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Service Information Bulletin

SUBJECT	DATE
SPN 100 (MCM) (GHG17) SPN 100 (CPC) (GHG17) SPN 100 (MCM) (EPA07/10/GHG14) SPN 100 (CPC) (EPA07/10/GHG14)	September 2016

Additions, Revisions, or Updates

Publication Number / Title	Platform	Section Title	Change
DDC-SVC-MAN-0191	MCM - GHG17 DD Platform	SPN 100/FMI 0 - GHG17	Added note to diagnostic procedures.
		SPN 100/FMI 1 - GHG17	
		SPN 100/FMI 3 - GHG17	
		SPN 100/FMI 4 - GHG17	
		SPN 100/FMI 5 - GHG17	
		SPN 100/FMI 10 - GHG17	
		SPN 100/FMI 17 - GHG17	
	CPC - GHG17 DD Platform	SPN 100/FMI 1 - GHG17	
		SPN 100/FMI 18 - GHG17	
DDC-SVC-MAN-0193	MCM - GHG17 DD Platform MD	SPN 100/FMI 0 - GHG17	Added note to diagnostic procedures.
		SPN 100/FMI 1 - GHG17	
		SPN 100/FMI 3 - GHG17	
		SPN 100/FMI 4 - GHG17	
		SPN 100/FMI 5 - GHG17	
		SPN 100/FMI 10 - GHG17	
		SPN 100/FMI 17 - GHG17	
	CPC - GHG17 DD Platform MD	SPN 100/FMI 1 - GHG17	
		SPN 100/FMI 18 - GHG17	

Publication Number / Title	Platform	Section Title	Change
DDC-SVC-MAN-0084	MCM - EPA07/10/ GHG14 DD Platform	SPN 100/FMI 0 - EPA07/10/GHG14	Added note to diagnostic procedures. Updated procedures with new information.
		SPN 100/FMI 1 - EPA07/10/GHG14	
		SPN 100/FMI 3 - EPA07/10/GHG14	
		SPN 100/FMI 4 - EPA07/10/GHG14	
		SPN 100/FMI 5 - EPA07/10/GHG14	
		SPN 100/FMI 10 - EPA07/10/GHG14	
		SPN 100/FMI 17 - EPA07/10/GHG14	
	CPC - EPA07/10/ GHG14 DD Platform	SPN 100/FMI 1 - EPA07/10/GHG14	
		SPN 100/FMI 18 - EPA07/10/GHG14	

DiagnosticLink users: Please update the troubleshooting guides in DiagnosticLink with this newest version. To update the tool troubleshooting guide, open DiagnosticLink and from the Help – Troubleshooting Guides menu, select the appropriate troubleshooting manual, then click Update.

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2 SPN 100/FMI 0 - GHG17

Oil Pressure Stuck

Table 1.

SPN 100/FMI 0	
Description	This fault code sets when the engine oil pressure is higher than a calibrated pressure for the specific RPM.
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always On
Monitor Sequence	Key On Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	While the engine is at normal operating temperature, road test performing several decelerations.

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Connect DiagnosticLink ®.
2. Turn the ignition ON, (key ON, engine OFF).
3. Check for multiple fault codes. Are fault codes SPN 100/FMI 3 or FMI 4 present?
    a. Yes; diagnose the other fault codes first.
    b. No; Go to step 4.
4. Monitor the engine oil pressure. Does the engine oil pressure read zero psi?
    a. Yes; Go to step 5.
    b. No; replace the engine oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor".
5. Turn the ignition OFF.
6. Remove the engine oil temperature sensor; Refer to section "Removal of the Engine Oil Temperature Sensor".
7. Reconnect the oil temperature sensor to the electrical connector while the engine oil temperature sensor is still removed.
8. Plumb a manual gauge into the oil temperature sensor port.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

9. Start and warm the engine to operating temperature.
10. Perform several neutral run-ups. Does the oil pressure reading on the manual gauge match the engine oil pressure sensor reading in DiagnosticLink?

a. Yes; Go to step 11.
b. No; replace the engine oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Reinstall the engine oil temperature sensor; Refer to section "Installation of the Engine Oil Temperature Sensor" and verify repair.

11. Road test the vehicle. Does the engine oil pressure reading on the manual gauge match the engine oil pressure reading in DiagnosticLink when the fault is present?
    a. Yes; replace the oil pump. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Reinstall the engine oil temperature sensor; Refer to section "Installation of the Engine Oil Temperature Sensor" and verify repair.
    b. No; replace the engine oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Reinstall the engine oil temperature sensor; Refer to section "Installation of the Engine Oil Temperature Sensor" and verify repair.

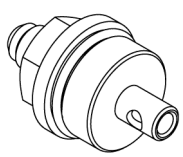
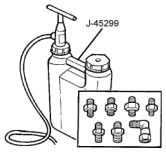
3 SPN 100/FMI 1 - GHG17

Low Engine Oil Pressure

Table 2.

SPN 100/FMI 1	
Description	This Fault Code Sets When the Engine Oil Pressure is Less Than a Calibrated Threshold
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always ON
Monitor Sequence	Key ON, Engine ON
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	Check at Engine Operating Temperature

Table 3.

J-49181	Oil System Priming Adapter	 d580037
J-45299	Oil System Priming Pump	 d580151

Possible causes:
- Failed oil pressure sensor
- Initial start after oil maintenance
- Vehicle is parked on a steep incline
- Improper oil level
- Oil dilution
- Leaks in the oil suction manifold
- Leaks at the oil suction pipes
- Failed oil pump

Table 4.

DD15TC and DD16 Minimum Oil Pressure at Operating Temperature		
RPM	**BAR**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

Table 5.

DD15AT Minimum Oil Pressure at Operating Temperature		
RPM	**BAR**	**psi**
600	0.689	10
1200	1.65	24
1800	2.55	37

Table 6.

DD13 Minimum Oil Pressure at Operating Temperature		
RPM	**BAR**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

NOTE: The oil gauge in the dash is NOT used to diagnose or verify low oil pressure concerns.

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Check for multiple codes. Are there multiple oil pressure sensor circuit fault codes?
    a. Yes; diagnose the oil pressure sensor circuit fault codes first.
    b. No; Go to step 2.
2. With the vehicle parked on a flat, level surface, check the engine oil level after the engine has been shut off for at least 20 minutes. Is the engine oil at the correct level?
    a. Yes; Go to step 7.
    b. No; Go to step 3.

NOTE: An increase in the oil level suggests that there may be fuel or coolant entering the engine oil.

3. Is the oil level overfilled?
    a. Yes; Go to step 5.
    b. No; Go to step 4.
4. Use the manufacturer recommended oil to fill the engine oil to the correct level. Check for external engine oil leaks and repair as necessary. Verify repair.
5. Check the oil for signs of coolant intrusion. When there is coolant intrusion, the oil will exhibit a milky appearance or become thick and sludgy. Are there signs of coolant in the oil?
    a. Yes; Refer to section "Coolant in Oil". Verify repair.
    b. No; Go to step 6.
6. Check the oil for signs of fuel intrusion. When there is fuel intrusion into the oil, the oil becomes thin and has a fuel odor. Are there signs of fuel in the oil?
    a. Yes; determine the cause of fuel in the oil. Change the oil and filter. Verify repair.
    b. No; the oil level may have been over filled by the customer. Correct the oil level. Go to step 7.
7. Turn the ignition ON (key ON, engine OFF).
8. Connect DiagnosticLink ® and check for a biased oil pressure sensor at key ON, engine OFF. Does the oil pressure sensor read zero psi?
    a. Yes; Go to step 9.
    b. No; replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

9. Start the engine and observe the stability of the oil pressure using the chart. Is the oil pressure stable and within normal operating range as per the chart?
    a. Yes; clear the code. Release the vehicle.
    b. No; Go to step 10.
10. Inspect the vehicle for aftermarket components plumbed into the oil system. Are there any aftermarket components installed?
    a. Yes; isolate the aftermarket components. Recheck the oil pressure.
    b. No; Go to step 11.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

NOTE: A code will be set when the oil temperature sensor is unplugged.

11. Remove the oil temperature sensor and connect a manual gauge into the oil temperature sensor port. Refer to section "Removal of the Engine Oil Temperature Sensor". Start and run the engine at the rpm listed in the chart. Is the oil pressure, observed on the manual gauge, stable and within normal operating range as per the chart?
    a. Yes; reinstall the oil temperature sensor; Refer to section "Installation of the Engine Oil Temperature Sensor". Replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair. Clear the code. Release the vehicle.
    b. No; Go to step 12.
12. Remove and inspect the inlet air temperature sensor, intake manifold pressure sensor, and charge air temperature sensor for signs of damage. Is there damage present?
    a. Yes; Refer to section "Test-E - Two-Filter Fuel System".
    b. No; Go to step 13.
13. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter". Is the correct oil filter installed?
    a. Yes; Go to step 14.
    b. No; install the correct oil filter. Verify repair.
14. Inspect the outside of the oil filter for signs of metal or bearing material. Is there an excessive amount of metal or bearing material present on the outside of the filter?
    a. Yes; determine the cause of the excessive metal in the oil. Repair as necessary.
    b. No; Go to step 15.

