

DD: Fuel Pressure, Fuel Rail Pressure (FRP) And Fuel Rail Pressure Temperature (FRPT) Sensors

 **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 pressure sensor (9F972)
- fuel rail pressure (FRP) sensor (6B288)
- fuel rail pressure temperature (FRPT) sensor (9G756)
- harness circuits: FLP, FRP, FRP-PFI and FRT
- PCM (12A650)

Tables and Graphs**FRP SENSOR VOLTAGE AND PRESSURE SPECIFICATIONS**

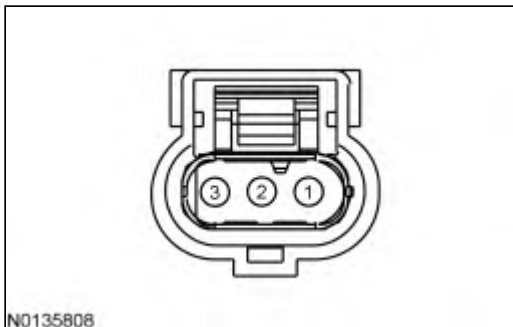
Voltage	Pressure, MPa (gauge)	Pressure, psi (gauge)
4.80	27.95	4054
4.50	26	3771
3.50	19.5	2828
2.50	13.0	1885
1.50	6.5	943
0.50	0	0
0.20	-1.95	-283

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
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

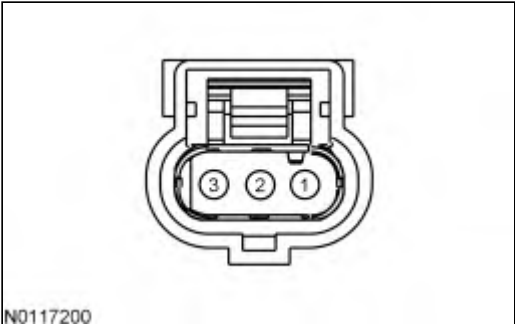
Fuel Pressure Sensor Connector

Pin	Circuit
1	FLP (Fuel Low Pressure)
2	SIGRTN (Signal Return)

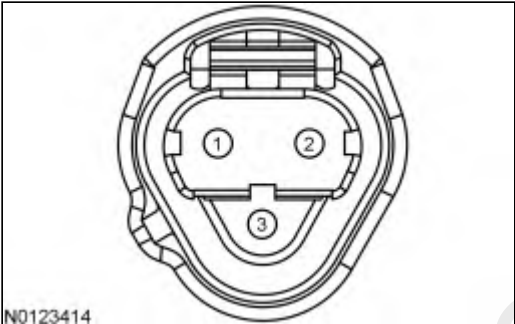
Pin	Circuit
3	VREF (Reference Voltage)

Fuel Rail Pressure (FRP) Sensor Connector

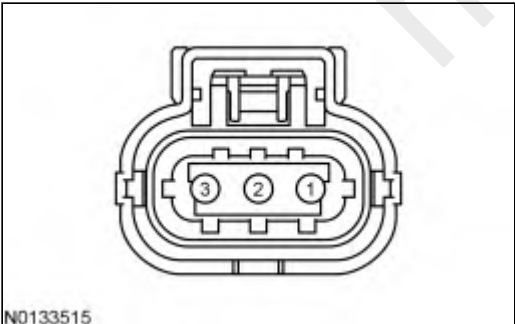
A



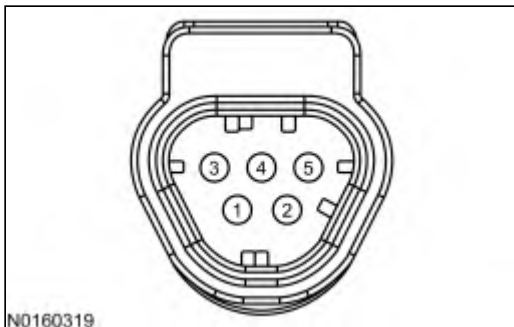
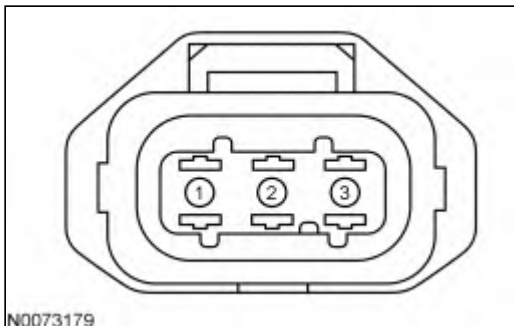
B



