

1 9 09-13



Service Information Bulletin

SUBJECT	DATE
SPN 164/FMI 0,1,2,3,4,5,20,21	September 2013

Additions, Revisions, or Updates

Publication Number / Title	Platform	Section Title	Change
DDC-SVC-MAN-0084	DD Platform	SPN 164/FMI 0, 1 – All Years	To add wiring diagram and check procedures.
		SPN 164/FMI 2,3,4,5,20,21-EPA07	
		SPN 164/FMI 2,3,4,5,20,21 – EPA10-GHG14	



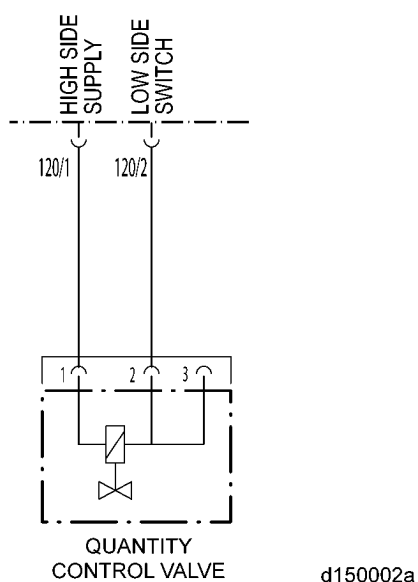
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2 SPN 164/FMI 0 - All Years

This diagnostic is typically a Quantity Control Valve High Side Driver Error.

Table 1.

SPN 164/FMI 0	
Description	Quantity Control Valve (High Side) Error
Monitored Parameter	Quantity Control Valve
Typical Enabling Conditions	Always Enabled
Monitor Sequence	None
Execution Frequency	Continuous when enabling conditions met
Typical Duration	2 Seconds
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	Engine Idle (1 minute)



- MCM pin 1 circuit is shorted to ground
- Internal short of the quantity control valve

Check as follows:

1. Check for multiple codes.
 - a. If SPN 164/FMI 1 is stored along with SPN 164/FMI 0, service SPN 164/FMI 1 first.
 - b. If only SPN 164/FMI 0 is active, Go to step 2.
2. Disconnect the quantity control valve harness connector.
3. Ensure the multi meter or Digital Voltage Ohm Meter (DVOM) resistance is set to zero.
 - a. If meter can auto-zero, perform this function before making a resistance measurement.
 - b. If meter cannot auto-zero, note the resistance of the leads and subtract it from the measurement taken in step 4.
4. Measure the resistance across pins 1 and 2 of the quantity control valve.
 - a. If the resistance is between 1 and 2 ohms. Go to step 5.
 - b. If the resistance is not between 1 and 2 ohms, replace quantity control valve.
 Refer to section "Removal of the Quantity Control Valve - Three-Filter System"
 Refer to section "Removal of the Quantity Control Valve - Two-Filter System"
5. Disconnect the 120-pin MCM connector.

6. Inspect the 120-pin MCM harness and module connectors for signs of damage; bent, spread, broken, unseated (pushed out) or corroded pins, water, fuel or oil intrusion and damaged seals.
 - a. If signs of damage are present, repair as necessary.
 - a. If no signs of damage are present, Go to step 7.
7. Measure the resistance between pins 1 and 2 of the quantity control valve harness connector.
 - a. If the resistance is less than 10K ohms, repair the short in the wires between pins 1 and 2 of the quantity control valve harness connector.
 - b. If the resistance is greater than 10K ohms, Go to step 8.
8. Measure the resistance between pin 1 of the quantity control valve harness connector and battery ground.
 - a. If the resistance is greater than 10K ohms, Go to step 9.
 - b. If the resistance is less than 10K ohms, repair the short in the wire between pin 1 of the quantity control valve harness connector and battery ground.
9. Reconnect the MCM 120-pin and quantity control valve harness connectors.
10. Run the engine for 10 minutes.
11. Check for active SPN 164/FMI 0.
12. Is SPN 164/FMI 0 active?
 - a. Yes; Go to step 13.
 - b. No; Clear any codes present and release the vehicle.
13. Install a test MCM module.
14. Run the engine for 10 minutes.
15. Check for active SPN 164/FMI 0.
16. Is SPN 164/FMI 0 active?
 - a. Yes; replace the quantity control valve.
Refer to section "Removal of the Quantity Control Valve - Three-Filter System"
Refer to section "Removal of the Quantity Control Valve - Two-Filter System"
 - b. No; Replace the MCM module.

3 SPN 164/FMI 1 - All Years

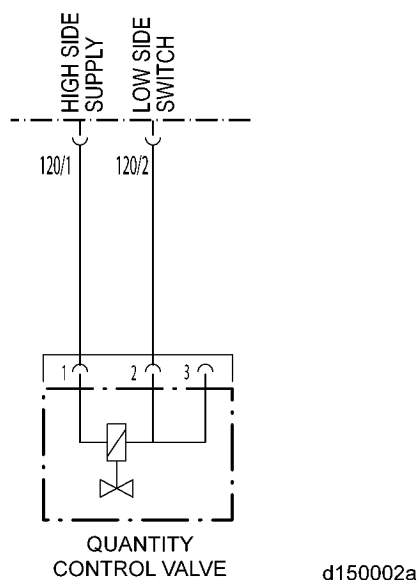
This diagnostic is typically a Quantity Control Valve Low Side Driver Error.

Table 2.

SPN 164/FMI 1	
Description	Quantity Control Valve (Low Side) Error
Monitored Parameter	Quantity Control Valve
Typical Enabling Conditions	Always Enabled
Monitor Sequence	None
Execution Frequency	Continuous when enabling conditions met
Typical Duration	2 Seconds
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	Engine Idle (1 minute)

This condition can occur when:

- MCM pin 2 circuit is shorted to power
- Internal short of the quantity control valve



Check as follows:

1. Turn the ignition OFF.
2. Disconnect the Quantity Control Valve (QCV) harness connector.
3. Inspect the harness connector for signs of damage: bent, spread, broken, corroded or unseated (push out) pins and signs of moisture in the connector or wire damage near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present. Go to step 4.
4. Ensure the multimeter or Digital Voltage Ohm Meter (DVOM) resistance is set to zero.
 - a. If meter can auto-zero, perform this function before making a resistance measurement.
 - b. If meter cannot auto-zero, note the resistance of the leads and subtract it from the measurement taken. Go to step 5.
5. Measure the resistance across pins 1 and 2 of the QCV.

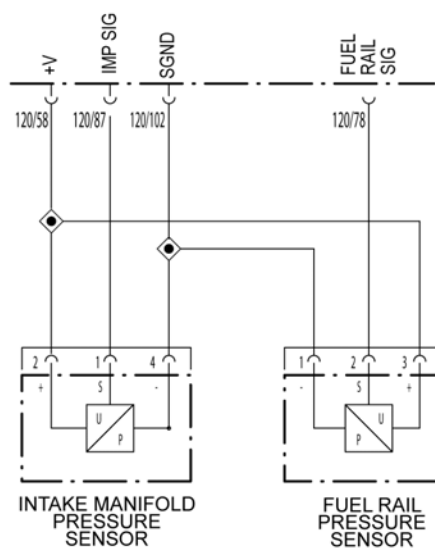
- a. If the resistance is between 1.0 ohm and 2.0 ohms, Go to step 6.
 - b. If resistance is NOT between 1.0 ohm and 2.0 ohms, replace QCV.
Refer to section "Removal of the Quantity Control Valve - Three-Filter System"
Refer to section "Removal of the Quantity Control Valve - Two-Filter System".
6. Disconnect the 120-pin Motor Control Module (MCM) connector.
7. Inspect the harness connector for signs of damage: bent, spread, broken, corroded or unseated (push out) pins and sign of moisture in the connector or wire damage near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 8.
8. Measure the resistance between pins 1 and 3 of the QCV harness connector.
 - a. If the resistance is greater than 10k ohms, replace the MCM. Refer to section "Removal of the Motor Control Module."
 - b. If the resistance is less than 10k ohms, repair the short circuit between pins 1 and 2 of the QCV and pins 1 and 2 of the MCM 120-pin connector.

4 SPN 164/FMI 2 - EPA07

This diagnostic is typically Fuel Rail Pressure Drift High.

Table 3.

SPN 164/FMI 2 – EPA07	
Description	Fuel Rail Pressure Drift High
Monitored Parameter	Fuel Rail Pressure
Typical Enabling Conditions	Always Enabled
Monitor Sequence	None
Execution Frequency	Continuous when enabling conditions met
Typical Duration	2 Seconds
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	Engine Idle (1 minute)



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Check as follows:

1. Disconnect the Fuel Rail Pressure sensor.
2. Inspect the Fuel Rail Pressure harness connector and sensor housing for signs of damage, bent, spread, broken corroded or unseated (push out) pins or wire damage near the connector.
 - a. If signs of damage are present, repair as needed.
 - b. If no signs of damage are present, Go to step 3.
3. Turn the ignition ON (key ON, engine OFF).
4. Measure the voltage between pins 1 and 3 of the Fuel Rail Pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, Go to step 6.
 - b. If the voltage is NOT between 4.5 and 5.5 volts, Go to step 5.
5. Measure the voltage between pin 3 of the Fuel Rail Pressure sensor harness connector and battery ground.
 - a. If the voltage is between 4.5 and 5.5 volts, repair the wire between pin 1 of the Fuel Rail Pressure sensor harness connector and pin 120 of the MCM 120-pin connector.
 - b. If the voltage is NOT between 4.5 and 5.5 volts, repair the wire between pin-3 of the Fuel Rail Pressure sensor harness connector and pin 58 of the MCM120-pin harness connector.
6. Turn the ignition OFF.
7. Disconnect the MCM 120-pin harness connector.

