Computers and Control Systems: Pinpoint Tests

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

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

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

⚠ **WARNING: Vehicle fuel systems are pressurized even when the engine is not running. To avoid fire or personal injury, disable the fuel delivery system and relieve fuel system pressure before removing any fuel system component. Refer to the fuel system information at the beginning of pinpoint HC. 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 (FRP) sensor (6B288)
- fuel rail temperature (FRT) sensor (4702)
- fuel rail pressure temperature (FRPT) sensor (9G756)
- harness circuits: FRP, FRT, and FRPT
- powertrain control module (PCM) (12A650)

Tables and Graphs

FRP SENSOR VOLTAGE AND PRESSURE SPECIFICATIONS

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

FRT SENSOR TEMPERATURE, VOLTAGE, AND RESISTANCE SPECIFICATIONS

Temperature		Sensor	
°C	°F	Volts	K Ohms
100	212	0.47	2.073
95	203	0.54	2.405
90	194	0.61	2.800

(Continued)

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

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FRT SENSOR TEMPERATURE, VOLTAGE, AND RESISTANCE SPECIFICATIONS

Temperature		Sensor	
°C	°F	Volts	K Ohms
85	185	0.70	3.273
80	176	0.80	3.840
75	167	0.92	4.524
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 (FRP) Sensor Connector

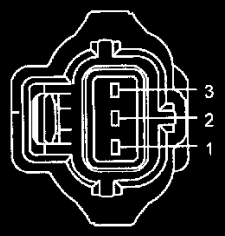

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Table And Fuel Rail Pressure (FRP) Sensor Connector

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

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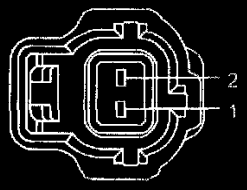
Pin	Circuit
3	FRP (Fuel Rail Pressure)
2	SIGRTN (Signal Return)
1	VREF (Reference Voltage)

Fuel Rail Temperature (FRT) Sensor Connector



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

Fuel Rail Pressure (FRP) Sensor Connector And Fuel Rail Temperature (FRT) Sensor Connector

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

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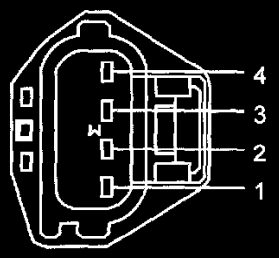
Fuel Rail Pressure Temperature (FRPT) Sensor Connector



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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
Crown Victoria, Five Hundred, Freestyle, Grand Marquis, Montego	150 (50-50-50) Pin	E36 B40, E40 E41 E37	FRT VREF SIGRTN FRP
E-Series 4.6L	170 Pin	B40, E57 E58 E32	VREF SIGRTN FRP
E-Series 6.8L, E-Series 5.4L, F-Super Duty, Mustang	170 Pin	E19 B40, E57 E58 E32	FRT VREF SIGRTN FRP

(Continued)

Fuel Rail Pressure Temperature (FRPT) Sensor Connector And Powertrain Control Module (PCM) Connector

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

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Vehicle	Connector	Pin	Circuit
Escape, Mariner	150 (50-50-50) Pin	E28 B40, E40 E41 E37	FRT VREF SIGRTN FRP
Explorer, Mountaineer	170 Pin	E19 E57 E58 E32	FRT VREF SIGRTN FRP
F-150 4.6L	190 Pin	B29, E57 E58 E32	VREF SIGRTN FRP
Focus	150 (50-50-50) Pin	E31 E40 E41 E37	FRT VREF SIGRTN FRP
Ford GT	104 Pin	90 91 63	VREF SIGRTN FRP
LS	150 (60-32-58) Pin	E4 B55, E14 E17 E49	FRT VREF SIGRTN FRP
Taurus	104 Pin	10 90 91 63	FRT VREF SIGRTN FRP
Town Car	150 (50-50-50) Pin	E36 B40, E40 E41 B37	FRT VREF SIGRTN FRP
All other vehicles	190 Pin	E19 B29, E57 E58 E32	FRT VREF SIGRTN FRP