C



D

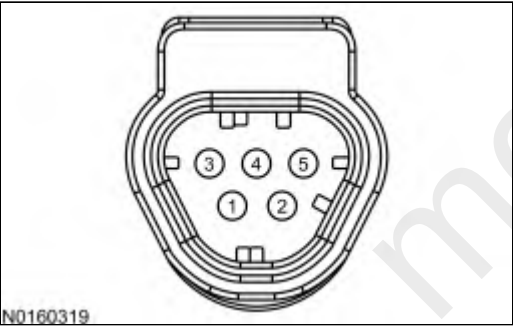
**E**

Vehicle	Connector	Pin	Circuit
Aviator, Explorer 3.0L	A	3 2 1	FRP SIGRTN VREF
Continental 3.0L, Continental 2.7L, EcoSport 2.0L, Edge 2.7L, Fusion 2.7L, MKZ 3.0L, Nautilus 2.7L, Transit	B	2 3 1	FRP SIGRTN VREF
Corsair, Escape/Kuga	C	2 1 3	FRP SIGRTN VREF
EcoSport 1.0L	C	2 3 1	FRP SIGRTN VREF
Expedition, Navigator	D	5 3 4	FRP SIGRTN VREF
Explorer 2.3L	A	2 1 3	FRP SIGRTN VREF

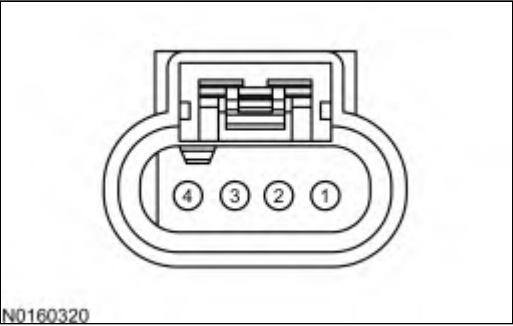
Vehicle	Connector	Pin	Circuit
F-150 2.7L, F-150 5.0L, Mustang 5.0L, Ranger	C	3 2 1	FRP SIGRTN VREF
Flex, Fusion 2.0L, MKZ 2.0L	E	2 1 3	FRP SIGRTN VREF
Fusion 1.5L	E	3 2 1	FRP SIGRTN VREF
Transit Connect 1.0L	A	1 2 3	FRP SIGRTN VREF
All other vehicles	D	4 3 5	FRP SIGRTN VREF

Fuel Rail Pressure Temperature (FRPT) Sensor Connector

A



B



Vehicle	Connector	Pin	Circuit

Vehicle	Connector	Pin	Circuit
Expedition, Navigator	A	5 3 4 2	FRT FRP-PFI SIGRTN VREF
F-150 2.7L, F-150 3.5L, Ford GT	A	5 2 4 3	FRT FRP-PFI SIGRTN VREF
Mustang 5.0L, Mustang 5.2L Supercharged	B	3 4 2 1	FRT FRP-PFI SIGRTN VREF
Mustang TiVCT 5.2L	A	5 2 4 3	FRT FRP SIGRTN VREF
All other vehicles	B	4 3 2 1	FRT FRP-PFI SIGRTN VREF

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Section 6, Reference Values.

Vehicle	Connector	Pin	Circuit
Aviator, Explorer 3.0L	306 PIN	E71 B10	FRP FLP
Continental 2.0L, Flex, Fusion 1.5L, Fusion 2.0L, MKZ 2.0L	198 PIN	E37 B71	FRP FLP
Continental 2.7L, Continental 3.0L, Fusion 2.7L, MKZ 3.0L	198 PIN	E35 B71	FRP FLP
Corsair, Escape/Kuga 2.0L, Explorer 2.3L, Mustang 2.3L, Ranger, Transit Connect	198 PIN	E55 B73	FRP FLP

Vehicle	Connector	Pin	Circuit
EcoSport 1.0L Automatic Transmission, EcoSport 2.0L	198 PIN	E37	FRP
EcoSport 1.0L Manual Transmission	198 PIN	E38	FRP
Edge 2.0L, Nautilus 2.0L	198 PIN	E37 B73	FRP FLP
Edge 2.7L	306 PIN	E35 B25	FRP FLP
Escape/Kuga 1.5L	198 PIN	E9 B73	FRP FLP
Expedition, F-150 3.5L High Output, Navigator	198 PIN	E33 E21 E38	FRT FRP FRP-PFI
Ford GT	198 PIN	E67 E35 E37	FRT FRP FRP-PFI
Mustang 5.2L Supercharged	306 PIN	E31 E115	FRT FRP
Mustang TiVCT 5.2L	198 PIN	B44 B34	FRT FRP
Nautilus 2.7L	306 PIN	E37 B25	FRP FLP
Transit GTDI 3.5L	306 PIN	E71	FRP
All other vehicles	306 PIN	E31 E71 E70	FRT FRP FRP-PFI

DD1 CHECK FOR DTCS

Are DTCs P0087, P0088, P0182, P0183, P018B, P018C, P018D, P0192 or P0193 present?