8. Inspect the MCM 120-pin module connector housing and harness connector for signs of damage, bent, spread, broken, corroded or unseated (push out) pins or wire damage near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 9.
9. Measure the resistance between pin 2 of the Fuel Rail Pressure sensor harness connector and pin 78 of the MCM 120-pin harness connector.
 - a. If the resistance is less than 5 ohms, Go to step 10.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 2 of the Fuel Rail Pressure sensor harness connector and pin 78 of the MCM 120-pin harness connector.
10. Measure the resistance between pin 1 of the Fuel Rail Pressure sensor harness connector and pin 102 of the MCM 120-pin harness connector.
 - a. If the resistance is less than 5 ohms, Go to step 11.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 1 of the Fuel Rail Pressure sensor harness connector and pin 102 of the MCM 120-pin harness connector.
11. Measure the resistance between pin 3 of the Fuel Rail Pressure sensor harness connector and pin 58 of the MCM 120-pin harness connector.
 - a. If the resistance is less than 5 ohms, Go to step 12.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 3 of the Fuel Rail Pressure sensor and pin 58 of the MCM 120-pin harness connector.
12. Reconnect the MCM 120-pin connector.
13. Turn the ignition ON (key ON, engine OFF).
14. Measure the voltage between pins 1 and 3 of the Fuel Rail Pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, replace the Fuel Rail Pressure sensor. Refer to section "Removal of the Fuel Rail Pressure Sensor".
 - b. If the voltage is not between 4.5 and 5.5 volts, repeat this procedure. If the results are the same, replace the MCM. Refer to section "Removal of the Motor Control Module".

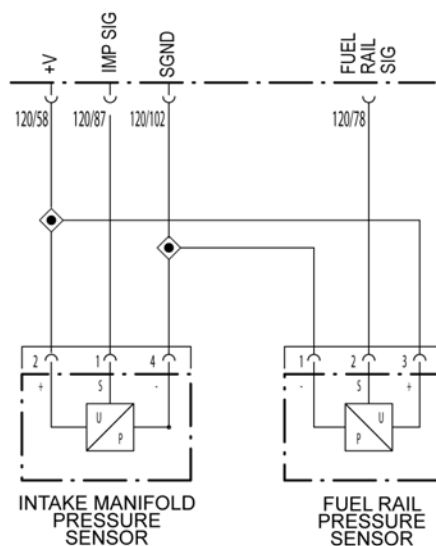
5 SPN 164/FMI 3 - EPA07

This diagnostic is typically the Fuel Rail Pressure Sensor Circuit Failed High (Open Circuit).

Check as follows:

Table 4.

SPN 164/FMI 3	
Description	Fuel Rail Pressure Sensor Circuit Failed High
Monitored Parameter	Fuel Rail Pressure Sensor
Typical Enabling Conditions	Always Enabled
Monitor Sequence	None
Execution Frequency	Always Enabled
Typical Duration	2 Seconds
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	Engine Idle (1 minute)



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1. Check for multiple codes.
 - a. If the following codes are present, SPN 2630/FMI 3, SPN 164/FMI 3, repair the open in the common ground wire from pin 102 of the MCM 120-pin harness connector to the respective sensor ground pin on the sensor connector.
See above diagram.
 - b. If only fault SPN 164/FMI 3 is active, Go to step SPN 164/FMI 3 - EPA07
2. Disconnect the fuel rail pressure sensor connector.
3. Inspect the harness connector for signs of damage, bent, spread, corroded, broken or unseated (pushed out) pins, signs of water or oil intrusion and signs of wire damage near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present Go to step 4.
4. Turn the ignition ON (key ON, engine OFF).
5. Measure the voltage between pins 1 and 3 of the fuel rail pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, Go to step 7.
 - b. If the voltage is not between 4.5 and 5.5 volts, Go to step 6.
6. Measure the voltage between pin 3 of the fuel rail pressure sensor harness connector and battery ground.

- a. If the voltage is between 4.5 and 5.5 volts, repair the wire between pin 1 of the fuel rail pressure sensor harness connector and pin 102 of the MCM 120-pin connector.
 - b. If the voltage is not between 4.5 and 5.5 volts, repair the wire between pin 3 of the fuel rail pressure sensor harness connector and pin 58 of the MCM 120-pin connector.
7. Turn the ignition OFF.
8. Disconnect the MCM 120-pin harness connector.
9. Inspect the MCM 120-pin module connector housing and harness connector for signs of damage, bent spread corroded, broken or unseated (pushed out) pins, sign of water or oil intrusion and signs of wire damage near the connector.
 - a. If signs of damage are present, repair as needed.
 - b. If no sign of damage are present, Go to step 10.
10. Measure the resistance between pin 2 of the Fuel Rail Pressure sensor harness connector and pin 78 of the MCM 120-pin harness connector.
 - a. If the resistance is less than 5 ohms, Go to step 11.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 2 of the Fuel Rail Pressure sensor harness connector and pin 78 of the MCM 120-pin harness connector.
11. Reconnect the MCM 120-pin harness connector.
12. Turn the ignition ON (key ON, engine OFF).
13. Measure the voltage between pins 1 and 3 of the Fuel Rail Pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, replace the Fuel Rail Pressure connector. Refer to section "Removal of the Fuel Rail Pressure Sensor".
 - b. If the voltage is not between 4.5 and 5.5 volts, repeat this procedure. If the results are the same, replace the MCM. Refer to section "Removal of the Motor Control Module".

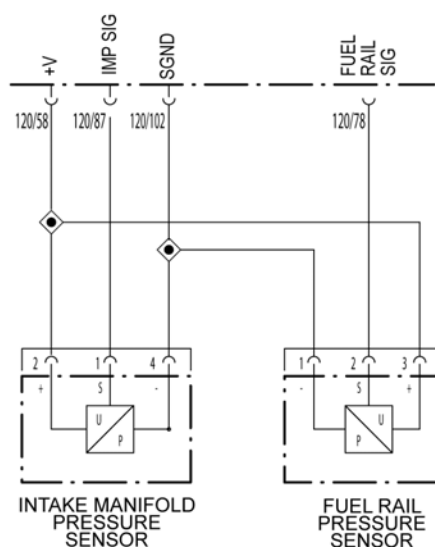
6 SPN 164/FMI 4 – EPA07

This diagnostic is typically a Fuel Rail Pressure Sensor Circuit Failed Low (Short to Ground).

NOTE: Fault may be induced by low battery voltage.

Table 5.

SPN 164/FMI 4	
Description	Fuel Rail Pressure Sensor Circuit Failed Low
Monitored Parameter	Fuel Rail Pressure Sensor
Typical Enabling Conditions	Always Enabled
Monitor Sequence	None
Execution Frequency	Always Enabled
Typical Duration	2 Seconds
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	Engine Idle (1 minute)



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Check as follows:

1. Is battery voltage SPN 168/FMI (any) also present?
 - a. Yes; repair battery voltage fault code.
 - b. No; Go to step 2.
2. Disconnect the fuel rail pressure sensor connector.
3. Inspect the harness connector for signs of damage, bent, spread, broken, corroded or unseated (push out) pins and signs of moisture in the connector or wire damage near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 4.
4. Turn the ignition ON (key ON, engine OFF).
5. Measure the voltage between pins 1 and 3 of the Fuel Rail Pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, Go to step 7.
 - b. If the voltage is not between 4.5 and 5.5 volts, Go to step 6.
6. Measure the voltage between pin 3 of the Fuel Rail Pressure sensor harness connector and battery ground.

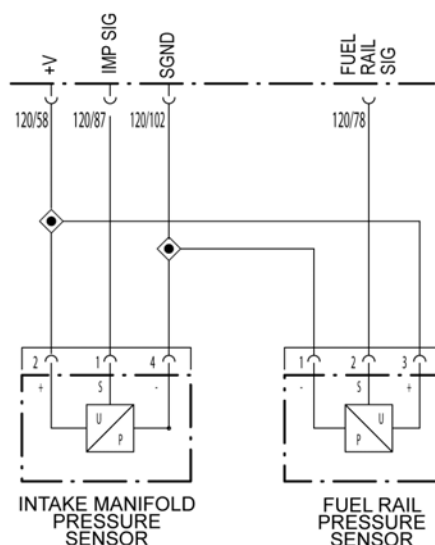
- a. If the voltage is between 4.5 and 5.5 volts, repair the wire between pin 1 of the Fuel Rail Pressure sensor harness connector and pin 102 of the MCM 120-pin harness connector.
 - b. If the voltage is not between 4.5 and 5.5 volts, repair the wire between pin 3 of the Fuel Rail Pressure sensor harness connector and pin 58 of the MCM 120-pin harness connector.
7. Turn the ignition OFF.
8. Disconnect the MCM 120-pin harness connector.
9. Inspect the MCM 120-pin module connector housing and harness connector for signs of damage, bent, spread, corroded, broken or unseated (push out) pins, sign of water or oil intrusion and signs of wire damage near the harness connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 10.
10. Measure the resistance between pin 2 of the Fuel Rail Pressure sensor and pin 78 of the MCM 120-pin harness connector.
 - a. If the resistance is less than 5 ohms, Go to step 11.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 2 of the Fuel Rail Pressure sensor and pin 78 of the MCM 120-pin harness connector.
11. Measure the resistance between pin 2 of the Fuel Rail Pressure sensor harness connector and battery ground.
 - a. If the resistance is less than 10k ohms, repair the short to ground in the wire between pin 2 of the Fuel Rail Pressure sensor and pin 78 of the MCM 120-pin harness connector.
 - b. If the resistance is greater the 10k ohms, Go to step 12.
12. Reconnect the MCM 120-pin harness connector.
13. Turn the ignition ON (key ON, engine OFF).
14. Measure the voltage between pins 1 and 3 of the Fuel Rail Pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, replace the Fuel Rail Pressure sensor. Refer to section "Removal of the Fuel Rail Pressure Sensor".
 - b. If the voltage is not between 4.5 and 5.5 volts, repeat this procedure. If the results are the same, replace the MCM. Refer to section "Removal of the Motor Control Module".