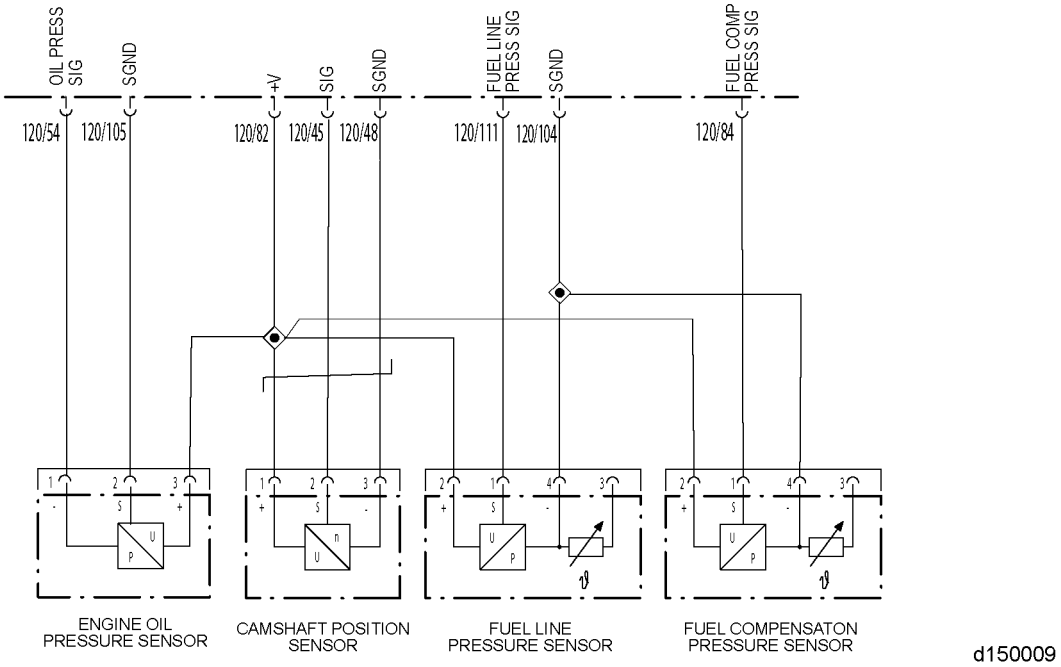
15. Inspect the oil filter stand pipe and oil bypass valve (located on the top of the stand pipe) for damage. Is there any damage present or is the oil bypass valve missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; Go to step 16.
16. Inspect the oil filter drain back valve located in the bottom of the oil filter housing. Is the oil filter drain back valve damaged or missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; reinstall the oil filter . Refer to section "Replacement of the Oil Filter". Go to step 17.
17. Remove the rocker cover. Refer to section "Removal of the Rocker Cover".
18. Use the oil system adapter J-49181 and oil primer pump tool J-45299 to check for leaks in the upper portion of the engine. Refer to section "Priming the Engine Lubrication System". Are there any leaks present?
    a. Yes; repair as necessary. Verify repair.
    b. No; Go to step 19.
19. Remove the oil pan. Refer to section "Removal of the Oil Pan".
20. Check the torque on the oil suction manifold bolts and oil pump using a torque wrench. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Are the bolts torqued to specification?
    a. Yes; Go to step 21.
    b. No; Remove the oil suction manifold and the oil pump. Replace the O-rings, then reinstall the oil pump and oil suction manifold. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.
21. Remove the oil pump, oil suction manifold, and oil lines. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Check the condition of the oil pump, oil suction manifold, suction lines, and O-rings. Is there any damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 22.
22. Inspect the rod and main bearings; Refer to section "DD Platform Bearing Failure Guide" in the *DDC-SVC-MAN-0196 "DD Platform Bearing Failure Guide."* Are the rod and main bearings excessively worn or damaged?
    a. Yes; repair as necessary. Verify repair.
    b. No; replace the oil pump, Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

4 SPN 100/FMI 3 - GHG17

Engine Oil Pressure Sensor Circuit Failed High

Table 7.

SPN 100/FMI 3	
Description	This Fault Sets When Either Short to Voltage or Open circuit on Engine Oil Pressure (EOP) Sensor Circuit Are Present.
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always On
Monitor Sequence	Key ON Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None
Verification	Check at Engine Operating Temperature



NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Turn the ignition ON (key ON, engine OFF).
2. Check for multiple codes. Is SPN 3510/FMI 3 also present?
    a. Yes; diagnose 3510/FMI 3 fault first.
    b. No; Go to step 3.
3. Disconnect the Engine Oil Pressure (EOP) sensor and inspect the electrical connector for damage, corrosion or spread pins. Is damage, corrosion or spread pins present?
    a. Yes; repair as necessary.

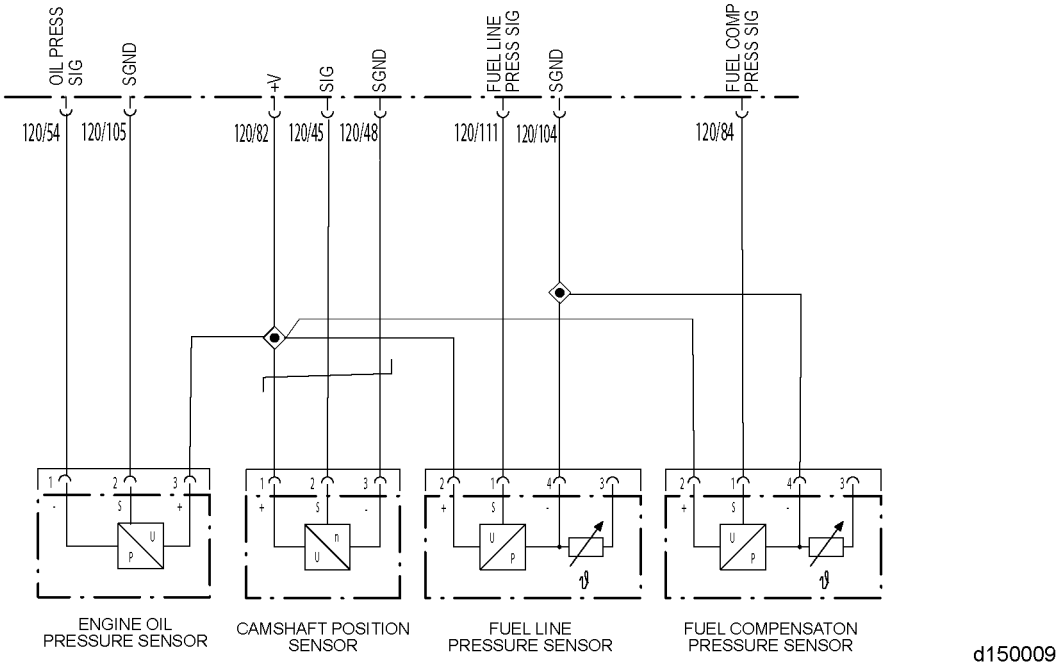
   b. No; Go to step 4.
4. Measure the resistance between pin 2 of the EOP sensor harness connector and ground. Is the resistance greater than five ohms?
   a. Yes; repair open between pin 2 of the EOP sensor and pin 105 of the MCM 120-pin connector.
   b. No; Go to step 5.
5. Measure the voltage between pin 3 of the EOP sensor harness connector and ground. Is voltage present?
   a. Yes; Go to step 6.
   b. No; repair open between pin 3 of the EOP sensor and pin 82 of the MCM 120-pin connector.
6. Is the voltage from previous step greater than five volts?
   a. Yes; repair short to battery power between pin 3 of the EOP sensor and pin 82 of the MCM 120-pin connector.
   b. No; Go to step 7.
7. Measure the voltage between pin 2 of the EOP sensor harness connector and ground. Is voltage present?
   a. Yes; repair the short to power between pin 2 of the EOP sensor and pin 105 of the MCM 120-pin connector.
   b. No; Go to step 8.
8. Measure the voltage between pin 1 of the EOP sensor harness connector and ground. Is voltage present?
   a. Yes; repair the short to power between pin 1 of the EOP sensor and pin 54 of the MCM 120-pin connector.
   b. No; Go to step 9.
9. Measure the resistance between pin 1 of the EOP sensor harness connector and pin 54 of the MCM 120-pin connector. Is the resistance greater than five ohms?
   a. Yes; repair an open between pin 1 of the EOP sensor harness connector and pin 54 of the MCM 120-pin connector.
   b. No; replace the EOP sensor. Refer to section "Removal of the Engine Oil Pressure Sensor".

5 SPN 100/FMI 4 - GHG17

Engine Oil Pressure Sensor Circuit Failed Low

Table 8.

SPN 100/FMI 4	
Description	This Code Sets When a Short to Ground on Engine Oil Pressure (EOP) Sensor Circuit is Present.
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always On
Monitor Sequence	Key ON Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None
Verification	Check At Engine Operating Temperature



NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Connect DiagnosticLink ®.
2. Turn the ignition ON (key ON, engine OFF).
3. Check for multiple codes. Are there additional circuit failed low codes (FMI 4) for the Camshaft Position (CMP) sensor, fuel line pressure sensor and fuel compensation pressure present?
    a. Yes, Go to step 8.
    b. No, Go to step 4.
4. Turn the ignition OFF.