Powertrain Control Module (PCM) Connector

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

DD

Test Step		Results / Action to Take
DD1	**CHECK FOR FRPT DTCS**	
	• For vehicles equipped with an FRP sensor, GO to **DD2**. • For DTC P0180, GO to **DD49**. • For DTC P0181, GO to **DD51**. • For KOEO and KOER DTCs P0182 or P0183, GO to **DD42**. • For continuous memory DTC P0190, GO to **DD28**. • For DTC P0191, GO to **DD36**. • For KOEO and KOER DTCs P0192 or P0193, GO to **DD28**. • For continuous memory DTCs P0192 or P0193, GO to **DD41**. • Key ON, engine OFF. • Access the PCM and monitor the FRT V PID. • While observing the PID, carry out the following: — Tap on the sensor to simulate road shock — Wiggle the sensor connector — Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM • Check the FRPT and 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 Charts, Diagnostic Trouble Code (DTC) Charts and Descriptions.
DD2	**CHECK FOR FRP DTCS**	
	• For DTC P0180, GO to **DD24**. • For DTC P0181, GO to **DD26**. • 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 **DD3**. • For continuous memory DTCs P0192 or P0193, GO to **DD16**. • Key ON, engine OFF. • Access the PCM and monitor the FRT V PID. • While observing the PID, carry out the following: — Tap on the sensor to simulate road shock — Wiggle the sensor connector — Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM • Check the FRT and 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 Charts, Diagnostic Trouble Code (DTC) Charts and Descriptions.

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

DD

Test Step		Results / Action to Take
DD3	**CONTINUOUS MEMORY DTC P0190, KOEO AND KOER DTCS P0192 AND P0193: CHECK FRP SENSOR FOR FUEL LEAKS**	
	Note: Repair any fuel pump DTCs prior to this test. • Key ON, engine running. • Idle the engine for 2 minutes. • Inspect the FRP vacuum hose between the intake manifold and the FRP sensor for air leaks and correct connection. • Key in OFF position. • Remove the vacuum hose from the FRP. • Inspect the FRP and vacuum hose for traces of fuel. • **Is any fuel present?**	**Yes** INSTALL a new FRP sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC. REFER to Computers and Control Systems. CLEAR the DTCs. REPEAT the self-test. **No** GO to **DD4**.
DD4	**CHECK THE VREF AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS**	
	• Connect the vacuum hose to the FRP. • FRP Sensor connector disconnected. • Key ON, engine OFF. • Measure the voltage between: (+) FRP Sensor Connector, Harness Side: VREF - Pin 1 (-) FRP Sensor Connector, Harness Side: SIGRTN - Pin 2 • **Is the voltage between 4.5 - 5.5 V?**	**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.
DD5	**INDUCE A HIGH VOLTAGE ON THE FRP CIRCUIT**	
	Note: If a diagnostic tool communication concern exists, immediately remove the jumper and follow the NO path in the Results/Action to Take column. • Key in OFF position. • Connect a 5 amp fused jumper wire between the following: Point A FRP Sensor Connector, Harness Side: VREF - Pin 1 Point B FRP Sensor Connector, Harness Side: FRP - Pin 3 • Key ON, engine OFF. • Access the PCM and monitor the FRP V PID. • **Is the voltage greater than 4.5 V?**	**Yes** INSTALL a new FRP sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC. REFER to Computers and Control Systems. CLEAR the DTCs. REPEAT the self-test. **No** GO to **DD6**.