7 SPN 164/FMI 5 – EPA07

This diagnostic is typically Fuel Rail Pressure Sensor Circuit Failed Open or a Stuck-in-Range Sensor.

Table 6.

SPN 164/FMI 5	
Description	Fuel Rail Pressure Sensor Circuit Failed Open
Monitored Parameter	Fuel Rail Pressure Sensor
Typical Enabling Conditions	Always Enabled
Monitor Sequence	None
Execution Frequency	Always Enabled
Typical Duration	2 Seconds
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	Engine Idle (1 minute)



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Check as follows:

1. Disconnect the Fuel Rail Pressure sensor.
2. Inspect the harness connector for signs of damaged, bent, spread, broken, corroded or unseated (push out) pins or wire damage near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 3.
3. Turn the ignition ON (key ON, engine OFF).
4. Measure the voltage between pins 1 and 3 of the Fuel Rail Pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, Go to step 6.
 - b. If the voltage is not between 4.5 and 5.5 volts, Go to step 5.
5. Measure the voltage between pin 3 of the Fuel Rail Pressure sensor harness connector and battery ground.
 - a. If the voltage is between 4.5 and 5.5 volts, repair the wire between pin 1 of the Fuel Rail Pressure sensor harness connector and pin 102 of the MCM 120-pin harness connector.
 - b. If the voltage is not between 4.5 and 5.5 volts, repair the wire between pin 3 of the Fuel Rail Pressure sensor harness connector and pin 58 of the MCM 120-pin harness connector.
6. Turn the ignition OFF.
7. Disconnect the MCM 120-pin connector.

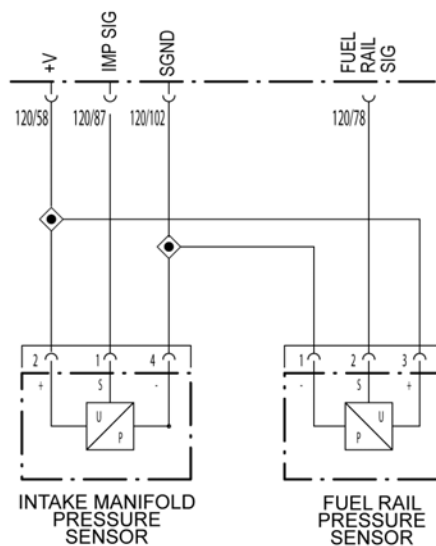
8. Inspect the MCM 120-pin module connector housing and harness connector for signs of damaged, bent, spread, broken, corroded or unseated (push out) pins, signs of water or oil intrusion and signs of wire damage near the harness connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 9.
9. Measure the resistance between pin 2 of the Fuel Rail Pressure sensor harness connector and pin 78 of the MCM 120-pin harness connector.
 - a. If the resistance is less than 5 ohms, Go to step 10.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 2 of the Fuel Rail Pressure sensor and pin 78 of the MCM 120-pin harness connector.
10. Reconnect the MCM 120-pin harness connector.
11. Turn the ignition ON (key ON, engine OFF).
12. Measure the voltage between pins 1 and 3 of the Fuel Rail Pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, replace the Fuel Rail Pressure sensor. Refer to section "Removal of the Fuel Rail Pressure Sensor".
 - b. If the voltage is not between 4.5 and 5.5 volts, repeat this procedure. If the results are the same, replace the MCM. Refer to section "Removal of the Motor Control Module".

8 SPN 164/FMI 20 – EPA07

This diagnostic is typically Fuel Rail Pressure Sensor Drift High.

Table 7.

SPN 164/FMI 20	
Description	Fuel Rail Pressure Sensor - Drift High
Monitored Parameter	Fuel Rail Pressure Sensor
Typical Enabling Conditions	Key On & Engine Off
Monitor Sequence	None
Execution Frequency	Once when enabling conditions met
Typical Duration	10 Seconds
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	Key On & Engine Off



d150007a

Check as follows:

1. Disconnect the fuel rail pressure sensor.
2. Inspect the fuel rail pressure sensor connector and harness connector for signs of damage; bent, spread, broken, unseated (pushed out) or corroded pins, signs of water intrusion or damaged wiring near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 3.
3. Turn the ignition ON (key ON, engine OFF).
4. Measure the voltage between pins 1 and 3 of the fuel rail pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, Go to step 6.
 - b. If the voltage is not between 4.5 and 5.5 volts, Go to step 5.
5. Measure the voltage between pin 3 of the fuel rail pressure sensor harness connector and battery ground.
 - a. If the voltage is between 4.5 and 5.5 volts, repair the wire between pin 1 of the fuel rail pressure sensor harness connector and pin 102 of the MCM 120-pin connector.
 - b. If the voltage is not between 4.5 and 5.5 volts, repair the wire between pin 3 of the fuel rail pressure sensor and pin 58 of the MCM 120-pin connector.
6. Turn the ignition OFF.
7. Disconnect the MCM 120-pin connector.

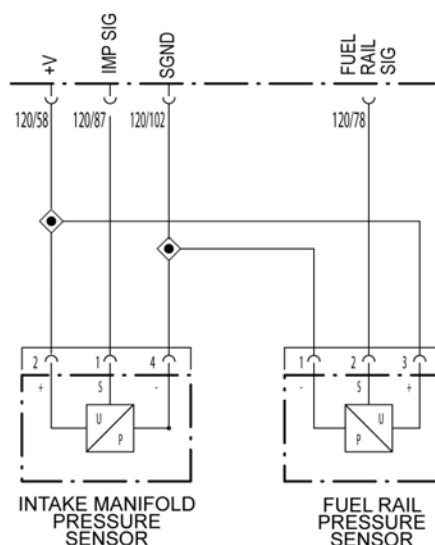
8. Inspect the MCM 120-pin connector and harness connector for signs of damage: bent, spread, broken, unseated (pushed out) or corroded pins, signs of water intrusion or damaged wiring near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 9.
9. Measure the resistance between pin 2 of the fuel rail pressure sensor harness connector and pin 78 of the MCM 120-pin connector.
 - a. If the resistance is less than 5 ohms, Go to step 10.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 2 of the fuel rail pressure sensor harness connector and pin 78 of the MCM 120-pin connector.
10. Measure the resistance between pin 1 of the fuel rail pressure sensor harness connector and pin 102 of the MCM 120-pin connector.
 - a. If the resistance is less than 5 ohms, Go to step 11.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 1 of the fuel rail pressure sensor harness connector and pin 102 of the MCM 120-pin connector.
11. Measure the resistance between pins 2 and 3 of the fuel rail pressure sensor harness connector.
 - a. If the resistance is greater than 10K ohms, Go to step 12.
 - b. If the resistance is less than 10K ohms, repair the short in the wires between pins 2 and 3 of the fuel rail pressure sensor harness connector.
12. Reconnect the MCM 120-pin harness connector.
13. Turn the ignition ON (key ON, engine OFF).
14. Measure the voltage between pins 1 and 3 of the fuel rail pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, replace fuel rail pressure sensor. Refer to section "Removal of the Fuel Rail Pressure Sensor".
 - b. If the voltage is not between 4.5 and 5.5 volts, repeat the above procedure. If the results are the same, replace the MCM module. If the problem is still unresolved, contact the CSC at 800-445-1980.

9 SPN 164/FMI 21 - EPA07

This diagnostic is typically Fuel Rail Pressure Sensor Drift Low.

Table 8.

SPN 164/FMI 21	
Description	Fuel Rail Pressure Sensor - Drift Low
Monitored Parameter	Fuel Rail Pressure Sensor
Typical Enabling Conditions	Key On & Engine Off
Monitor Sequence	None
Execution Frequency	Once when enabling conditions met
Typical Duration	10 Seconds
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	Key On & Engine Off



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Check as follows:

1. Disconnect the fuel rail pressure sensor.
2. Inspect the fuel rail pressure sensor connector and harness connector for signs of damage: bent, spread, broken, unseated (pushed out) or corroded pins, signs of water intrusion or damaged wiring near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, go to step 3.
3. Turn the ignition ON (key ON, engine OFF).
4. Measure the voltage between pins 1 and 3 of the fuel rail pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, go to step 6.
 - b. If the voltage is not between 4.5 and 5.5 volts, go to step 5.
5. Measure the voltage between pin 3 of the fuel rail pressure sensor harness connector and battery ground.
 - a. If the voltage is between 4.5 and 5.5 volts, repair the wire between pin 1 of the fuel rail pressure sensor harness connector and pin 102 of the MCM 120-pin connector.
 - b. If the voltage is not between 4.5 and 5.5 volts, repair the wire between pin 3 of the fuel rail pressure sensor and pin 58 of the MCM 120-pin connector.
6. Turn the ignition OFF.
7. Disconnect the MCM 120-pin connector.