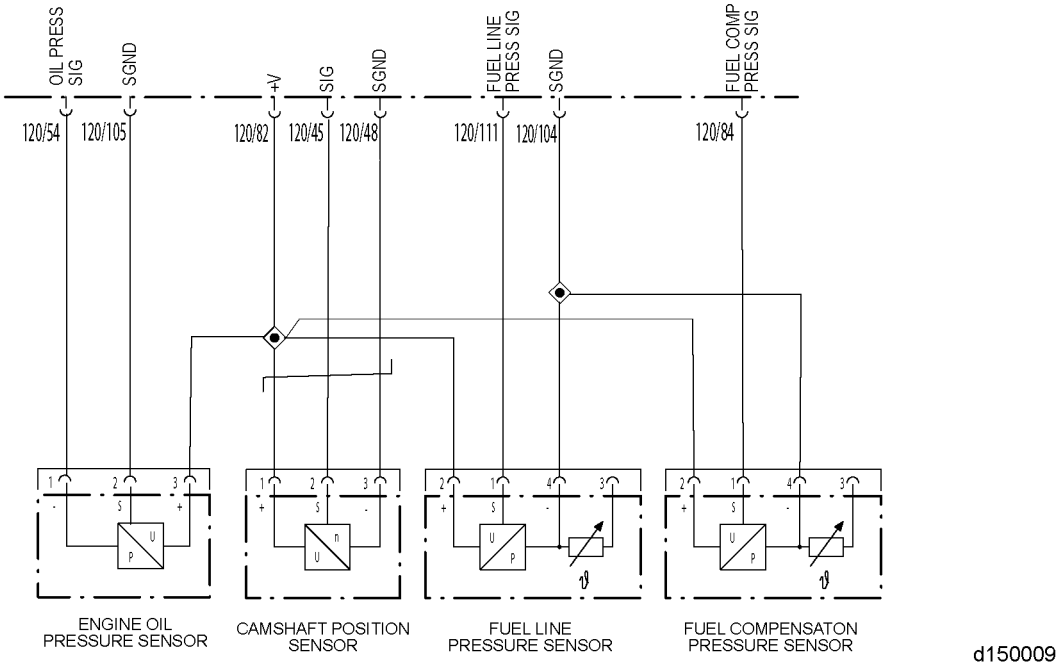
5. Disconnect the EOP sensor harness connector.
6. Inspect the EOP connector and EOP harness connector for damage, bent, spread or unseated (pushed out) pins, corrosion or wire damage. Is damage present?
    a. Yes, repair as necessary.
    b. No, Go to step 7.
7. Measure the resistance between pin 1 of the EOP sensor and ground. Is the resistance greater than 10k ohms?
    a. Yes; Go to step 8.
    b. No; repair the short to ground between pin 1 of the EOP sensor and ground.
8. Measure the resistance between pin 3 of the EOP sensor and ground. Is the resistance greater than 10k ohms?
    a. Yes; replace the EOP sensor. Refer to section "Removal of the Engine Oil Pressure Sensor".
    b. No; repair the short to ground between pin 3 of the EOP sensor and ground.
    NOTE: This could include a short to ground on pin 3 of the EOP sensor, pin 1 of the camshaft position sensor, pin 2 of the fuel line pressure sensor, and pin 2 of the fuel compensation pressure sensor.

6 SPN 100/FMI 5 - GHG17

Oil Pressure Sensor Stuck High - Low Speed

Table 9.

SPN 100/FMI 5	
Description	This diagnosis is Typically Oil Pressure Stuck
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always Enabled
Monitor Sequence	Key On Engine Running at Speeds Below 625 rpm
Execution Frequency	Continuous When Enabling Conditions are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	While the Engine is at Normal Operating Temperature, Road Test Performing Several Decelerations



NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

1. Connect DiagnosticLink ®.
2. Turn the ignition ON (key ON, engine OFF).

3. Check for multiple fault codes. Are fault codes SPN 100/FMI 3 or FMI 4 present?
    a. Yes; diagnose the other fault codes first.
    b. No; Go to step 4.
4. Disconnect the engine oil pressure sensor. Inspect the connector for damage, bent, spread or unseated (pushed out) pins, corrosion or wire damage. Is damage present?
    a. Yes; repair as necessary .
    b. No; Go to step 5.
5. Measure the resistance between pin 2 of the engine oil pressure sensor and ground. Is the resistance greater than five ohms?
    a. Yes; repair the open circuit between pin 2 of the engine oil pressure sensor and pin 105 of the MCM 120-pin connector.
    b. No; replace the engine oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor".

7 SPN 100/FMI 10 - GHG17

Low Oil Pressure Derate

Table 10.

SPN 100/FMI 10	
Description	This Fault Code Sets When the Engine Power has Been Limited to Prevent Engine Damage Due to a Low Oil Pressure Condition
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always On
Monitor Sequence	Key ON Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	Engine Derate or Engine Shut Down - Calibration Dependent
Verification	Check at Engine Operating Temperature

Possible causes:
- Failed oil pressure sensor
- Initial start after oil maintenance
- Vehicle is parked on a steep incline
- Improper oil level
- Oil dilution
- Leaks in the oil suction manifold
- Leaks at the oil suction pipes
- Failed oil pump

Table 11.

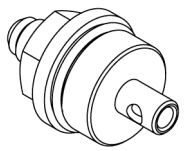
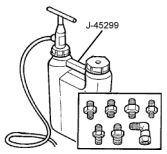
Tools Used		
J-49181	Oil System Priming Adapter	 d580037
J-45299	Oil System Priming Pump	 d580151

Table 12.

DD15TC and DD16 Minimum Oil Pressure at Operating Temperature		
rpm	**Bar**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

Table 13.

DD15AT Minimum Oil Pressure at Operating Temperature		
rpm	**Bar**	**psi**
600	0.689	10
1200	1.65	24
1800	2.55	37

Table 14.

DD13 Minimum Oil Pressure at Operating Temperature		
rpm	**Bar**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

NOTE: The oil gauge in the dashboard of the vehicle is NOT used to diagnose or verify low oil pressure concerns.

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Check for multiple codes. Are there multiple oil pressure sensor circuit fault codes?
    a. Yes; diagnose the oil pressure sensor circuit fault codes first.
    b. No; Go to step 2.
2. With the vehicle parked on a flat, level surface, check the engine oil level after the engine has been shut off for at least 20 minutes. Is the engine oil at the correct level?
    a. Yes; Go to step 7.
    b. No; Go to step 3.

NOTE: An increase in the oil level suggests that there may be fuel or coolant entering the engine oil.

3. Is the oil level overfilled?
    a. Yes; Go to step 5.
    b. No; Go to step 4.
4. Use the manufacturer recommended oil to fill the engine oil to the correct level. Check for external engine oil leaks and repair as necessary. Verify repair.
5. Check the oil for signs of coolant intrusion. When there is coolant intrusion, the oil will exhibit a milky appearance or become thick and sludgy. Are there signs of coolant in the oil?
    a. Yes; Refer to section "Coolant in Oil". Verify repair.
    b. No; Go to step 6.
6. Check the oil for signs of fuel intrusion. When there is fuel intrusion into the oil, the oil becomes thin and has a fuel odor. Are there signs of fuel in the oil?

a. Yes; determine the cause of fuel in the oil. Change the oil and filter. Verify repair.
b. No; the oil level may have been over filled by the customer. Correct the oil level. Go to step 7.

7. Turn the ignition ON (key ON, engine OFF).
8. Connect DiagnosticLink ® and check for a biased oil pressure sensor at key ON, engine OFF. Does the oil pressure sensor read zero psi?
    a. Yes; Go to step 9.
    b. No; replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

9. Start the engine and observe the stability of the oil pressure using the chart. Is the oil pressure stable and within normal operating range as per the chart?
    a. Yes; clear the code. Release the vehicle.
    b. No; Go to step 10.
10. Inspect the vehicle for aftermarket components plumbed into the oil system. Are there any aftermarket components installed?
    a. Yes; isolate the aftermarket components. Recheck the oil pressure.
    b. No; Go to step 11.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

NOTE: A code will be set when the oil temperature sensor is unplugged.

11. Remove the oil temperature sensor and connect a manual gauge into the oil temperature sensor port. Refer to section "Removal of the Engine Oil Temperature Sensor". Start and run the engine at the rpm listed in the chart. Is the oil pressure, observed on the manual gauge, stable and within normal operating range as per the chart?
    a. Yes; reinstall the oil temperature sensor; Refer to section "Installation of the Engine Oil Temperature Sensor". Replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair. Clear the code. Release the vehicle.
    b. No; Go to step 12.
12. Remove and inspect the inlet air temperature sensor, intake manifold pressure sensor, and charge air temperature sensor for signs of damage. Is there damage present?
    a. Yes; Refer to section "Test-E - Two-Filter Fuel System".
    b. No; Go to step 13.

13. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter". Is the correct oil filter installed?
    a. Yes; Go to step 14.
    b. No; install the correct oil filter. Verify repair.
14. Inspect the outside of the oil filter for signs of metal or bearing material. Is there an excessive amount of metal or bearing material present on the outside of the filter?
    a. Yes; determine the cause of the excessive metal in the oil. Repair as necessary.
    b. No; Go to step 15.
15. Inspect the oil filter stand pipe and oil bypass valve (located on the top of the stand pipe) for damage. Is there any damage present or is the oil bypass valve missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; Go to step 16.
16. Inspect the oil filter drain back valve located in the bottom of the oil filter housing. Is the oil filter drain back valve damaged or missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; reinstall the oil filter. Refer to section "Replacement of the Oil Filter". Go to step 17.
17. Remove the rocker cover. Refer to section "Removal of the Rocker Cover".
18. Use the oil system adapter J-49181 and oil primer pump tool J-45299 to check for leaks in the upper portion of the engine. Refer to section "Priming the Engine Lubrication System". Are there any leaks present?
    a. Yes; repair as necessary. Verify repair.
    b. No; Go to step 19.
19. Remove the oil pan. Refer to section "Removal of the Oil Pan".
20. Check the torque on the oil suction manifold bolts and oil pump using a torque wrench. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Are the bolts torqued to specification?
    a. Yes; Go to step 21.
    b. No; remove the oil suction manifold and the oil pump. Replace the O-rings, then reinstall the oil pump and oil suction manifold. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.
21. Remove the oil pump, oil suction manifold, and oil lines. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Check the condition of the oil pump, oil suction manifold, suction lines, and O-rings. Is there any damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 22.
22. Inspect the rod and main bearings; Refer to section "DD Platform Bearing Failure Guide" in the *DDC-SVC-MAN-0196 "DD Platform Bearing Failure Guide."* Are the rod and main bearings excessively worn or damaged?
    a. Yes; repair as necessary. Verify repair.
    b. No; replace the oil pump. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

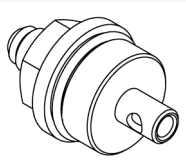
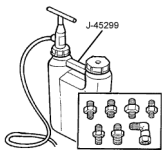
8 SPN 100/FMI 17 - GHG17

Oil Pressure Very Low

Table 15.