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

Test Step	Results / Action to Take
DD6 CHECK THE FRP CIRCUIT(S) FOR A SHORT TO SIGRTN OR GND IN THE HARNESS • Key in OFF position. • Remove the jumper wire(s). • PCM connector disconnected. • Measure the resistance between: (+) PCM Connector, Harness Side: FRP (-) PCM Connector, Harness Side: SIGRTN • Measure the resistance between: (+) PCM Connector, Harness Side: FRP (-): Ground • **Is the resistance greater than 10K ohms?**	**Yes** GO to **DD53**. **No** REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
DD7 CHECK THE FRP CIRCUIT FOR AN OPEN IN THE HARNESS • Key in OFF position. • PCM connector disconnected. • Measure the resistance between: (+) PCM Connector, Harness Side: FRP (-) FRP Sensor Connector, Harness Side: FRP - Pin 3 • **Is the resistance less than 5 ohms?**	**Yes** GO to **DD8**. **No** REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
DD8 CHECK THE FRP CIRCUIT FOR A SHORT TO VREF • Measure the resistance between: (+) PCM Connector, Harness Side: VREF (-) PCM Connector, Harness Side: FRP • **Is the resistance greater than 10K ohms?**	**Yes** GO to **DD9**. **No** REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
DD9 CHECK THE FRP CIRCUIT FOR A SHORT TO VOLTAGE • Key ON, engine OFF. • Measure the voltage between: (+) FRP Sensor Connector, Harness Side: FRP - Pin 3 (-): Ground • **Is any voltage present?**	**Yes** REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. **No** GO to **DD10**.

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

Test Step		Results / Action to Take
DD10	**INDUCE A LOW VOLTAGE ON THE FRP CIRCUIT**	
	Note: If a diagnostic tool communication concern exists, immediately remove the jumper and follow the NO path in the Results/Action to Take column. • Key in OFF position. • PCM connector connected. • Connect a 5 amp fused jumper wire between the following: **Point A FRP Sensor Connector, Harness Side:** FRP - Pin 3 **Point B FRP Sensor Connector, Harness Side:** SIGRTN - Pin 2 • Key ON, engine OFF. • Access the PCM and monitor the FRP V PID. • **Is the voltage less than 0.1 V?**	**Yes** INSTALL a new FRP sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC. CLEAR the DTCs. REPEAT the self-test. **No** GO to **DD53**.
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 Charts**, Diagnostic Trouble Code(DTC) Charts and Descriptions. **No** GO to **DD12**.
DD12	**INSPECT ALL THE VACUUM HOSES CONNECTED TO THE INTAKE MANIFOLD FOR LEAKS**	
	• Key in OFF position. • FRP Sensor connector connected. • Key ON, engine running. • Allow the engine idle to stabilize. • Inspect all the vacuum hoses connected to the intake manifold for leaks. • **Are any vacuum hose concerns present?**	**Yes** ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. **No** GO to **DD13**.
DD13	**CHECK THE FRP CONNECTOR FOR DAMAGE OR CORROSION**	
	• Key in OFF position. • FRP 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**.

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

DD

Test Step		Results / Action to Take
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. • FRP 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 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**.
DD15	**COMPARE THE FRP PID TO THE MECHANICAL GAUGE**	
	Note: Most mechanical gauges are referenced to atmospheric pressure. The FRP sensor is referenced to manifold pressure. In order to make a valid comparison, the engine must be off. **Note:** The vehicle may exhibit a long crank until the fuel system is pressurized. • Key in OFF position. • 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 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 **DD53**. **No** INSTALL a new FRP sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC. CLEAR the DTCs. REPEAT the self-test.

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

DD

Test Step		Results / Action to Take
DD16	**CONTINUOUS MEMORY DTCS P0192 AND P0193: CHECK THE FRP 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 V PID. • While observing the PID, carry out the following: — Tap on the sensor to simulate road shock — Wiggle the sensor connector — Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM • Check the FRP connector for damage or corrosion. • **Is a concern present?**	**Yes** ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. **No** GO to Pinpoint Test Z.
DD17	**KOEO AND KOER DTCS P0182 OR P0183: CHECK THE RESISTANCE OF THE FRT SENSOR**	
	• Key in OFF position. • FRT Sensor connector disconnected. • Measure the resistance between: **(+) FRT Sensor Connector, Component Side**: FRT - Pin 1 **(-) FRT Sensor Connector, Component Side**: SIGRTN - Pin 2 • **Is the resistance between 2K - 96K ohms?**	**Yes** GO to **DD18**. **No** INSTALL a new FRT sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC. CLEAR the DTCs. REPEAT the self-test.
DD18	**CHECK THE FRT FOR INTERNAL SHORTS**	
	• Measure the resistance between: **(+) FRT Sensor Connector, Component Side**: FRT - Pin 1 **(-)**: Ground • **Is the resistance greater than 10K ohms?**	**Yes** For DTC P0182, GO to **DD19**. For DTC P0183, GO to **DD21**. **No** INSTALL a new FRT sensor. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC. CLEAR the DTCs. REPEAT the self-test.