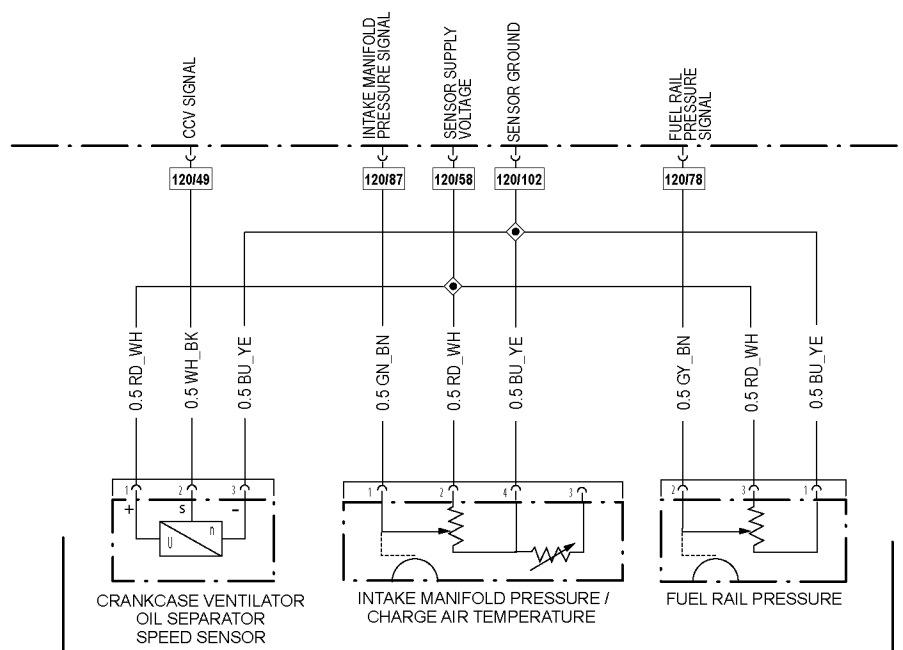
8. Inspect the MCM 120-pin connector and harness connector for signs of damage: bent, spread, broken, unseated (pushed out) or corroded pins, signs of water intrusion or damaged wiring near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, go to step 9.
9. Measure the resistance between pin 2 of the fuel rail pressure sensor harness connector and pin 78 of the MCM 120-pin connector.
 - a. If the resistance is less than 5 ohms, go to step 10.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 2 of the fuel rail pressure sensor harness connector and pin 78 of the MCM 120-pin connector.
10. Measure the resistance between pin 3 of the fuel rail pressure sensor harness connector and pin 58 of the MCM 120-pin connector.
 - a. If the resistance is less than 5 ohms, Go to step 11.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 3 of the fuel rail pressure sensor harness connector and pin 58 of the MCM 120-pin connector.
11. Measure the resistance between pins 1 and 2 of the fuel rail pressure sensor harness connector.
 - a. If the resistance is greater than 10K ohms, Go to step 12.
 - b. If the resistance is less than 10K ohms, repair the short in the wires between pins 1 and 2 of the fuel rail pressure sensor harness connector.
12. Reconnect the MCM 120-pin harness connector.
13. Turn the ignition ON (key ON, engine OFF).
14. Measure the voltage between pins 1 and 3 of the fuel rail pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, replace fuel rail pressure sensor. Refer to section "Removal of the Fuel Rail Pressure Sensor".
 - b. If the voltage is not between 4.5 and 5.5 volts, repeat the above procedure. If the results are the same, replace the MCM module. If the problem is still unresolved, contact the CSC at 800-445-1980.

10 SPN 164/FMI 2 – EPA 10 – GHG14

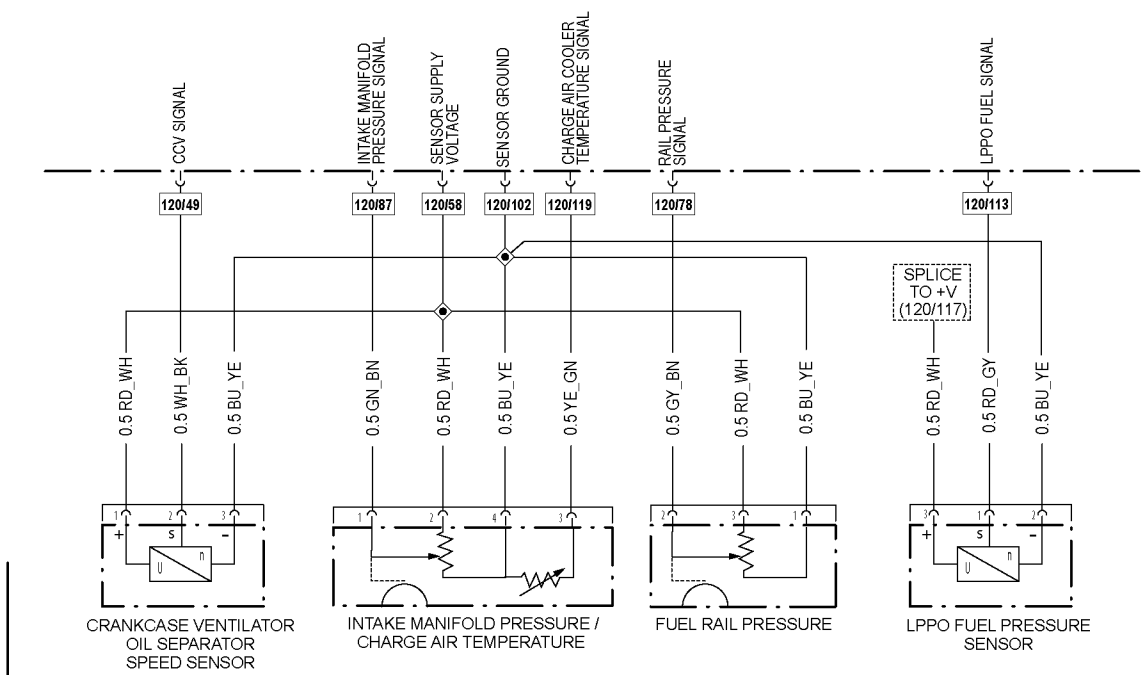
This diagnostic is typically Fuel Rail Pressure Drift High.

Table 9.

SPN 164/FMI 2	
Description	Fuel Rail Pressure Drift High
Monitored Parameter	Fuel Rail Pressure
Typical Enabling Conditions	Always Enabled
Monitor Sequence	None
Execution Frequency	Continuous when enabling conditions met
Typical Duration	2 Seconds
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	Engine Idle (1 minute)



EPA10 - ENGINE SERIAL NUMBER 0039648 AND EARLIER



GHG14 / EPA10 - ENGINE SERIAL NUMBER 0039649 AND LATER

d150221

Check as follows:

1. Disconnect the Fuel Rail Pressure sensor.
2. Inspect the Fuel Rail Pressure harness connector and sensor housing for signs of damage: bent, spread, broken corroded or unseated (push out) pins or wire damage near the connector.
 - a. If sign of damage are present, repair as needed.
 - b. If so signs of damage are present, Go to step 3.
3. Turn the ignition ON (key ON, engine OFF).
4. Measure the voltage between pins 1 and 3 of the Fuel Rail Pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, Go to step 6.

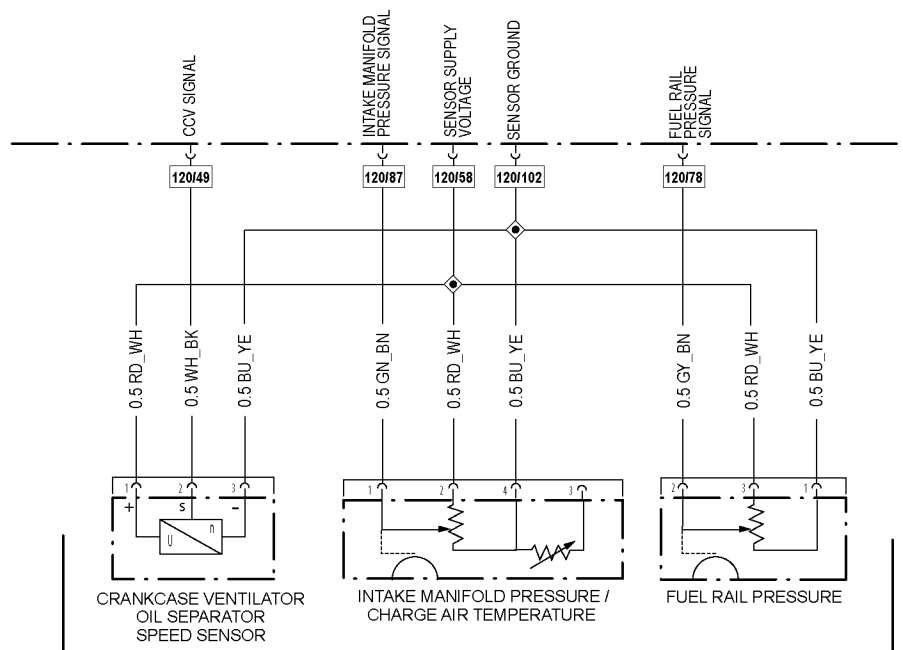
- b. If the voltage is NOT between 4.5 and 5.5 volts, Go to step 5.
5. Measure the voltage between pin 3 of the Fuel Rail Pressure sensor harness connector and battery ground.
 - a. If the voltage is between 4.5 and 5.5 volts, repair the wire between pin 1 of the Fuel Rail Pressure sensor harness connector and pin 120 of the MCM 120-pin connector.
 - b. If the voltage is NOT between 4.5 and 5.5 volts, repair the wire between pin 3 of the Fuel Rail Pressure sensor harness connector and pin 58 of the MCM2.1 120-pin harness connector.
6. Turn the ignition OFF.
7. Disconnect the MCM 120-pin harness connector.
8. Inspect the MCM 120-pin module connector housing and harness connector for signs of damage, bent, spread, broken, corroded or unseated (push out) pins or wire damage near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 9.
9. Measure the resistance between pin 2 of the Fuel Rail Pressure sensor harness connector and pin 78 of the MCM 120-pin harness connector.
 - a. If the resistance is less than 5 ohms, Go to step 10.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 2 of the Fuel Rail Pressure sensor harness connector and pin 78 of the MCM 120-pin harness connector.
10. Measure the resistance between pin 1 of the Fuel Rail Pressure sensor harness connector and pin 102 of the MCM 120-pin harness connector.
 - a. If the resistance is less than 5 ohms, Go to step 11.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 1 of the Fuel Rail Pressure sensor harness connector and pin 102 of the MCM 120-pin harness connector.
11. Measure the resistance between pin 3 of the Fuel Rail Pressure sensor harness connector and pin 58 of the MCM 120-pin harness connector.
 - a. If the resistance is less than 5 ohms, Go to step 12.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 3 of the Fuel Rail Pressure sensor and pin 58 of the MCM 120-pin harness connector.
12. Reconnect the MCM 120-pin connector.
13. Turn the ignition ON (key ON, engine OFF).
14. Measure the voltage between pins 1 and 3 of the Fuel Rail Pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, replace the Fuel Rail Pressure sensor. Refer to section "Removal of the Fuel Rail Pressure Sensor".
 - b. If the voltage is not between 4.5 and 5.5 volts, repeat this procedure. If the results are the same, replace the MCM. Refer to section "Removal of the Motor Control Module".