SPN 100/FMI 17	
Description	Engine Oil Pressure Plausibility Error
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always On
Monitor Sequence	Key ON Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	Check at Engine Operating Temperature

Table 16.

J-49181	Oil System Priming Adapter	 d580037
J-45299	Oil System Priming Pump	 d580151

NOTE: The Common Powertrain Controller (CPC) digital outputs have the same SPN as some Motor Control Module (MCM) faults. DiagnosticLink ® makes the distinction between the MCM and CPC when diagnosing a fault.

Possible causes:
- Failed oil pressure sensor
- Initial start after oil maintenance
- Vehicle is parked on a steep incline
- Improper oil level
- Oil dilution
- Leaks in the oil suction manifold
- Leaks at the oil suction pipes
- Failed oil pump

Table 17.

DD15TC and DD16 Minimum Oil Pressure at Operating Temperature		
rpm	**Bar**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

Table 18.

DD15AT Minimum Oil Pressure at Operating Temperature		
rpm	**Bar**	**psi**
600	0.689	10
1200	1.65	24
1800	2.55	37

Table 19.

DD13 Minimum Oil Pressure at Operating Temperature		
rpm	**Bar**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

NOTE: The oil gauge in the dash is NOT used to diagnose or verify low oil pressure concerns.

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Check for multiple codes. Are there multiple oil pressure sensor circuit fault codes?
    a. Yes; diagnose the oil pressure sensor circuit fault codes first.
    b. No; Go to step 2.
2. With the vehicle parked on a flat, level surface, check the engine oil level after the engine has been shut off for at least 20 minutes. Is the engine oil at the correct level?
    a. Yes; Go to step 7.
    b. No; Go to step 3.

NOTE: An increase in the oil level suggests that there may be fuel or coolant entering the engine oil.

3. Is the oil level overfilled?
    a. Yes; Go to step 5.
    b. No; Go to step 4.
4. Use the manufacturer recommended oil to fill the engine oil to the correct level. Check for external engine oil leaks and repair as necessary. Verify repair.
5. Check the oil for signs of coolant intrusion. When there is coolant intrusion, the oil will exhibit a milky appearance or become thick and sludgy. Are there signs of coolant in the oil?
    a. Yes; Refer to section "Coolant in Oil". Verify repair.
    b. No; Go to step 6.

6. Check the oil for signs of fuel intrusion. When there is fuel intrusion into the oil, the oil becomes thin and has a fuel odor. Are there signs of fuel in the oil?
    a. Yes; determine the cause of fuel in the oil. Change the oil and filter. Verify repair.
    b. No; the oil level may have been over filled by the customer. Correct the oil level. Go to step 7.
7. Turn the ignition ON (key ON, engine OFF).
8. Connect DiagnosticLink ® and check for a biased oil pressure sensor at key ON, engine OFF. Does the oil pressure sensor read zero psi?
    a. Yes; Go to step 9.
    b. No; replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

9. Start the engine and observe the stability of the oil pressure using the chart. Is the oil pressure stable and within normal operating range as per the chart?
    a. Yes; clear the code. Release the vehicle.
    b. No; Go to step 10.
10. Inspect the vehicle for aftermarket components plumbed into the oil system. Are there any aftermarket components installed?
    a. Yes; isolate the aftermarket components. Recheck the oil pressure.
    b. No; Go to step 11.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

NOTE: A code will be set when the oil temperature sensor is unplugged.

11. Remove the oil temperature sensor and connect a manual gauge into the oil temperature sensor port. Refer to section "Removal of the Engine Oil Temperature Sensor". Start and run the engine at the rpm listed in the chart. Is the oil pressure, observed on the manual gauge, stable and within normal operating range as per the chart?
    a. Yes; reinstall the oil temperature sensor; Refer to section "Installation of the Engine Oil Temperature Sensor". Replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair. Clear the code. Release the vehicle.
    b. No; Go to step 12.
12. Remove and inspect the inlet air temperature sensor, intake manifold pressure sensor, and charge air temperature sensor for signs of damage. Is there damage present?
    a. Yes; Refer to section "Test-E - Two-Filter Fuel System".

b. No; Go to step 13.

13. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter". Is the correct oil filter installed?
    a. Yes; Go to step 14.
    b. No; install the correct oil filter. Verify repair.
14. Inspect the outside of the oil filter for signs of metal or bearing material. Is there an excessive amount of metal or bearing material present on the outside of the filter?
    a. Yes; determine the cause of the excessive metal in the oil. Repair as necessary.
    b. No; Go to step 15.
15. Inspect the oil filter stand pipe and oil bypass valve (located on the top of the stand pipe) for damage. Is there any damage present or is the oil bypass valve missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; Go to step 16.
16. Inspect the oil filter drain back valve located in the bottom of the oil filter housing. Is the oil filter drain back valve damaged or missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; reinstall the oil filter . Refer to section "Replacement of the Oil Filter". Go to step 17.
17. Remove the rocker cover. Refer to section "Removal of the Rocker Cover".
18. Use the oil system adapter J-49181 and oil primer pump tool J-45299 to check for leaks in the upper portion of the engine. Refer to section "Priming the Engine Lubrication System". Are there any leaks present?
    a. Yes; repair as necessary. Verify repair.
    b. No; Go to step 19.
19. Remove the oil pan. Refer to section "Removal of the Oil Pan".
20. Check the torque on the oil suction manifold bolts and oil pump using a torque wrench. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Are the bolts torqued to specification?
    a. Yes; Go to step 21.
    b. No; remove the oil suction manifold and the oil pump. Replace the O-rings, then reinstall the oil pump and oil suction manifold. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.
21. Remove the oil pump, oil suction manifold, and oil lines. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Check the condition of the oil pump, oil suction manifold, suction lines, and O-rings. Is there any damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 22.
22. Inspect the rod and main bearings; Refer to section "DD Platform Bearing Failure Guide" in the *DDC-SVC-MAN-0196 "DD Platform Bearing Failure Guide."* Are the rod and main bearings excessively worn or damaged?
    a. Yes; repair as necessary. Verify repair.
    b. No; replace the oil pump, Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

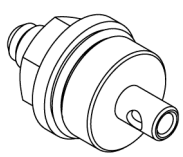
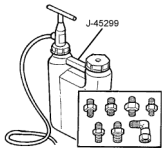
9 SPN 100/FMI 1 – GHG17

Oil Pressure Very Low

Table 20.

SPN 100/FMI 1	
Description	This fault code sets when the engine oil pressure is less than a calibrated threshold.
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always On
Monitor Sequence	Key On Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	Check At Engine Operating Temperature

Table 21.

J-49181	Oil System Priming Adapter	 d580037
J-45299	Oil System Priming Pump	 d580151

This fault will illuminate the Check Engine Lamp (CEL) and Shutdown Engine Lamp (SEL).

NOTE: The Common Powertrain Controller (CPC) digital outputs have the same SPN as some Motor Control Module (MCM) faults. DiagnosticLink ® makes the distinction between the MCM and CPC when diagnosing a fault.

Possible causes:
- Failed oil pressure sensor
- Initial start after oil maintenance
- Vehicle is parked on a steep incline
- Improper oil level
- Oil dilution
- Leaks in the oil suction manifold
- Leaks at the oil suction pipes
- Failed oil pump

Table 22.

DD15TC and DD16 Minimum Oil Pressure at operating Temperature		
rpm	**Bar**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

Table 23.

DD15AT Minimum Oil Pressure at operating Temperature		
rpm	**Bar**	**psi**
600	0.689	10
1200	1.65	24
1800	2.55	37

Table 24.

DD13 Minimum Oil Pressure at operating Temperature		
rpm	**Bar**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

NOTE: The oil gauge in the dash is NOT used to diagnose or verify low oil pressure concerns.

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Check for multiple codes. Are there multiple oil pressure sensor circuit fault codes?
    a. Yes; diagnose the oil pressure sensor circuit fault codes first.
    b. No; Go to step 2.
2. With the vehicle parked on a flat, level surface, check the engine oil level after the engine has been shut off for at least 20 minutes. Is the engine oil at the correct level?
    a. Yes; Go to step 7.
    b. No; Go to step 3.

NOTE: An increase in the oil level suggests that there may be fuel or coolant entering the engine oil.

3. Is the oil level overfilled?
    a. Yes; Go to step 5.
    b. No; Go to step 4.
4. Use the manufacturer recommended oil to fill the engine oil to the correct level. Check for external engine oil leaks and repair as necessary. Verify repair.
5. Check the oil for signs of coolant intrusion. When there is coolant intrusion, the oil will exhibit a milky appearance or become thick and sludgy. Are there signs of coolant in the oil?
    a. Yes; Refer to section "Coolant in Oil". Verify repair.
    b. No; Go to step 6.