Yes	For DTCs P0182 or P0183, GO to DD13 . For DTCs P018B, P018C or P018D, GO to DD2 . For all others, GO to DD8 .
No	RETURN to Section 3, Symptom Charts for further direction.

DD2 CHECK THE VREF AND SIGRTN CIRCUITS FOR AN OPEN

- Ignition OFF.
- For Explorer 3.3L, Expedition, F-150, Ford GT, Mustang 5.0L, Navigator, and Transit 3.5L TiVCT,
- FRPT Sensor connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) FRPT Sensor Connector, Harness Side	(-) FRPT Sensor Connector, Harness Side
VREF	SIGRTN

- For all others,
- Fuel Pressure Sensor connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) Fuel Pressure Sensor Connector, Harness Side	(-) Fuel Pressure Sensor Connector, Harness Side
VREF - Pin 3	SIGRTN - Pin 2

Is the voltage between 4.5 - 5.5 V?

Yes	GO to DD3 .
No	GO to Pinpoint Test C .

DD3 CHECK THE LOW PRESSURE CIRCUITS FOR AN OPEN

- Ignition OFF.
- PCM connector disconnected.
- For Explorer 3.3L, Expedition, F-150, Ford GT, Mustang 5.0L, Navigator, and Transit 3.5L TiVCT,
- Measure the resistance between:

(+) FRPT Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
FRP-PFI	FRP-PFI

- For all others,
- Measure the resistance between:

(+) Fuel Pressure Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
FLP - Pin 1	FLP

Is the resistance less than 5 ohms?

Yes	GO to DD4 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

DD4 CHECK THE LOW PRESSURE CIRCUITS FOR A SHORT TO GROUND

- For Explorer 3.3L, Expedition, F-150, Ford GT, Mustang 5.0L, Navigator, and Transit 3.5L TiVCT,
- Measure the resistance between:

(+) FRPT Sensor Connector, Harness Side	(-)
FRP-PFI	Ground

- For all others,

- Measure the resistance between:

(+) Fuel Pressure Sensor Connector, Harness Side	(-)
FLP - Pin 1	Ground

Is the resistance greater than 10K ohms?

Yes	GO to DD5 .
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

DD5 CHECK THE LOW PRESSURE CIRCUITS FOR A SHORT TO VOLTAGE

- Ignition ON, engine OFF.
- For Explorer 3.3L, Expedition, F-150, Ford GT, Mustang 5.0L, Navigator, and Transit 3.5L TiVCT,
- Measure the voltage between:

(+) FRPT Sensor Connector, Harness Side	(-)
FRP-PFI	Ground

- For all others,
- Measure the voltage between:

(+) Fuel Pressure Sensor Connector, Harness Side	(-)
FLP - Pin 1	Ground

Is any voltage present?

Yes	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.
No	For DTC P018B, GO to DD7 . For all others, GO to DD6 .

DD6 CHECK THE LOW PRESSURE CIRCUITS FOR AN INTERMITTENT CONCERN

- Ignition OFF.
- For Explorer 3.3L, Expedition, F-150, Ford GT, Mustang 5.0L, Navigator, and Transit 3.5L TiVCT,
- FRPT Sensor connector connected.
- PCM connector connected.
- Ignition ON, engine OFF.
- Access the PCM and monitor the FLP_V (VOLT) 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 connector for damage or corrosion.
- For all others,
- Fuel Pressure Sensor connector connected.
- PCM connector connected.
- Ignition ON, engine OFF.
- Access the PCM and monitor the FLP_V (VOLT) 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 connector for damage or corrosion.

Is a concern present?

Yes	REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.
No	INSTALL a new sensor in question. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC . REFER to the Workshop Manual Section 310-01, Fuel Tank and Lines. Clear the PCM DTCs. REPEAT the self-test.

DD7 COMPARE THE FLP PID TO THE MECHANICAL GAUGE

Note: The vehicle may exhibit a long crank until the fuel system is pressurized.

- Ignition OFF.
- Relieve the fuel pressure. Refer to the Workshop Manual Section 310-00, Fuel System for the Fuel System Pressure Release procedure.
- Mechanical fuel pressure gauge connected.
- Disable the fuel pump.
- Ignition ON, engine OFF.
- Monitor the mechanical gauge.
- Access the PCM and monitor the FLP (PRESS) PID.
- Compare the FLP PID value to the mechanical gauge.
- Ignition OFF.
- Pressurize the fuel system. Refer to the Workshop Manual Section 310-00, Fuel System for the Fuel System Pressure Release procedure to pressurize the fuel system.
- Ignition ON, engine running.
- Allow the fuel pressure to stabilize.
- Ignition OFF.
- Ignition ON, engine OFF.
- Compare the FLP PID value to the mechanical gauge.