11 SPN 164/FMI 3 – EPA10 – GHG14

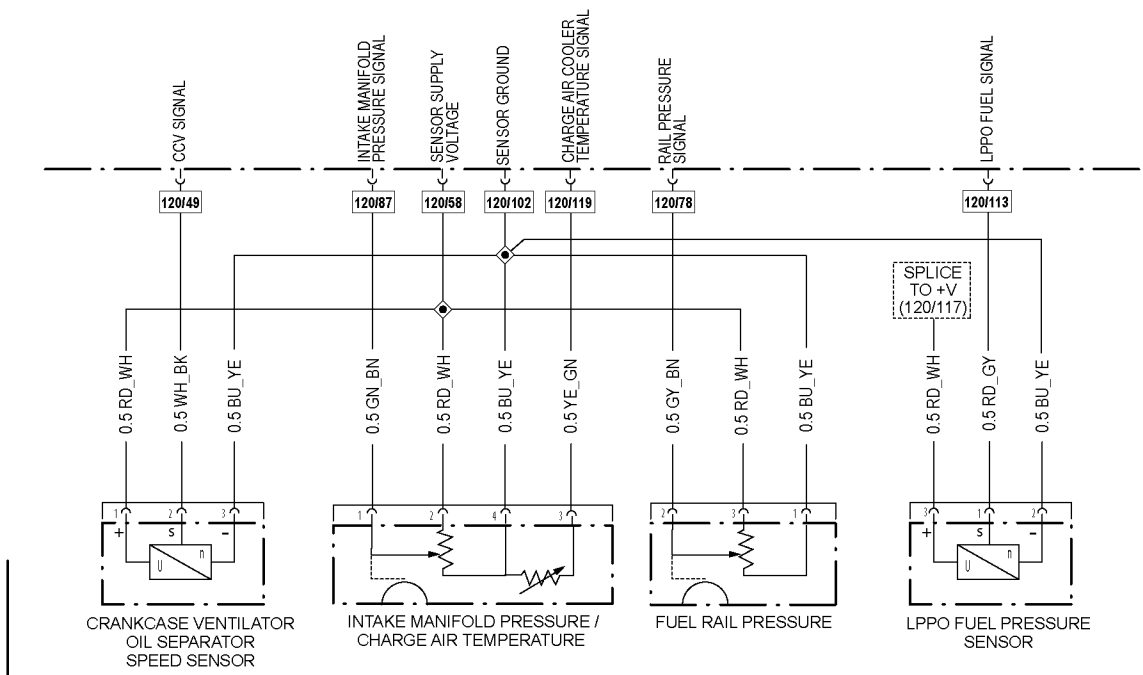
This diagnostic is typically the Fuel Rail Pressure Sensor Circuit Failed High (Open Circuit).

Table 10.

SPN 164/FMI 3	
Description	Fuel Rail Pressure Sensor Circuit Failed High
Monitored Parameter	Fuel Rail Pressure Sensor
Typical Enabling Conditions	Always Enabled
Monitor Sequence	None
Execution Frequency	Always Enabled
Typical Duration	2 Seconds
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	Engine Idle (1 minute)



EPA10 - ENGINE SERIAL NUMBER 0039648 AND EARLIER



GHG14 / EPA10 - ENGINE SERIAL NUMBER 0039649 AND LATER

d150221

Check as follows:

1. Check for multiple codes.
 - a. If two or more of the following codes are present: SPN 2631/FMI 3, SPN 2630/FMI 3, SPN 164/FMI 3, or SPN 94/FMI 3, repair the open in the common ground wire from pin 102 of the MCM 120-pin harness connector to the respective sensor ground pin on the sensor connector. See above diagram.
 - b. If only fault SPN 164/FMI 3 is active, Go to step 2.
2. Disconnect the fuel rail pressure sensor connector.
3. Inspect the harness connector for signs of damage: bent, spread, corroded, broken or unseated (pushed out) pins, signs of water or oil intrusion and signs of wire damage near the connector.

- a. If signs of damage are present, repair as needed.
 - b. If no signs of damage are present Go to step 4.
4. Turn the ignition ON (key ON, engine OFF).
5. Measure the voltage between pins 1 and 3 of the fuel rail pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, Go to step 7.
 - b. If the voltage is not between 4.5 and 5.5 volts, Go to step 6.
6. Measure the voltage between pin 3 of the fuel rail pressure sensor harness connector and battery ground.
 - a. If the voltage is between 4.5 and 5.5 volts, repair the wire between pin 1 of the fuel rail pressure sensor harness connector and pin 102 of the MCM 120-pin connector.
 - b. If the voltage is not between 4.5 and 5.5 volts, repair the wire between pin 3 of the fuel rail pressure sensor harness connector and pin 58 of the MCM 120-pin connector.
7. Turn the ignition OFF.
8. Disconnect the MCM 120-pin harness connector.
9. Inspect the MCM 120-pin module connector housing and harness connector for signs of damage: bent, spread, corroded, broken or unseated (pushed out) pins, sign of water or oil intrusion and signs of wire damage near the connector.
 - a. If signs of damage are present, repair as needed.
 - b. If no sign of damage are present, Go to step 10.
10. Measure the resistance between pin 2 of the Fuel Rail Pressure sensor harness connector and pin 78 of the MCM 120-pin harness connector.
 - a. If the resistance is less than 5 ohms, Go to step 11.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 2 of the Fuel Rail Pressure sensor harness connector and pin 78 of the MCM 120-pin harness connector.
11. Reconnect the MCM 120-pin harness connector.
12. Turn the ignition ON (key ON, engine OFF).
13. If the voltage between pins 1 and 3 of the Fuel Rail Pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, replace the Fuel Rail Pressure connector. Refer to section "Removal of the Fuel Rail Pressure Sensor".
 - b. If the voltage is not between 4.5 and 5.5 volts, repeat this procedure. If the results are the same, replace the MCM. Refer to section "Removal of the Motor Control Module".

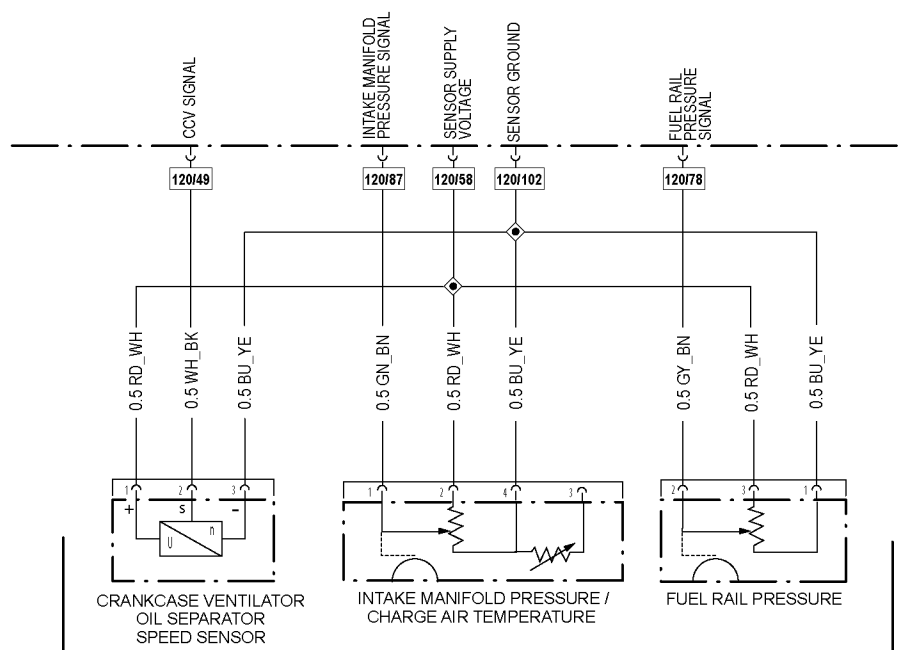
12 SPN 164/FMI 4 – EPA10 – GHG14

This diagnostic is typically a Fuel Rail Pressure Sensor Circuit Failed Low (Short to Ground).