6. Check the oil for signs of fuel intrusion. When there is fuel intrusion into the oil, the oil becomes thin and has a fuel odor. Are there signs of fuel in the oil?
    a. Yes; determine the cause of fuel in the oil. Change the oil and filter. Verify repair.
    b. No; the oil level may have been over filled by the customer. Correct the oil level. Go to step 7.
7. Turn the ignition ON (key ON, engine OFF).
8. Connect DiagnosticLink® and check for a biased oil pressure sensor at key ON, engine OFF. Does the oil pressure sensor read zero psi?
    a. Yes; Go to step 9.
    b. No; replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

9. Start the engine and observe the stability of the oil pressure using the chart. Is the oil pressure stable and within normal operating range as per the chart?
    a. Yes; clear the code. Release the vehicle.
    b. No; Go to step 10.
10. Inspect the vehicle for aftermarket components plumbed into the oil system. Are there any aftermarket components installed?
    a. Yes; isolate the aftermarket components. Recheck the oil pressure.
    b. No; Go to step 11.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

NOTE: A code will be set when the oil temperature sensor is unplugged.

11. Remove the oil temperature sensor and connect a manual gauge into the oil temperature sensor port. Refer to section "Removal of the Engine Oil Temperature Sensor". Start and run the engine at the rpm listed in the chart. Is the oil pressure, observed on the manual gauge, stable and within normal operating range as per the chart?
    a. Yes; reinstall the oil temperature sensor; Refer to section "Installation of the Engine Oil Temperature Sensor". Replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair. Clear the code. Release the vehicle.
    b. No; Go to step 12.
12. Remove and inspect the inlet air temperature sensor, intake manifold pressure sensor, and charge air temperature sensor for signs of damage. Is there damage present?
    a. Yes; Refer to section "Test-E - Two-Filter Fuel System".

b. No; Go to step 13.

13. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter". Is the correct oil filter installed?
    a. Yes; Go to step 14.
    b. No; install the correct oil filter. Verify repair.
14. Inspect the outside of the oil filter for signs of metal or bearing material. Is there an excessive amount of metal or bearing material present on the outside of the filter?
    a. Yes; determine the cause of the excessive metal in the oil. Repair as necessary.
    b. No; Go to step 15.
15. Inspect the oil filter stand pipe and oil bypass valve (located on the top of the stand pipe) for damage. Is there any damage present or is the oil bypass valve missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; Go to step 16.
16. Inspect the oil filter drain back valve located in the bottom of the oil filter housing. Is the oil filter drain back valve damaged or missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; reinstall the oil filter . Refer to section "Replacement of the Oil Filter". Go to step 17.
17. Remove the rocker cover. Refer to section "Removal of the Rocker Cover". Go to step 18.
18. Use the oil system adapter J-49181 and oil primer pump tool J-45299 to check for leaks in the upper portion of the engine. Refer to section "Priming the Engine Lubrication System". Are there any leaks present?
    a. Yes; repair as necessary. Verify repair.
    b. No; Go to step 19.
19. Remove the oil pan. Refer to section "Removal of the Oil Pan". Go to step 20.
20. Check the torque on the oil suction manifold bolts and oil pump using a torque wrench. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Are the bolts torqued to specification?
    a. Yes; Go to step 21.
    b. No; Remove the oil suction manifold and the oil pump. Replace the O-rings, then reinstall the oil pump and oil suction manifold. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.
21. Remove the oil pump, oil suction manifold, and oil lines. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Check the condition of the oil pump, oil suction manifold, suction lines, and O-rings. Is there any damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 22.
22. Inspect the rod and main bearings. Are the rod and main bearings excessively worn or damaged?
    a. Yes; repair as necessary. Verify repair.
    b. No; replace the oil pump, Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

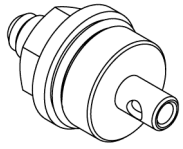
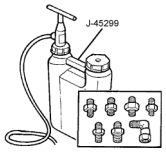
10 SPN 100/FMI 18 – GHG17

Oil Pressure Low

Table 25.

SPN 100/FMI 18	
Description	This Fault Code Sets when the Engine Oil Pressure is Less than a Calibrated Threshold
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always On
Monitor Sequence	Key ON Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	Check At Engine Operating Temperature

Table 26.

J-49181	Oil System Priming Adapter	 d580037
J-45299	Oil System Priming Pump	 d580151

NOTE: The Common Powertrain Controller (CPC) digital outputs have the same SPN as some Motor Control Module (MCM) faults. DiagnosticLink ® makes the distinction between the MCM and CPC when diagnosing a fault.

Possible causes:
- Failed oil pressure sensor
- Initial start after oil maintenance
- Vehicle is parked on a steep incline
- Improper oil level
- Oil dilution
- Leaks in the oil suction manifold
- Leaks at the oil suction pipes
- Failed oil pump

Table 27.

DD15TC and DD16 Minimum Oil Pressure at Operating Temperature		
rpm	**Bar**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

Table 28.

DD15AT Minimum Oil Pressure at Operating Temperature		
rpm	**Bar**	**psi**
600	0.689	10
1200	1.65	24
1800	2.55	37

Table 29.

DD13 Minimum Oil Pressure at Operating Temperature		
rpm	**Bar**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

NOTE: The oil gauge in the dash is NOT used to diagnose or verify low oil pressure concerns.

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Check for multiple codes. Are there multiple oil pressure sensor circuit fault codes?
    a. Yes; diagnose the oil pressure sensor circuit fault codes first.
    b. No; Go to step 2.
2. With the vehicle parked on a flat, level surface, check the engine oil level after the engine has been shut off for at least 20 minutes. Is the engine oil at the correct level?
    a. Yes; Go to step 7.
    b. No; Go to step 3.

NOTE: An increase in the oil level suggests that there may be fuel or coolant entering the engine oil.

3. Is the oil level overfilled?
    a. Yes; Go to step 5.
    b. No; Go to step 4.
4. Use the manufacturer recommended oil to fill the engine oil to the correct level. Check for external engine oil leaks and repair as necessary. Verify repair.
5. Check the oil for signs of coolant intrusion. When there is coolant intrusion, the oil will exhibit a milky appearance or become thick and sludgy. Are there signs of coolant in the oil?
    a. Yes; Refer to section "Coolant in Oil". Verify repair.
    b. No; Go to step 6.

6. Check the oil for signs of fuel intrusion. When there is fuel intrusion into the oil, the oil becomes thin and has a fuel odor. Are there signs of fuel in the oil?
    a. Yes; determine the cause of fuel in the oil. Change the oil and filter. Verify repair.
    b. No; the oil level may have been over filled by the customer. Correct the oil level. Go to step 7.
7. Turn the ignition ON (key ON, engine OFF).
8. Connect DiagnosticLink ® and check for a biased oil pressure sensor at key ON, engine OFF. Does the oil pressure sensor read zero psi?
    a. Yes; Go to step 9.
    b. No; replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

9. Start the engine and observe the stability of the oil pressure using the chart. Is the oil pressure stable and within normal operating range as per the chart?
    a. Yes; clear the code. Release the vehicle.
    b. No; Go to step 10.
10. Inspect the vehicle for aftermarket components plumbed into the oil system. Are there any aftermarket components installed?
    a. Yes; isolate the aftermarket components. Recheck the oil pressure.
    b. No; Go to step 11.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

NOTE: A code will be set when the oil temperature sensor is unplugged.

11. Remove the oil temperature sensor and connect a manual gauge into the oil temperature sensor port. Refer to section "Removal of the Engine Oil Temperature Sensor". Start and run the engine at the rpm listed in the chart. Is the oil pressure, observed on the manual gauge, stable and within normal operating range as per the chart?
    a. Yes; reinstall the oil temperature sensor; Refer to section "Installation of the Engine Oil Temperature Sensor". Replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair. Clear the code. Release the vehicle.
    b. No; Go to step 12.
12. Remove and inspect the inlet air temperature sensor, intake manifold pressure sensor, and charge air temperature sensor for signs of damage. Is there damage present?
    a. Yes; Refer to section "Test-E - Two-Filter Fuel System".

b. No; Go to step 13.

13. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter". Is the correct oil filter installed?
    a. Yes; Go to step 14.
    b. No; install the correct oil filter. Verify repair.
14. Inspect the outside of the oil filter for signs of metal or bearing material. Is there an excessive amount of metal or bearing material present on the outside of the filter?
    a. Yes; determine the cause of the excessive metal in the oil. Repair as necessary.
    b. No; Go to step 15.
15. Inspect the oil filter stand pipe and oil bypass valve (located on the top of the stand pipe) for damage. Is there any damage present or is the oil bypass valve missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; Go to step 16.
16. Inspect the oil filter drain back valve located in the bottom of the oil filter housing. Is the oil filter drain back valve damaged or missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; reinstall the oil filter . Refer to section "Replacement of the Oil Filter". Go to step 17.
17. Remove the rocker cover. Refer to section "Removal of the Rocker Cover".
18. Use the oil system adapter J-49181 and oil primer pump tool J-45299 to check for leaks in the upper portion of the engine. Refer to section "Priming the Engine Lubrication System". Are there any leaks present?
    a. Yes; repair as necessary. Verify repair.
    b. No; Go to step 19.
19. Remove the oil pan. Refer to section "Removal of the Oil Pan".
20. Check the torque on the oil suction manifold bolts and oil pump using a torque wrench. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Are the bolts torqued to specification?
    a. Yes; Go to step 21.
    b. No; Remove the oil suction manifold and the oil pump. Replace the O-rings, then reinstall the oil pump and oil suction manifold. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.
21. Remove the oil pump, oil suction manifold, and oil lines. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Check the condition of the oil pump, oil suction manifold, suction lines, and O-rings. Is there any damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 22.
22. Inspect the rod and main bearings; Refer to section "DD Platform Bearing Failure Guide" in the *DDC-SVC-MAN-0196 "DD Platform Bearing Failure Guide."* Are the rod and main bearings excessively worn or damaged?
    a. Yes; repair as necessary. Verify repair.
    b. No; replace the oil pump, Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

11 SPN 100/FMI 0 - GHG17

Oil Pressure Stuck

Table 30.