Are the FLP PID values within 153 kPa (22 psi) of the mechanical gauge readings?

Yes	The system is operating correctly at this time.
No	GO to Pinpoint Test Z .

DD8 CHECK THE VREF AND SIGRTN CIRCUITS FOR AN OPEN

- Ignition OFF.
- For Mustang 5.2L,
- FRPT Sensor connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) FRPT Sensor Connector, Harness Side	(-) FRPT Sensor Connector, Harness Side
VREF	SIGRTN

- For all others,
- FRP Sensor connector disconnected.
- Ignition ON, engine OFF.

- Measure the voltage between:

(+) FRP Sensor Connector, Harness Side	(-) FRP Sensor Connector, Harness Side
VREF	SIGRTN

Is the voltage between 4.5 - 5.5 V?

Yes	GO to DD9 .
No	GO to Pinpoint Test C .

DD9 CHECK THE FRP CIRCUIT FOR AN OPEN

- Ignition OFF.
- PCM connector disconnected.
- For Mustang 5.2L,
- Measure the resistance between:

(+) FRPT Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
FRP	FRP

- For all others,
- Measure the resistance between:

(+) FRP Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
FRP	FRP

Is the resistance less than 5 ohms?

Yes	GO to DD10 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

DD10 CHECK THE FRP CIRCUIT FOR A SHORT TO GROUND

- For Mustang 5.2L,
- Measure the resistance between:

(+) FRPT Sensor Connector, Harness Side	(-)
FRP	Ground

- For all others,
- Measure the resistance between:

(+) FRP Sensor Connector, Harness Side	(-)
FRP	Ground

Is the resistance greater than 10K ohms?

Yes	GO to DD11 .
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

DD11 CHECK THE FRP CIRCUIT FOR A SHORT TO VOLTAGE

- Ignition ON, engine OFF.
- For Mustang 5.2L,
- Measure the voltage between:

(+) FRPT Sensor Connector, Harness Side	(-)
FRP	Ground

- For all others,
- Measure the voltage between:

(+) FRP Sensor Connector, Harness Side	(-)
FRP	Ground

Is any voltage present?

Yes	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.
No	For DTCs P0087 or P0088, GO to Pinpoint Test Z . For all others, GO to DD12 .

DD12 CHECK THE FRP CIRCUIT FOR AN INTERMITTENT CONCERN

- Ignition OFF.
- PCM connector connected.
- For Mustang 5.2L,
- FRPT Sensor connector connected.
- For all others,
- FRP Sensor connector connected.
- Ignition ON, engine OFF.
- Access the PCM and monitor the FRP (VOLT) 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 connector for damage or corrosion.

Is a concern present?

Yes	REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.
No	INSTALL a new sensor in question. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC . REFER to the Workshop Manual Section 303-14, Electronic Engine Controls.

Clear the PCM DTCs. REPEAT the self-test.

DD13 CHECK THE VREF AND SIGRTN CIRCUITS FOR AN OPEN

- Ignition OFF.
- FRPT Sensor connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) FRPT Sensor Connector, Harness Side	(-) FRPT Sensor Connector, Harness Side
VREF	SIGRTN

Is the voltage between 4.5 - 5.5 V?

Yes	GO to DD14 .
No	GO to Pinpoint Test C .

DD14 CHECK THE FRT CIRCUIT FOR AN OPEN

- Ignition OFF.
- PCM connector disconnected.
- Measure the resistance between:

(+) FRPT Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
FRT	FRT

Is the resistance less than 5 ohms?

Yes	GO to DD15 .
No	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

DD15 CHECK THE FRT CIRCUIT FOR A SHORT TO GROUND

- Measure the resistance between:

(+) FRPT Sensor Connector, Harness Side	(-)
FRT	Ground

Is the resistance greater than 10K ohms?

Yes	GO to DD16 .
No	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

DD16 CHECK THE FRT CIRCUIT FOR A SHORT TO VOLTAGE

- Ignition ON, engine OFF.

- Measure the voltage between:

(+) FRPT Sensor Connector, Harness Side	(-)
FRT	Ground

Is any voltage present?

Yes	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.
No	GO to DD17 .

DD17 CHECK THE FRT CIRCUIT FOR AN INTERMITTENT CONCERN

- Ignition OFF.
- PCM connector connected.
- FRPT Sensor connector connected.
- Ignition ON, engine OFF.
- Access the PCM and monitor the FRT_V (VOLT) 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 connector for damage or corrosion.

Is a concern present?

Yes	REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.
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 the Workshop Manual Section 303-14, Electronic Engine Controls. Clear the PCM DTCs. REPEAT the self-test.