	output
FPM	FPM	input
FP M	FPM	input
FRP	FRP	input
FRT	FRT	input
FTP	FTP	input
GENCM/ILINE	GENRC	output
GENMN GFS	GENLI	input
HFC	HFC	output
HOS11	HEGO	input
HOS12	HEGO	input
HOS13	HEGO	input
IAC	IAC	output
IAT	IAT	input
IAT2	IAT 2	input
IMRC	IMRC	output
IMRC1M	IMRCM	input
IMTV1	IMTV1	output
IMTV2	IMTV2	output
ISS_SRC	ISS	input
KS1	KS1	input
KS2	KS2	input
LFC	LFC	output
MAF, MAF V	MAF	input
MAP V	MAP	input
O2S11	O2S	input
O2S12	O2S	input
O2S13	O2S	input
OSS	OSS	input
PSP	PSP	input
PSPT	PSP	input

(Continued)

PCM PIDS/Signals Continued

Intermittent**Z****PCM PIDS/SIGNALS**

PCM/TCM PIDS/SIGNALS	Associated Circuit	Test Type
PTO	PTO	input
SSA/SS1	SS1	output
SSB/SS2	SS2	output
SSC/SS3	SS3	output
SSD/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	input
TP	TP	input
TSS	TSS	input
VCT1	VCT1	output
VCT2	VCT2	output
VPWR	VPWR	input
Use DMM	VREF	output
Use DMM	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 clears any freeze frame data and eliminates FMEM. This helps to recreate the original conditions that set the DTCs or caused the symptom. • Key ON, engine OFF. • 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).

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 scan 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 scan tool. - Are all available PIDs/signals related to the symptom 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. Is a concern symptom 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 concern area. REPEAT the test step. GO to Z4.
	Note: Only MIL codes trigger freeze frame data. Refer to the scan 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. - Is all available data 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 scan 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 scan tool instruction manual for information on the recorder function. - Can the symptom be recreated?	

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Test Step		Results / Action to Take
Z6	RECREATE THE SYMPTOM USING THE KOEO AND ROAD TEST PROCEDURE	
	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 concern, 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 road test is the last attempt to locate the area of concern before physically disturbing vehicle circuits. • The Intermittent Road Test Procedure is a set of instructions for monitoring PIDs/signals with a scan 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. compare with the actual vehicle. • Locate the correct Reference Value Chart in (*). • Setup the vehicle to measure the circuits with a digital multimeter and a scan tool. • Connect a scan tool to the DLC. • Key ON, engine OFF. • With the scan tool, select and monitor PIDs and measure the circuits shown in the Reference Value Chart in Reference Values. • Compare the scan tool PIDs and digital multimeter values to the Reference Value Charts. • Are any values out of range?	Yes GO to Z10. No GO to Z7.
Z7	RECREATE THE SYMPTOM USING THE HOT IDLE ROAD TEST PROCEDURE	
	Note: The engine temperature should be at least 87°C (189°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.

(*) Reference Values,

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Test Step		Results / Action to Take
Z9	RECREATE THE SYMPTOM USING 88 KM/H (55 MPH) HIGH CRUISE ROAD TEST PROCEDURE - 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?	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 .
Z10	SELECT THE CIRCUITS FROM THE PCM PIDS/SIGNALS CHART Note: From the same chart, be sure to select and proceed with the appropriate test type. Note: The Input Test should be used on sensing inputs such as temperature, position or oxygen. Note: The Output Test should be used on output devices such as relays, coils or solenoids. - Remain in the PID/Signal selection menu with the scan 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 from (*). - Otherwise, highlight only the PIDs/signals from step Z2. - Proceed to the PCM PIDS/SIGNALS 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 scan tool, it may be helpful to replay it at this time. Refer to the scan tool instruction manual for recorder function information. Has a test been chosen?	Yes For the input test, GO to Z11 . For the output test, GO to Z15 . No To diagnose other driveability symptoms, REFER to Symptom Charts, No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index.

(*) Reference Values

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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. Failure to follow these instructions may result in personal injury. • Using the circuits chosen from the PCM PIDS/SIGNALS Chart, select only the recommended PIDs/signals to monitor with the scan 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 concern. • Key ON, engine OFF. • If the input is a switch type-component, turn it on manually. • Monitor the PID or DMM 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. CLEAR the DTCs. REPEAT the self-test. 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. Failure to follow these instructions may result in personal injury. • 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 concern. • If the input is a switch type-component, turn it on manually. • Monitor the PID or DMM 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. CLEAR the DTCs. REPEAT the self-test. No GO to Z13.

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Test Step		Results / Action to Take
Z13	KOEO WATER SOAK TEST PROCEDURE FOR THE PCM/TCM SENSORS, 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. Failure to follow these instructions may result in personal injury. • Key ON, engine OFF. • Continue to monitor the PIDs and circuits as in the previous step. • Proceed to the area of the suspect wiring or component concern. • If the input is a switch type-component, turn it on manually. • Monitor the PID or DMM 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. CLEAR the DTCs. REPEAT the self-test. No GO to Z14.
Z14	KOER WATER SOAK TEST PROCEDURE FOR THE PCM/TCM SENSORS, 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. Failure to follow these instructions may result in personal injury. • 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 concern. • If the input is a switch type-component, turn it on manually. • Monitor the PID or DMM 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. CLEAR the DTCs. REPEAT the self-test. No GO to Z15.

Intermittent

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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. Failure to follow these instructions may result in personal injury.  CAUTION: The cooling fans or the fuel pump may turn on during the next steps. Note: Remember that PIDs selected from the PCM PIDS/SIGNALS 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. • Using the circuits chosen from the PCM PIDS/SIGNALS Chart, select only the recommended PIDs/signals to monitor with the scan tool. If a PID is not available for the circuit, use a DMM to check the value. • Key ON, engine OFF. • With the scan tool, turn on selected outputs using output state control. Refer to the scan tool instruction manual. • Proceed to the area of the suspect wiring or component concern. • Monitor the PID or DMM 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. CLEAR the DTCs. REPEAT the self-test. 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. Failure to follow these instructions may result in personal injury. Note: Remember that PIDs selected from the PCM PIDS/SIGNALS 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 concern. • Monitor the PIDs with the scan tool and note the values. Compare the scan 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 scan tool to DMM value mismatch or an idle fluctuation?		Yes REPAIR as necessary. VERIFY the repair. CLEAR the DTCs. REPEAT the self-test. 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. Failure to follow these instructions may result in personal injury. Note: Remember that PIDs selected from the PCM PIDS/SIGNALS 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 OFF. • With the scan tool, turn on selected outputs using output state control. Refer to the scan tool instruction manual. • Proceed to the area of the suspect wiring or component concern. • Monitor the PID or DMM 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 Reference Values?		Yes REPAIR as necessary. VERIFY the repair. CLEAR the DTCs. REPEAT the self-test. 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. Failure to follow these instructions may result in personal injury. • Key ON, engine running. • Using the circuits chosen from the PCM PIDS/SIGNALS Chart, select only the recommended PIDs/signals to monitor with the scan tool. If a PID is not available for the circuit, use a DMM to check the value. • Proceed to the area of the suspect wiring or component concern. • Monitor the PID or DMM 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. CLEAR the DTCs. REPEAT the self-test. 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. CLEAR the DTCs. REPEAT the self-test. 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.