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

DD

Test Step	Results / Action to Take
DD19 CHECK THE FRT CIRCUIT(S) FOR A SHORT TO SIGRTN OR GND IN THE HARNESS • PCM connector disconnected. • Measure the resistance between: (+) PCM Connector, Harness Side: FRT (-) PCM Connector, Harness Side: SIGRTN • Measure the resistance between: (+) PCM Connector, Harness Side: FRT (-): Ground • **Is the resistance greater than 10K ohms?**	**Yes** GO to **DD20**. **No** REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
DD20 INDUCE A HIGH VOLTAGE ON THE FRT CIRCUIT • PCM connector connected. • Key ON, engine OFF. • Access the PCM and monitor the FRT V 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 **DD53**.
DD21 CHECK THE FRT AND SIG RTN CIRCUIT(S) FOR AN OPEN IN THE HARNESS • PCM connector disconnected. • Measure the resistance between: (+) PCM Connector, Harness Side / (-) FRT Sensor Connector, Harness Side: FRT - FRT - Pin 1 SIGRTN - SIGRTN - Pin 2 • **Are the resistances less than 5 ohms?**	**Yes** GO to **DD22**. **No** REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
DD22 CHECK THE SENSOR SIGNAL FOR A SHORT TO VREF • Measure the resistance between: (+) PCM Connector, Harness Side: FRT (-) PCM Connector, Harness Side: VREF • **Is the resistance greater than 10K ohms?**	**Yes** GO to **DD23**. **No** REPAIR the short circuit to VREF. CLEAR the DTCs. REPEAT the self-test.

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

DD

Test Step	Results / Action to Take
DD23 INDUCE A LOW VOLTAGE ON THE FRT CIRCUIT • PCM connector connected. • Connect a 5 amp fused jumper wire between the following: **Point A FRT Sensor Connector, Harness Side**: FRT - Pin 1 **Point B FRT Sensor Connector, Harness Side**: SIGRTN - Pin 2 • Key ON, engine OFF. • Access the PCM and monitor the FRT V PID. • **Is the voltage less than 0.2 V?**	**Yes** Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z. **No** GO to **DD53**.
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**.
DD25 CHECK THE FRT CIRCUIT FOR AN INTERMITTENT CONCERN • PCM connector connected. • Access the PCM and monitor the FRT V PID. • Carry out a thorough wiggle test on the FRT Sensor harness. • **Is the FRT signal stable?**	**Yes** GO to **DD27**. **No** ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
DD26 KOEO AND KOER DTC P0181: CHECK THE FRT_V PID • 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 V PID. • **Is the voltage between 0.4 - 4.5 V?**	**Yes** GO to **DD27**. **No** DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Charts, Diagnostic Trouble Code(DTC) Charts and Descriptions.
DD27 COMPARE THE PIDS AFTER STABILIZING THE VEHICLE TEMPERATURE • Access the PCM and monitor the FRT_TEMP, CHT and ECT PIDs. • **Are the temperature PIDs nearly equal in value?**	**Yes** The concern is not present at this time. CLEAR the DTCs. REPEAT the self-test. **No** GO to Pinpoint Test Z.