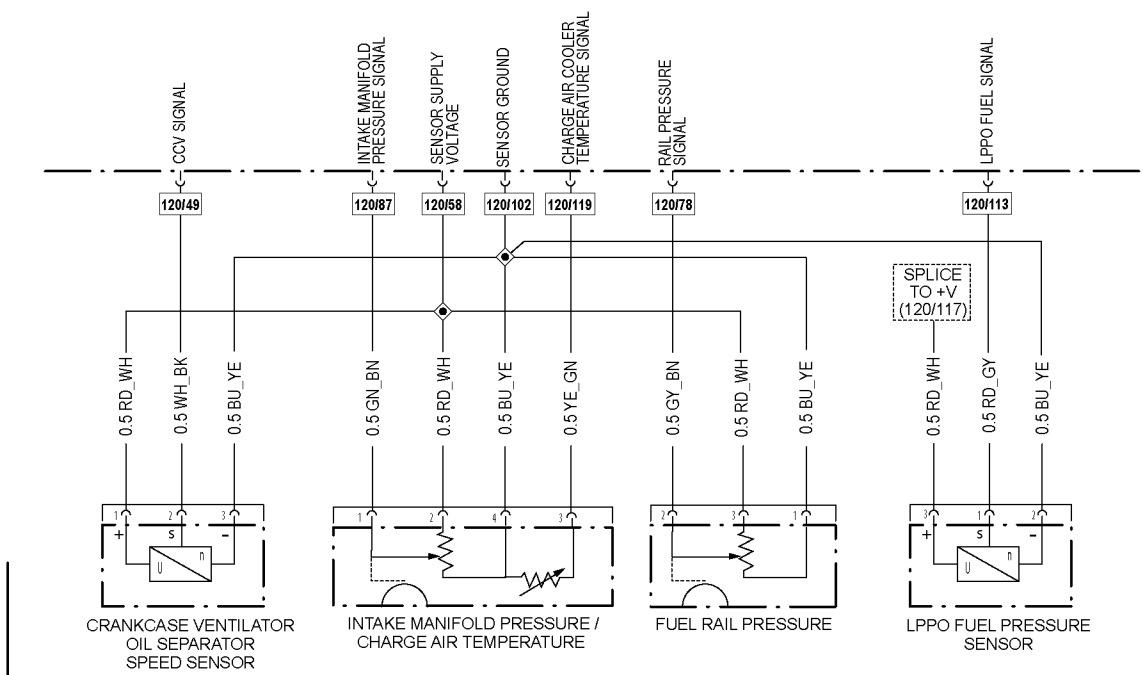
NOTE: Fault may be induced by low battery voltage.

Table 11.

SPN 164/FMI 4	
Description	Fuel Rail Pressure Sensor Circuit Failed Low
Monitored Parameter	Fuel Rail Pressure Sensor
Typical Enabling Conditions	Always Enabled
Monitor Sequence	None
Execution Frequency	Always Enabled
Typical Duration	2 Seconds
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	Engine Idle (1 minute)



EPA10 - ENGINE SERIAL NUMBER 0039648 AND EARLIER



GHG14 / EPA10 - ENGINE SERIAL NUMBER 0039649 AND LATER

d150221

Check as follows:

1. Is battery voltage SPN 168/FMI (any) also present?
 - a. Yes; repair battery voltage fault code.
 - b. No; Go to step 2.
2. Disconnect the fuel rail pressure sensor connector.
3. Inspect the harness connector for signs of damage: bent, spread, broken, corroded or unseated (push out) pins and signs of moisture in the connector or wire damage near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 4.

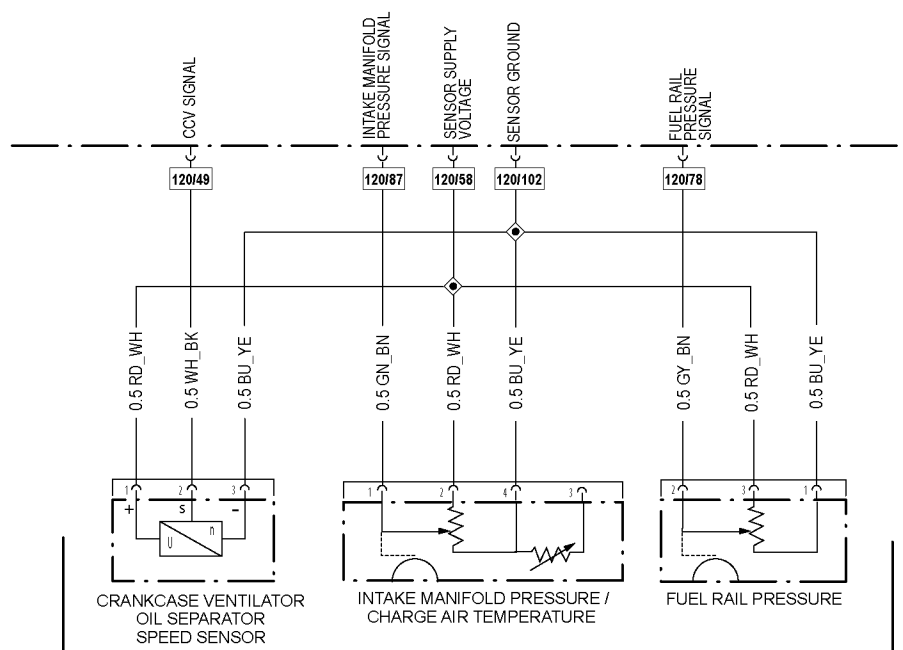
4. Turn the ignition ON (key ON, engine OFF).
5. Measure the voltage pins 1 and 3 of the Fuel Rail Pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, Go to step 7.
 - b. If the voltage is not between 4.5 and 5.5 volts, Go to step 6.
6. Measure the voltage between pin 3 of the Fuel Rail Pressure sensor harness connector and battery ground.
 - a. If the voltage is between 4.5 and 5.5 volts, repair the wire between pin 1 of the Fuel Rail Pressure sensor harness connector and pin 102 of the MCM 120-pin harness connector.
 - b. If the voltage is not between 4.5 and 5.5 volts, repair the wire between pin 3 of the Fuel Rail Pressure sensor harness connector and pin 58 of the MCM 120-pin harness connector.
7. Turn the ignition OFF.
8. Disconnect the MCM 120-pin harness connector.
9. Inspect the MCM 120-pin module connector housing and harness connector for signs of damage: bent, spread, corroded, broken or unseated (push out) pins, signs of water or oil intrusion and signs of wire damage near the harness connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 10.
10. Measure the resistance of pin 2 of the Fuel Rail Pressure sensor and pin 78 of the MCM 120-pin harness connector.
 - a. If the resistance is less than 5 ohms, Go to step 11.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 2 of the Fuel Rail Pressure sensor and pin 78 of the MCM 120-pin harness connector.
11. Measure the resistance between pin 2 of the Fuel Rail Pressure sensor harness connector and battery ground.
 - a. If the resistance is less than 10k ohms, repair the short to ground in the wire between pin 2 of the Fuel Rail Pressure sensor and pin 78 of the MCM 120-pin harness connector.
 - b. If the resistance is greater the 10k ohms, Go to step 12.
12. Reconnect the MCM 120-pin harness connector.
13. Turn the ignition ON (key ON, engine OFF).
14. Measure the voltage between pins 1 and 3 of the Fuel Rail Pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, replace the Fuel Rail Pressure sensor. Refer to section "Removal of the Fuel Rail Pressure Sensor".
 - b. If the voltage is not between 4.5 and 5.5 volts, repeat this procedure. If the results are the same, replace the MCM. Refer to section "Removal of the Motor Control Module".

13 SPN 164/FMI 5 – EPA10 – GHG14

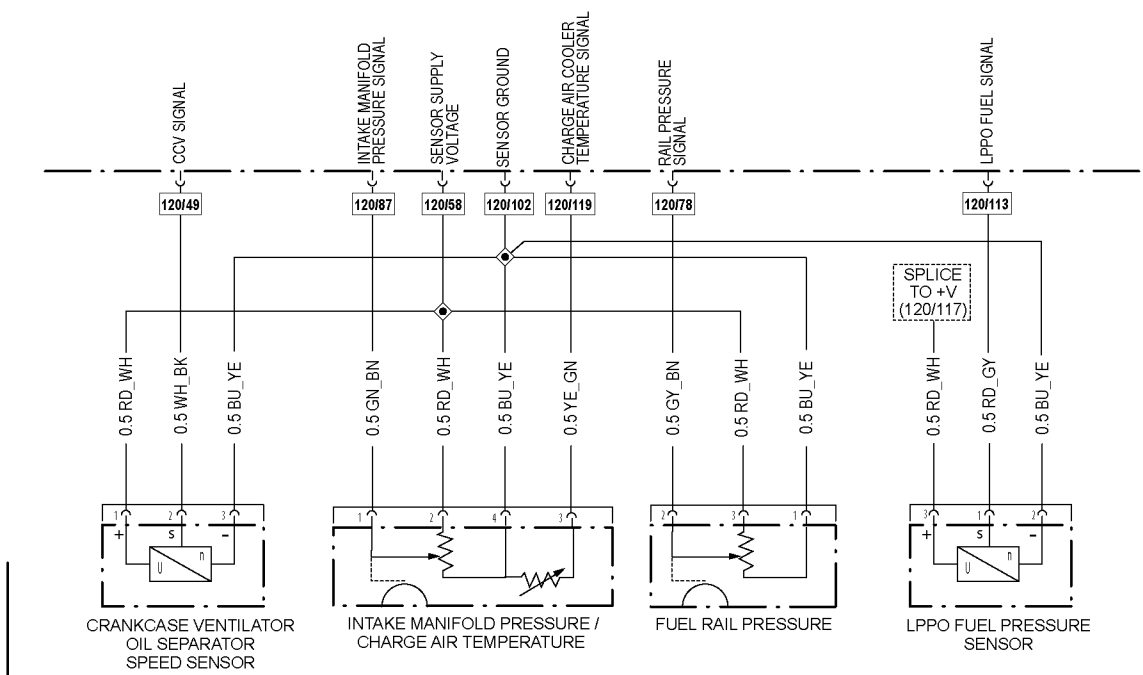
This diagnostic is typically Fuel Rail Pressure Sensor Circuit Open or a Stuck-in-Range Sensor.