SPN 100/FMI 0	
Description	This fault code sets when the engine oil pressure is higher than a calibrated pressure.
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always on
Monitor Sequence	Key ON, Engine Running
Execution Frequency	Continuous when enabling conditions met
Typical Duration	Two seconds
Dash Lamps	MIL, CEL
Engine Reaction	None
Verification	Engine running for at least four minutes, performing several decelerations.

Table 31.

DD5 - DD8 Normal Oil Pressure Readings		
Engine State	**Bar**	**psi**
Engine Stopped	0	0
Engine Running	3.5	50.76

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Connect DiagnosticLink ®.
2. Check for multiple codes. Are there any oil pressure circuit fault codes?
   a. Yes; diagnose the oil pressure circuit fault codes first.
   b. No; Go to step 3.
3. Turn the ignition ON (key ON, engine OFF).
4. Monitor the engine oil pressure. Does the engine oil pressure read 0 Bar (0 psi)?
   a. Yes; Go to step 5.
   b. No; replace the engine oil pressure switch. Refer to section "Removal of the Oil Pressure Switch".

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

5. Start the engine. Monitor the engine oil pressure. Does the engine oil pressure read 3.5 Bar (50.76 psi)?

a. Yes; Go to step 6.
b. No; replace the engine oil pressure switch. Refer to section "Removal of the Oil Pressure Switch".

6. Record a log file of the engine running and performing several decelerations. Review the oil pressure during the log file. Does the oil pressure ever change from 3.5 Bar (50.76 psi) while the engine is running?
   a. Yes; replace the engine oil pressure switch. Refer to section "Removal of the Oil Pressure Switch".
   b. No; Go to step 7.
7. Cycle the ignition. Clear fault codes and wait four minutes. Does SPN 100/FMI 0 fault code become active?
   a. Yes; replace the MCM. Refer to section Removal of the Motor Control Module. Verify repairs.
   b. No; release the vehicle.

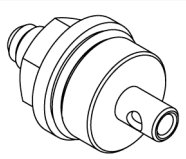
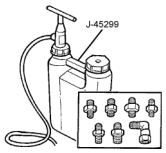
12 SPN 100/FMI 1 - GHG17

Low Engine Oil Pressure

Table 32.

SPN 100/FMI 1	
Description	This Fault Code Sets When the Engine Oil Pressure is Less Than a Calibrated Threshold
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always ON
Monitor Sequence	Key ON, Engine ON
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	Check at Engine Operating Temperature

Table 33.

Tools		
J-49181	Oil System Priming Adapter	 d580037
J-45299	Oil System Priming Pump	 d580151

Possible causes:

- Failed oil pressure sensor
- Initial start after oil maintenance
- Vehicle is parked on a steep incline
- Improper oil level
- Oil dilution
- Leaks in the oil suction manifold
- Leaks at the oil suction pipes
- Failed oil pump

Table 34.

DD5 - DD8 Normal Oil Pressure Readings		
Engine State	**Bar**	**psi**
Engine Stopped	0	0
Engine Running	3.5	50.76

NOTE: The oil gauge in the dashboard of the vehicle is NOT used to diagnose or verify low oil pressure concerns.

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Check for multiple codes. Are there any oil pressure circuit fault codes?
    a. Yes; diagnose the oil pressure circuit fault codes first.
    b. No; Go to step 2.
2. With the vehicle parked on a flat, level surface, check the engine oil level after the engine has been shut off for at least 20 minutes. Is the engine oil at the correct level?
    a. Yes; Go to step 7.
    b. No; Go to step 3.

NOTE: An increase in the oil level suggests that there may be fuel or coolant entering the engine oil.

3. Is the oil level overfilled?
    a. Yes; Go to step 5.
    b. No; Go to step 4.
4. Use the manufacturer recommended oil to fill the engine oil to the correct level. Check for external engine oil leaks and repair as necessary. Verify repair.
5. Check the oil for signs of coolant intrusion. When there is coolant intrusion, the oil will exhibit a milky appearance or become thick and sludgy. Are there signs of coolant in the oil?
    a. Yes; Refer to section "Coolant in Oil". Verify repair.
    b. No; Go to step 6.
6. Check the oil for signs of fuel intrusion. When there is fuel intrusion into the oil, the oil becomes thin and has a fuel odor. Are there signs of fuel in the oil?
    a. Yes; determine the cause of fuel in the oil. Change the oil and filter. Verify repair.
    b. No; the oil level may have been over filled by the customer. Correct the oil level. Go to step 7.
7. Turn the ignition ON (key ON, engine OFF).
8. Connect DiagnosticLink ® and check for a biased oil pressure switch at key ON, engine OFF. Does the oil pressure switch read zero psi)?
    a. Yes; Go to step 9.
    b. No; replace the oil pressure switch. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

9. Start the engine and observe the stability of the oil pressure using the chart. Is the oil pressure stable and within normal operating range as per the chart?
    a. Yes; clear the code. Release the vehicle.
    b. No; Go to step 10.
10. Inspect the vehicle for aftermarket components plumbed into the oil system. Are there any aftermarket components installed?

a. Yes; isolate the aftermarket components. Recheck the oil pressure.
b. No; Go to step 11.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

NOTE: A code will be set when the engine oil temperature sensor is unplugged.

11. Remove the oil temperature sensor and connect a manual gauge into the oil temperature sensor port. Refer to section "Removal of the Engine Oil Temperature Sensor". Start and run the engine at the rpm listed in the chart. Is the oil pressure, observed on the manual gauge, stable and within normal operating range as per the chart?
    a. Yes; reinstall the oil temperature sensor; Refer to section "Installation of the Engine Oil Temperature Sensor". Replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair. Clear the code. Release the vehicle.
    b. No; Go to step 12.
12. Remove and inspect the inlet air temperature sensor, intake manifold pressure sensor, and charge air temperature sensor for signs of damage. Is there damage present?
    a. Yes; Refer to section "Test-E - Two-Filter Fuel System".
    b. No; Go to step 13.
13. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter". Is the correct oil filter installed?
    a. Yes; Go to step 14.
    b. No; install the correct oil filter. Verify repair.
14. Inspect the outside of the oil filter for signs of metal or bearing material. Is there an excessive amount of metal or bearing material present on the outside of the filter?
    a. Yes; determine the cause of the excessive metal in the oil. Repair as necessary.
    b. No; Go to step 15.
15. Inspect the oil filter stand pipe and oil bypass valve (located on the top of the stand pipe) for damage. Is there any damage present or is the oil bypass valve missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; Go to step 16.
16. Inspect the oil filter drain back valve located in the bottom of the oil filter housing. Is the oil filter drain back valve damaged or missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; reinstall the oil filter . Refer to section "Replacement of the Oil Filter". Go to step 17.
17. Remove the rocker cover. Refer to section "Removal of the Rocker Cover".
18. Use the oil system adapter J-49181 and oil primer pump tool J-45299 to check for leaks in the upper portion of the engine. Refer to section "Priming the Engine Lubrication System". Are there any leaks present?
    a. Yes; repair as necessary. Verify repair.
    b. No; Go to step 19.
19. Remove the oil pan. Refer to section "Removal of the Oil Pan".
20. Check the torque on the oil suction manifold bolts and oil pump using a torque wrench. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Are the bolts torqued to specification?
    a. Yes; Go to step 21.

b. No; remove the oil suction manifold and the oil pump. Replace the O-rings, then reinstall the oil pump and oil suction manifold. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