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

DD

Test Step		Results / Action to Take
DD28	**CONTINUOUS MEMORY DTC P0190, KOEO AND KOER DTCS P0192 AND P0193: CHECK THE FRPT SENSOR FOR FUEL LEAKS**	
	Note: Repair any fuel pump DTCs prior to this test. • Key ON, engine running. • Idle the engine for 2 minutes. • Inspect the FRP vacuum hose between the intake manifold and the FRP sensor for air leaks and correct connection. • Key in OFF position. • Remove the vacuum hose from the FRPT. • Inspect the FRPT and vacuum hose for traces of fuel. • **Is any fuel present?**	**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. CLEAR the DTCs. REPEAT the self-test. **No** GO to **DD29**.
DD29	**CHECK THE VREF AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS**	
	• Connect the vacuum hose to the FRPT. • FRPT Sensor connector disconnected. • Key ON, engine OFF. • Measure the voltage between: **(+) FRPT Sensor Connector, Harness Side** / **(-) FRPT Sensor Connector, Harness Side** VREF - Pin 2 / SIGRTN - Pin 4 • **Is the voltage between 4.5 - 5.5 V?**	**Yes** For DTC P0190, GO to **DD37**. For DTC P0192, GO to **DD30**. For DTC P0193, GO to **DD32**. **No** GO to Pinpoint Test C.
DD30	**INDUCE A HIGH VOLTAGE ON THE FRPT CIRCUIT**	
	Note: If a diagnostic tool communication concern exists, immediately remove the jumper and follow the NO path in the Results/Action to Take column. • Key in OFF position. • Connect a 5 amp fused jumper wire between the following: **Point A FRPT Sensor Connector, Harness Side** / **Point B FRPT Sensor Connector, Harness Side** VREF - Pin 2 / FRP - Pin 1 • Key ON, engine OFF. • Access the PCM and monitor the FRP V PID. • **Is the voltage greater than 4.5 V?**	**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. CLEAR the DTCs. REPEAT the self-test. **No** GO to **DD31**.

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

DD

Test Step	Results / Action to Take
DD31 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: (+) PCM Connector, Harness Side: FRP; (-) PCM Connector, Harness Side: SIGRTN FRP; FRT • Measure the resistance between: (+) PCM Connector, Harness Side: FRP; (-): Ground • **Is the resistance greater than 10K ohms?**	**Yes** GO to **DD53**. **No** REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
DD32 CHECK THE FRP CIRCUIT FOR AN OPEN IN THE HARNESS • Key in OFF position. • PCM connector disconnected. • Measure the resistance between: (+) PCM Connector, Harness Side: FRP; (-) FRPT Sensor Connector, Harness Side: FRP - Pin 1 • **Is the resistance less than 5 ohms?**	**Yes** GO to **DD33**. **No** REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
DD33 CHECK THE FRP CIRCUIT FOR A SHORT TO VREF AND FRT IN THE HARNESS • Measure the resistance between: (+) PCM Connector, Harness Side: FRP; (-) PCM Connector, Harness Side: VREF FRP; FRT • **Are the resistances greater than 10K ohms?**	**Yes** GO to **DD34**. **No** REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
DD34 CHECK THE FRP CIRCUIT FOR A SHORT TO VOLTAGE • Key ON, engine OFF. • Measure the voltage between: (+) FRPT Sensor Connector, Harness Side: FRP - Pin 1; (-): Ground • **Is any voltage present?**	**Yes** REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test. **No** GO to **DD35**.

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

DD

Test Step		Results / Action to Take
DD35	**INDUCE A LOW VOLTAGE ON THE FRPT CIRCUIT**	
	Note: If a diagnostic tool communication concern exists, immediately remove the jumper and follow the NO path in the Results/Action to Take column. • Key in OFF position. • PCM connector connected. • Connect a 5 amp fused jumper wire between the following: **Point A FRPT Sensor Connector, Harness Side:** FRP - Pin 1 **Point B FRPT Sensor Connector, Harness Side:** SIGRTN - Pin 4 • Key ON, engine OFF. • Access the PCM and monitor the FRP V PID. • **Is the voltage less than 0.01 V?**	**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. CLEAR the DTCs. REPEAT the self-test. **No** GO to **DD53**.
DD36	**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 Charts, Diagnostic Trouble Code (DTC) Charts and Descriptions. **No** GO to **DD37**.
DD37	**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 **DD38**.
DD38	**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 **DD39**.

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

DD

Test Step		Results / Action to Take
DD39	**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 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 **DD40**.
DD40	**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 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 **DD53**. **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. CLEAR the DTCs. REPEAT the self-test.