Table 12.

SPN 164/FMI 5	
Description	Fuel Rail Pressure Sensor Circuit Failed Open
Monitored Parameter	Fuel Rail Pressure Sensor
Typical Enabling Conditions	Always Enabled
Monitor Sequence	None
Execution Frequency	Always Enabled
Typical Duration	2 Seconds
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	Engine Idle (1 minute)



EPA10 - ENGINE SERIAL NUMBER 0039648 AND EARLIER



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d150221

Check as follows:

1. Disconnect the Fuel Rail Pressure sensor.
2. Inspect the harness connector for signs of damage: bent, spread, broken, corroded, or unseated (push out) pins or wire damage near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 3.
3. Turn the ignition ON (key ON, engine OFF).
4. Measure the voltage between pins 1 and 3 of the Fuel Rail Pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, Go to step 6.

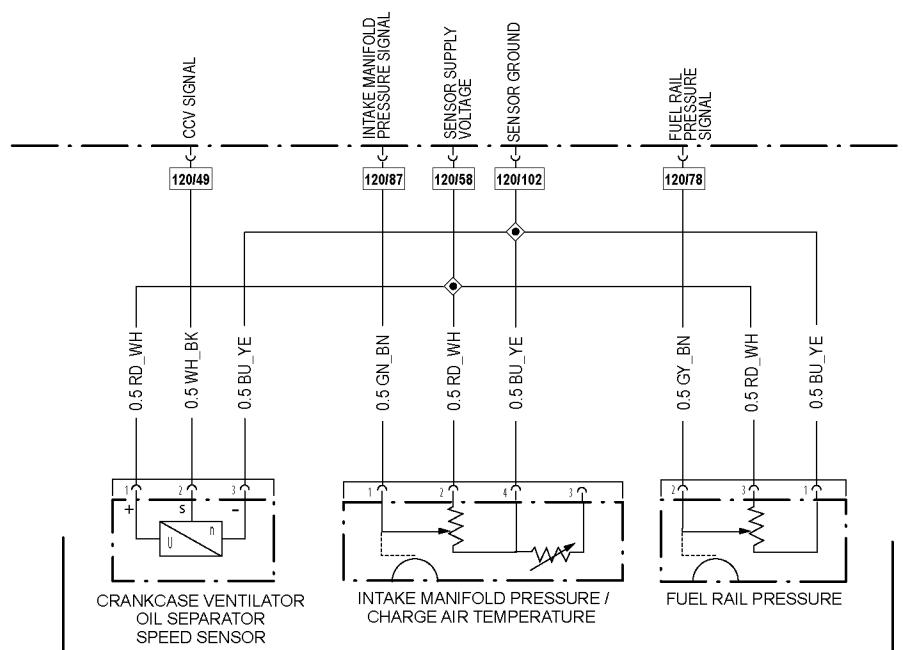
- b. If the voltage is not between 4.5 and 5.5 volts, Go to step 5.
5. Measure the voltage between pin 3 of the Fuel Rail Pressure sensor harness connector and battery ground.
 - a. If the voltage is between 4.5 and 5.5 volts, repair the wire between pin 1 of the Fuel Rail Pressure sensor harness connector and pin 102 of the MCM 120-pin harness connector.
 - b. If the voltage is not between 4.5 and 5.5 volts, repair the wire between pin 3 of the Fuel Rail Pressure sensor harness connector and pin 58 of the MCM 120-pin harness connector.
6. Turn the ignition OFF.
7. Disconnect the MCM 120-pin connector.
8. Inspect the MCM 120-pin module connector housing and harness connector for signs of damage: bent, spread, broken, corroded or unseated (push out) pins, signs of water or oil intrusion and signs of wire damage near the harness connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 9.
9. Measure the resistance between pin 2 of the Fuel Rail Pressure sensor harness connector and pin 78 of the MCM 120-pin harness connector.
 - a. If the resistance is less than 5 ohms, Go to step 10.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 2 of the Fuel Rail Pressure sensor and pin 78 of the MCM 120-pin harness connector.
10. Reconnect the MCM 120-pin harness connector.
11. Turn the ignition ON (key ON, engine OFF).
12. Measure the voltage between pins 1 and 3 of the Fuel Rail Pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, replace the Fuel Rail Pressure sensor. Refer to section "Removal of the Fuel Rail Pressure Sensor".
 - b. If the voltage is not between 4.5 and 5.5 volts, repeat this procedure. If the results are the same, replace the MCM. Refer to section "Removal of the Motor Control Module".

14 SPN 164/FMI 20 – EPA10/GHG14

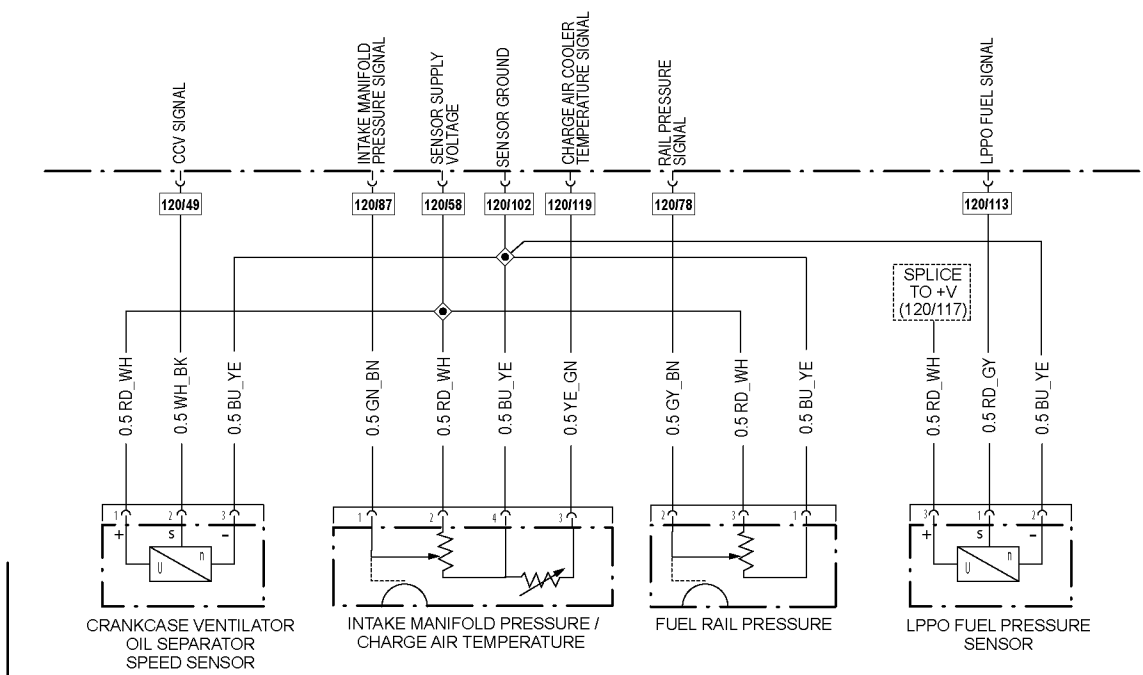
This diagnostic is typically Rail Pressure Sensor Drift High.

Table 13.

SPN 164/FMI 20	
Description	Fuel Rail Pressure Sensor - Drift High
Monitored Parameter	Fuel Rail Pressure Sensor
Typical Enabling Conditions	Key On & Engine Off
Monitor Sequence	None
Execution Frequency	Once when enabling conditions met
Typical Duration	10 Seconds
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	Key On & Engine Off



EPA10 - ENGINE SERIAL NUMBER 0039648 AND EARLIER



GHG14 / EPA10 - ENGINE SERIAL NUMBER 0039649 AND LATER

d150221

NOTE: For EPA10 - Make sure MCM software is 7.5.0.108 (or higher) with Fuel Map ZGS 004 (DD15 & DD16) & ZGS 005 (DD13) or higher.

Check as follows:

1. Disconnect the fuel rail pressure sensor.
2. Inspect the fuel rail pressure sensor connector and harness connector for signs of damage: bent, spread, broken, unseated (pushed out) or corroded pins, signs of water intrusion or damaged wiring near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 3.