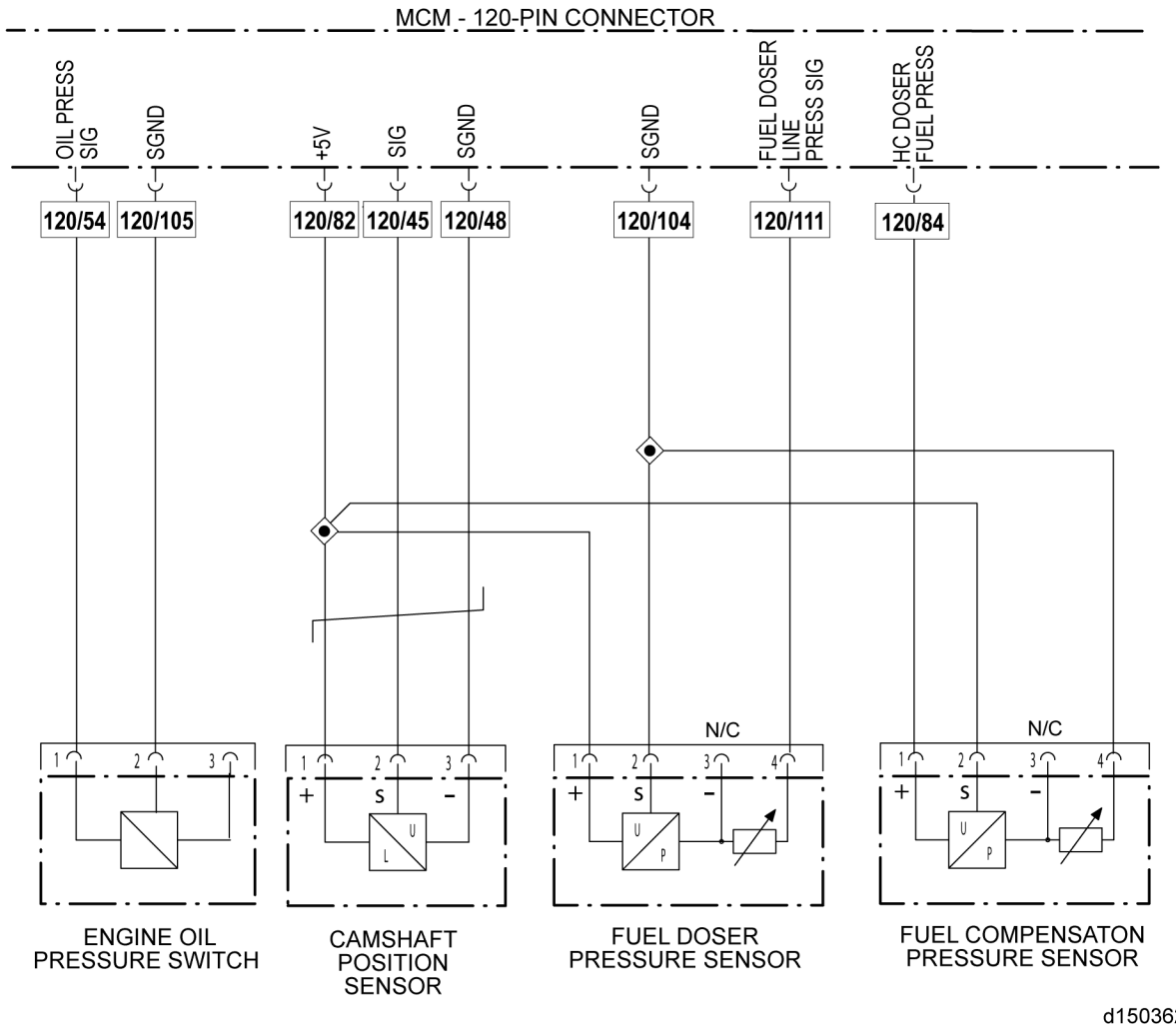
21. Remove the oil pump, oil suction manifold, and oil lines. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Check the condition of the oil pump, oil suction manifold, suction lines, and O-rings. Is there any damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 22.
22. Inspect the rod and main bearings; Refer to section "DD Platform Bearing Failure Guide" in the *DDC-SVC-MAN-0196 "DD Platform Bearing Failure Guide."* Are the rod and main bearings excessively worn or damaged?
    a. Yes; repair as necessary. Verify repair.
    b. No; replace the oil pump, Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

13 SPN 100/FMI 3 - GHG17

Engine Oil Pressure Switch Circuit Failed High

Table 35.

SPN 100/FMI 3	
Description	Engine oil pressure voltage is more than a calibrated threshold.
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	This fault code sets when the engine oil pressure switch voltage is more than 4.6 volts.
Monitor Sequence	Key ON, Engine Running
Execution Frequency	Continuous when enabling conditions met
Typical Duration	Two seconds
Dash Lamps	CEL
Engine Reaction	None
Verification	Key ON, Engine Running for at least four minutes.



NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of Main and Connecting Rod Bearings in Chassis".

Check as follows:

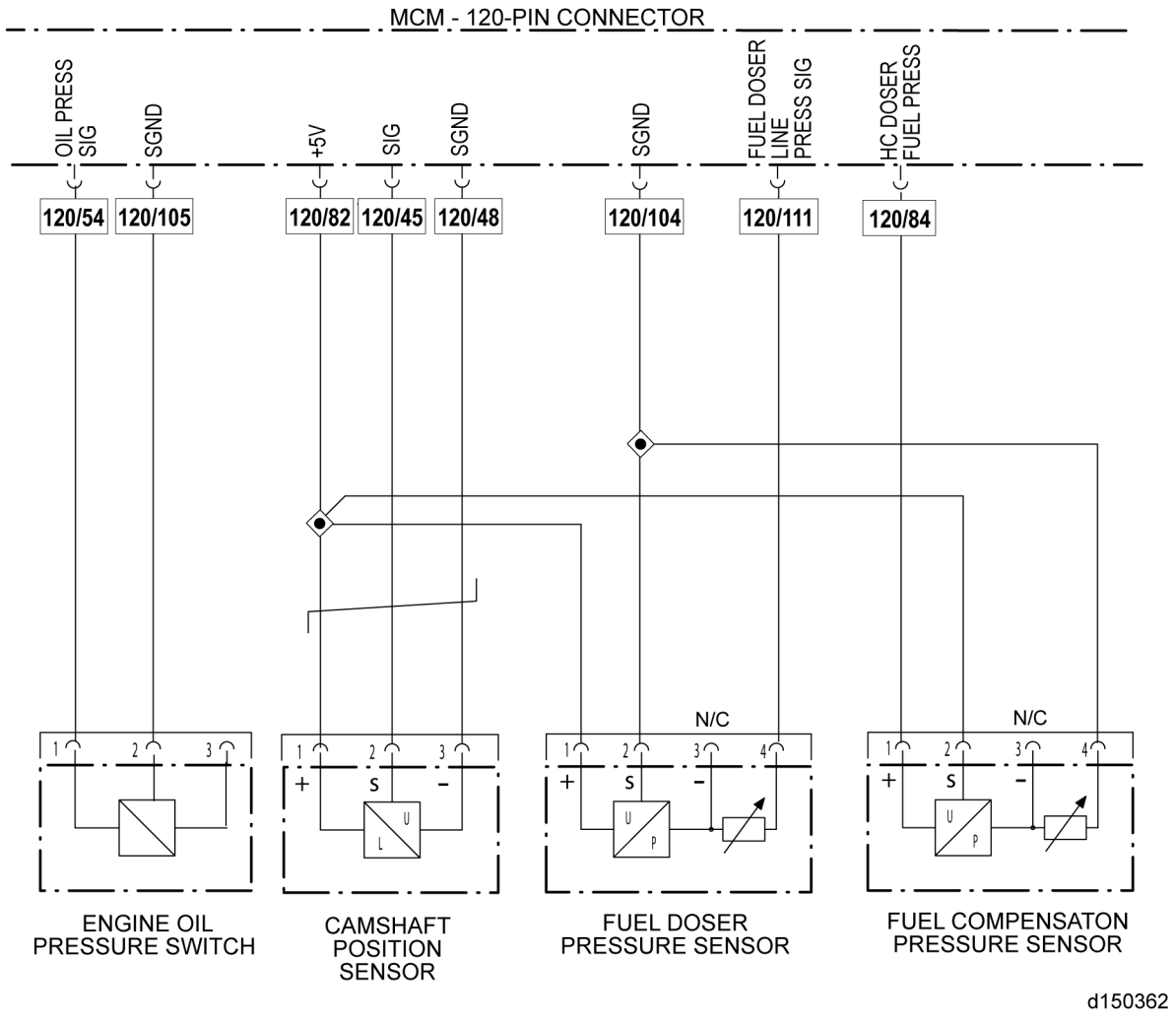
1. Connect DiagnosticLink ®.
2. Turn the ignition ON (key ON, engine OFF).
3. Check for multiple codes. Are there any additional circuit failed high codes (FMI 3) present for the Camshaft Position (CMP) sensor, fuel line pressure sensor and fuel compensation pressure sensor?
    a. Yes; repair a short to power between pin 82 of the MCM 120-pin harness connector and pin 3 of the engine oil pressure switch harness connector, pin 1 of the Camshaft Position (CMP) sensor harness connector and pin 2 of the fuel line pressure and fuel compensation pressure sensors.
    b. No; Go to step 4.
4. Disconnect the engine oil pressure switch.
5. Inspect the engine oil pressure connector and engine oil pressure harness connector for damage, bent, spread or unseated (pushed out) pins, corrosion or wire damage. Is damage present?
    a. Yes; repair as necessary. Go to step 6.
    b. No; Go to step 6.
6. Measure the voltage between pin 3 of the engine oil pressure switch and battery ground. Is the voltage greater than 4.6 volts?
    a. Yes; repair a short to power between pin 3 of the engine oil pressure switch harness connector and pin 82 of the MCM 120-pin harness connector.
    b. No; Go to step 7.
7. Measure the voltage between pin 2 of the engine oil pressure switch and battery ground. Is there voltage present?
    a. Yes; repair a short to power between pin 2 of the engine oil pressure switch harness connector and pin 105 of the MCM 120-pin harness connector.
    b. No; Go to step 8.
8. Measure the voltage between pin 1 of the engine oil pressure switch and battery ground. Is there voltage present?
    a. Yes; repair a short to power between pin 1 of the engine oil pressure switch harness connector and pin 54 of the MCM 120-pin harness connector.
    b. No; replace the MCM. Refer to section Removal of the Motor Control Module. Verify repairs.

14 SPN 100/FMI 4 - GHG17

Engine Oil Pressure Switch Circuit Failed Low

Table 36.

SPN 100/FMI 4	
Description	Engine oil pressure voltage is less than a calibrated threshold.
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	This fault code sets when the engine oil pressure switch voltage is less than 0.1 volts.
Monitor Sequence	Key ON, Engine Running
Execution Frequency	Continuous when enabling conditions met
Typical Duration	Two seconds
Dash Lamps	CEL
Engine Reaction	None
Verification	Key ON, Engine Running for at least four minutes.



NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of Main and Connecting Rod Bearings in Chassis".