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

Test Step		Results / Action to Take
DD41	**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 V PID. • While observing the PID, carry out the following: — Tap on the sensor to simulate road shock — Wiggle the sensor connector — Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM • Check the FRPT connector for damage or corrosion. • **Is a concern present?**	**Yes** ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. **No** GO to Pinpoint Test Z.
DD42	**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: (+) FRPT Sensor Connector, Component Side: FRT - Pin 3 (-) FRPT Sensor Connector, Component Side: SIGRTN - Pin 4 • **Is the resistance between 2K - 96K ohms?**	**Yes** GO to **DD43**. **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. CLEAR the DTCs. REPEAT the self-test.
DD43	**CHECK THE FRPT FOR INTERNAL SHORTS**	
	• Measure the resistance between: (+) FRPT Sensor Connector, Component Side: FRT - Pin 3 (-): Ground • Measure the resistance between: (+) FRPT Sensor Connector, Component Side: FRT - Pin 3 (-) FRPT Sensor Connector, Component Side: FRP - Pin 1 FRT - Pin 3 / VREF - Pin 2 • **Are the resistances greater than 10K ohms?**	**Yes** For DTC P0182, GO to **DD44**. For DTC P0183, GO to **DD46**. **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. CLEAR the DTCs. REPEAT the self-test.

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

DD

Test Step	Results / Action to Take
DD44 CHECK THE FRT CIRCUIT(S) FOR A SHORT TO SIGRTN OR GND IN THE HARNESS • PCM connector disconnected. • Measure the resistance between: (+) PCM Connector, Harness Side: FRT (-) PCM Connector, Harness Side: SIGRTN • Measure the resistance between: (+) PCM Connector, Harness Side: FRT (-): Ground • **Is the resistance greater than 10K ohms?**	**Yes** GO to **DD45**. **No** REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.
DD45 FRPT SENSOR: INDUCE A HIGH VOLTAGE ON THE FRT CIRCUIT • PCM connector connected. • Key ON, engine OFF. • Access the PCM and monitor the FRT V 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 **DD53**.
DD46 CHECK THE FRT AND SIG RTN CIRCUIT(S) FOR AN OPEN IN THE HARNESS • PCM connector disconnected. • Measure the resistance between: (+) PCM Connector, Harness Side: FRT — (-) FRPT Sensor Connector, Harness Side: FRT - Pin 3 (+) PCM Connector, Harness Side: SIGRTN — (-) FRPT Sensor Connector, Harness Side: SIGRTN - Pin 4 • **Are the resistances less than 5 ohms?**	**Yes** GO to **DD47**. **No** REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.
DD47 CHECK THE FRT SIGNAL FOR A SHORT TO VREF AND FRP • Measure the resistance between: (+) PCM Connector, Harness Side: FRT — (-) PCM Connector, Harness Side: VREF (+) PCM Connector, Harness Side: FRT — (-) PCM Connector, Harness Side: FRP • **Are the resistances greater than 10K ohms?**	**Yes** GO to **DD48**. **No** REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

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

Test Step	Results / Action to Take
DD48 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: Point A FRPT Sensor Connector, Harness Side: FRT - Pin 3 Point B FRPT Sensor Connector, Harness Side: SIGRTN - Pin 4 • Key ON, engine OFF. • Access the PCM and monitor the FRT V PID. • **Is the voltage less than 0.2 V?**	**Yes** Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z. **No** GO to **DD53**.
DD49 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 **DD42**. **No** GO to **DD50**.
DD50 CHECK THE FRT CIRCUIT FOR AN INTERMITTENT CONCERN • PCM connector connected. • Access the PCM and monitor the FRT V PID. • Carry out a thorough wiggle test on the FRT Sensor harness. • **Is the FRT signal stable?**	**Yes** GO to **DD52**. **No** ISOLATE the concern and REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.
DD51 KOEO AND KOER DTC P0181: CHECK THE FRT_V PID **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 V PID. • **Is the voltage between 0.4 - 4.5 V?**	**Yes** GO to **DD52**. **No** DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to DTC Charts, Diagnostic Trouble Code (DTC) Charts and Descriptions.
DD52 COMPARE THE PIDS AFTER STABILIZING THE VEHICLE TEMPERATURE • Access the PCM and monitor the FRT_TEMP, CHT and ECT PIDs. • **Are the temperature PIDs nearly equal in value?**	**Yes** The concern is not present at this time. CLEAR the DTCs. REPEAT the self-test. **No** GO to Pinpoint Test Z.

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

DD

Test Step	Results / Action to Take
DD53 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.