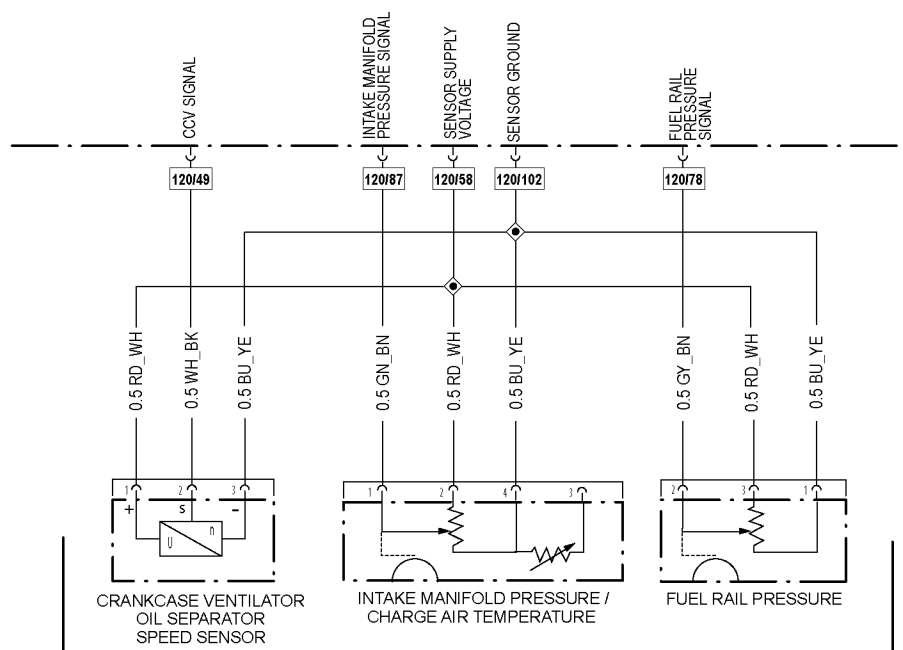
3. Turn the ignition ON (key ON, engine OFF).
4. Measure the voltage between pins 1 and 3 of the fuel rail pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, Go to step 6.
 - b. If the voltage is not between 4.5 and 5.5 volts, Go to step 5.
5. Measure the voltage between pin 3 of the fuel rail pressure sensor harness connector and battery ground.
 - a. If the voltage is between 4.5 and 5.5 volts, repair the wire between pin 1 of the fuel rail pressure sensor harness connector and pin 102 of the MCM 120-pin connector.
 - b. If the voltage is not between 4.5 and 5.5 volts, repair the wire between pin 3 of the fuel rail pressure sensor and pin 58 of the MCM 120-pin connector.
6. Turn the ignition OFF.
7. Disconnect the MCM 120-pin connector.
8. Inspect the MCM 120-pin connector and harness connector for signs of damage: bent, spread, broken, unseated (pushed out) or corroded pins, signs of water intrusion or damaged wiring near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 9.
9. Measure the resistance between pin 2 of the fuel rail pressure sensor harness connector and pin 78 of the MCM 120-pin connector.
 - a. If the resistance is less than 5 ohms, Go to step 10.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 2 of the fuel rail pressure sensor harness connector and pin 78 of the MCM 120-pin connector.
10. Measure the resistance between pin 1 of the fuel rail pressure sensor harness connector and pin 102 of the MCM 120-pin connector.
 - a. If the resistance is less than 5 ohms, Go to step 11.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 1 of the fuel rail pressure sensor harness connector and pin 102 of the MCM 120-pin connector.
11. Measure the resistance between pins 2 and 3 of the fuel rail pressure sensor harness connector.
 - a. If the resistance is greater than 10K ohms, Go to step 12.
 - b. If the resistance is less than 10K ohms, repair the short in the wires between pins 2 and 3 of the fuel rail pressure sensor harness connector.
12. Reconnect the MCM 120-pin harness connector.
13. Turn the ignition ON (key ON, engine OFF).
14. Measure the voltage between pins 1 and 3 of the fuel rail pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, replace fuel rail pressure sensor. Refer to section "Removal of the Fuel Rail Pressure Sensor".
 - b. If the voltage is not between 4.5 and 5.5 volts, repeat the above procedure. If the results are the same, replace the MCM module. If the problem is still unresolved, contact the CSC at 800-445-1980.

15 SPN 164/FMI 21 – EPA10/GHG14

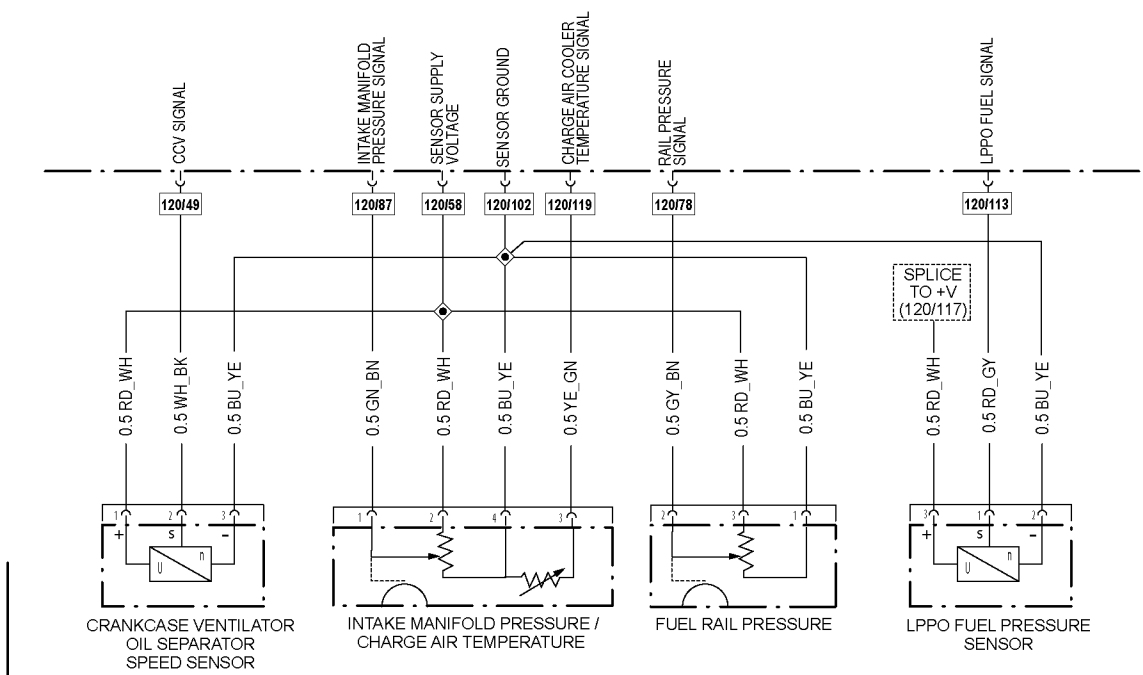
This diagnostic is typically Fuel Rail Pressure Sensor Drift Low.

Table 14.

SPN 164/FMI 21	
Description	Fuel Rail Pressure Sensor - Drift Low
Monitored Parameter	Fuel Rail Pressure Sensor
Typical Enabling Conditions	Key On & Engine Off
Monitor Sequence	None
Execution Frequency	Once when enabling conditions met
Typical Duration	10 Seconds
Dash Lamps	MIL, CEL
Engine Reaction	Derate 25%
Verification	Key On & Engine Off



EPA10 - ENGINE SERIAL NUMBER 0039648 AND EARLIER



GHG14 / EPA10 - ENGINE SERIAL NUMBER 0039649 AND LATER

d150221

Check as follows:

1. Disconnect the fuel rail pressure sensor.
2. Inspect the fuel rail pressure sensor connector and harness connector for signs of damage: bent, spread, broken, unseated (pushed out) or corroded pins, signs of water intrusion or damaged wiring near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 3.
3. Turn the ignition ON (key ON, engine OFF).
4. Measure the voltage between pins 1 and 3 of the fuel rail pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, Go to step 6.

- a. If the voltage is not between 4.5 and 5.5 volts, Go to step 5.
5. Measure the voltage between pin 3 of the fuel rail pressure sensor harness connector and battery ground.
 - a. If the voltage is between 4.5 and 5.5 volts, repair the wire between pin 1 of the fuel rail pressure sensor harness connector and pin 102 of the MCM 120-pin connector.
 - b. If the voltage is not between 4.5 and 5.5 volts, repair the wire between pin 3 of the fuel rail pressure sensor and pin 58 of the MCM 120-pin connector.
6. Turn the ignition OFF.
7. Disconnect the MCM 120-pin connector.
8. Inspect the MCM 120-pin connector and harness connector for signs of damage; bent, spread, broken, unseated (pushed out) or corroded pins, signs of water intrusion or damaged wiring near the connector.
 - a. If signs of damage are present, repair as necessary.
 - b. If no signs of damage are present, Go to step 9.
9. Measure the resistance between pin 2 of the fuel rail pressure sensor harness connector and pin 78 of the MCM 120-pin connector.
 - a. If the resistance is less than 5 ohms, Go to step 10.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 2 of the fuel rail pressure sensor harness connector and pin 78 of the MCM 120-pin connector.
10. Measure the resistance between pin 3 of the fuel rail pressure sensor harness connector and pin 58 of the MCM 120-pin connector.
 - a. If the resistance is less than 5 ohms, Go to step 11.
 - b. If the resistance is greater than 5 ohms, repair the wire between pin 3 of the fuel rail pressure sensor harness connector and pin 58 of the MCM 120-pin connector.
11. Measure the resistance between pins 1 and 2 of the fuel rail pressure sensor harness connector.
 - a. If the resistance is greater than 10K ohms, Go to step 12.
 - b. If the resistance is less than 10K ohms, repair the short in the wires between pins 1 and 2 of the fuel rail pressure sensor harness connector.
12. Reconnect the MCM 120-pin harness connector.
13. Turn the ignition ON (key ON, engine OFF).
14. Measure the voltage between pins 1 and 3 of the fuel rail pressure sensor harness connector.
 - a. If the voltage is between 4.5 and 5.5 volts, replace fuel rail pressure sensor. Refer to section "Removal of the Fuel Rail Pressure Sensor".
 - b. If the voltage is not between 4.5 and 5.5 volts, repeat the above procedure. If the results are the same, replace the MCM module. If the problem is still unresolved, contact the CSC at 800-445-1980.