Check as follows:

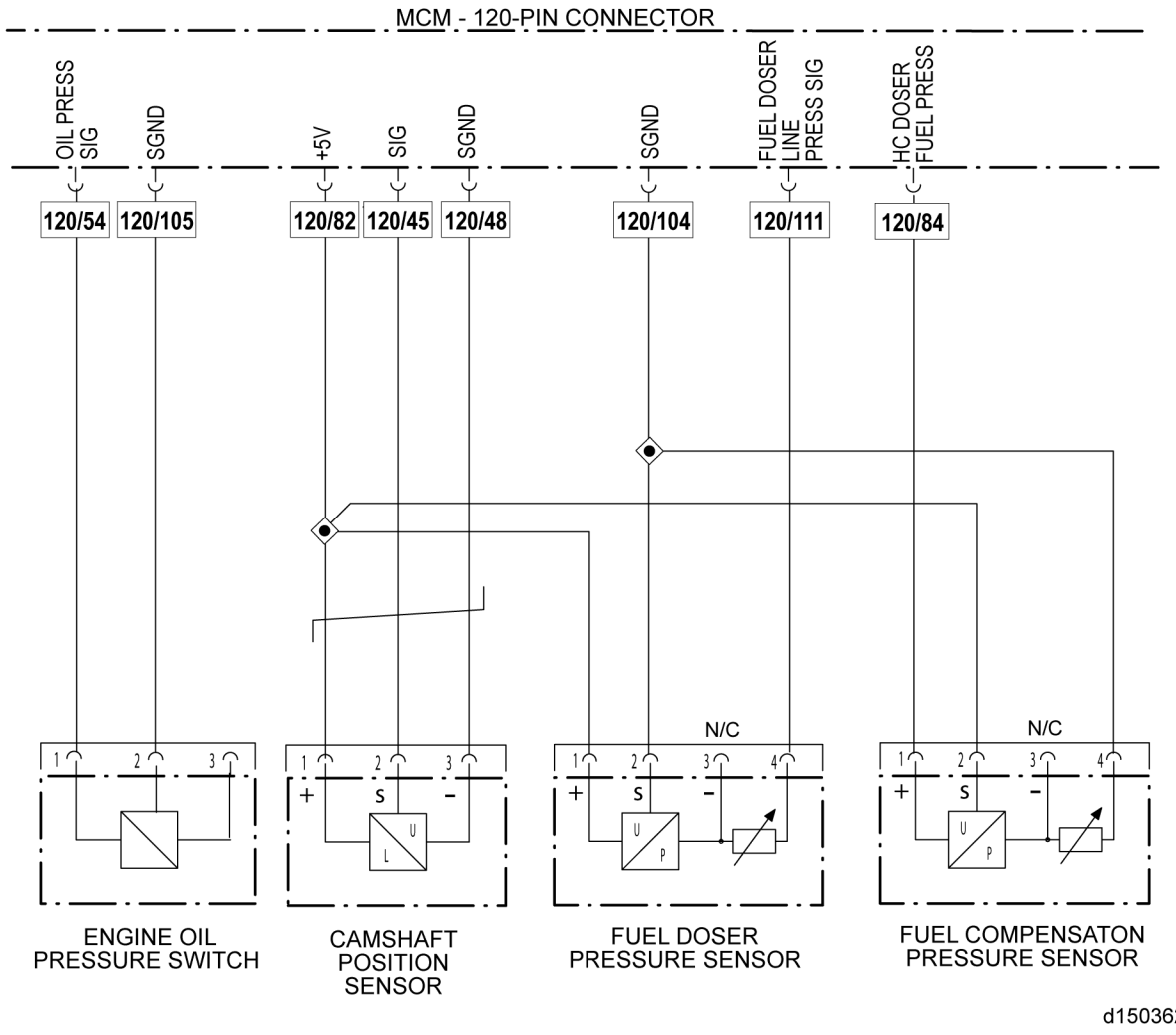
1. Connect DiagnosticLink ®.
2. Turn the ignition ON (key ON, engine OFF).
3. Check for multiple codes. Are there any additional circuit failed low codes (FMI 4) present for the Camshaft Position (CMP) sensor, fuel line pressure sensor and fuel compensation pressure?
    a. Yes; Go to step 8.
    b. No; Go to step 4.
4. Disconnect the engine oil pressure switch.
5. Inspect the engine oil pressure connector and engine oil pressure harness connector for damage, bent, spread or unseated (pushed out) pins, corrosion or wire damage. Is damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 6.
6. Measure the voltage between pin 3 of the engine oil pressure switch and battery ground. Is the voltage between 4.5 and 5.5 volts?
    a. Yes; Go to step 7.
    b. No; repair the wire between pin 3 of the engine oil pressure switch harness connector and pin 82 of the MCM 120-pin harness connector.
7. Measure the voltage between pins 2 and 3 of the engine oil pressure switch harness connector. Is the voltage less than 4.5 volts?
    a. Yes; repair the wire between pin 2 of the engine oil pressure switch harness connector and pin 105 of the MCM 120-pin harness connector.
    b. No; replace the engine oil pressure switch.
8. Turn the ignition OFF.
9. Disconnect the MCM 120-pin harness connector.
10. Inspect the MCM 120-pin connector and the MCM 120-pin harness connector for damage, bent, spread or unseated (pushed out) pins, corrosion or wire damage. Is damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 11.
11. Measure the resistance between pin 3 of the engine oil pressure switch harness connector and battery ground. Is the resistance greater than 10K ohms?
    a. Yes; Go to step 12.
    b. No; repair the short to ground between pin 3 of the engine oil pressure switch harness connector and pin 82 of the MCM 120-pin connector.
12. Measure the resistance between pin 3 of the engine oil pressure switch harness connector and pin 82 of the MCM 120-pin harness connector. Is the resistance greater than five ohms?
    a. Yes; repair the wire between pin 82 of the MCM 120-pin harness connector and pin 3 of the engine oil pressure switch harness connector, pin 1 of the Camshaft Position (CMP) sensor harness connector and pin 2 of the fuel line pressure and fuel compensation pressure sensors.
    b. No; replace the MCM. Refer to section Removal of the Motor Control Module. Verify repairs.

15 SPN 100/FMI 5 - GHG17

Oil Pressure Sensor Stuck High - Low Speed

Table 37.

SPN 100/FMI 5	
Description	This diagnosis is Typically Oil Pressure Stuck
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always Enabled
Monitor Sequence	Key On Engine Running at Speeds Below 625 rpm
Execution Frequency	Continuous When Enabling Conditions are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	While the Engine is At Normal Operating Temperature, Road Test Performing Several Decelerations



NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of Main and Connecting Rod Bearings in Chassis".

Check as follows:

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

1. Connect DiagnosticLink ®.
2. Turn the ignition ON (key ON, engine OFF).
3. Check for multiple fault codes. Are fault codes SPN 100/FMI 3 or FMI 4 present?
    a. Yes; diagnose the other fault codes first.
    b. No; Go to step 4.
4. Disconnect the engine oil pressure sensor. Inspect the connector for damage, bent, spread or unseated (pushed out) pins, corrosion or wire damage. Is damage present?
    a. Yes; repair as necessary.
    b. No; Go to step 5.
5. Measure the resistance between pin 2 of the engine oil pressure sensor and ground. Is the resistance greater than five ohms?
    a. Yes; repair the open circuit between pin 2 of the engine oil pressure sensor and pin 105 of the MCM 120-pin connector.
    b. No; replace the engine oil pressure sensor. Refer to section " *Removal of the Engine Oil Pressure Sensor*".

16 SPN 100/FMI 10 - GHG17

Low Oil Pressure Derate

Table 38.

SPN 100/FMI 10	
Description	This Fault Code Sets When the Engine Power has Been Limited to Prevent Engine Damage Due to a Low Oil Pressure Condition
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always On
Monitor Sequence	Key ON Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	Engine Derate or Engine Shut Down - Calibration Dependent
Verification	Check at Engine Operating Temperature

Possible causes:
- Failed oil pressure sensor
- Initial start after oil maintenance
- Vehicle is parked on a steep incline
- Improper oil level
- Oil dilution
- Leaks in the oil suction manifold
- Leaks at the oil suction pipes
- Failed oil pump

Table 39.

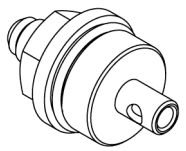
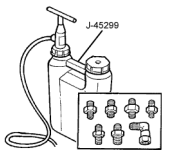
Tool		
J-49181	Oil System Priming Adapter	 d580037
J-45299	Oil System Priming Pump	 d580151

Table 40.

DD5 - DD8 Normal Oil Pressure Readings		
Engine State	**Bar**	**psi**
Engine Stopped	0	0
Engine Running	3.5	50.76

NOTE: The oil gauge in the dashboard of the vehicle is NOT used to diagnose or verify low oil pressure concerns.

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Check for multiple codes. Are there multiple oil pressure sensor circuit fault codes?
    a. Yes; diagnose the oil pressure sensor circuit fault codes first.
    b. No; Go to step 2.
2. With the vehicle parked on a flat, level surface, check the engine oil level after the engine has been shut off for at least 20 minutes. Is the engine oil at the correct level?
    a. Yes; Go to step 7.
    b. No; Go to step 3.

NOTE: An increase in the oil level suggests that there may be fuel or coolant entering the engine oil.

3. Is the oil level overfilled?
    a. Yes; Go to step 5.
    b. No; Go to step 4.
4. Use the manufacturer recommended oil to fill the engine oil to the correct level. Check for external engine oil leaks and repair as necessary. Verify repair.
5. Check the oil for signs of coolant intrusion. When there is coolant intrusion, the oil will exhibit a milky appearance or become thick and sludgy. Are there signs of coolant in the oil?
    a. Yes; Refer to section "Coolant in Oil." Verify repair.
    b. No; Go to step 6.
6. Check the oil for signs of fuel intrusion. When there is fuel intrusion into the oil, the oil becomes thin and has a fuel odor. Are there signs of fuel in the oil?
    a. Yes; determine the cause of fuel in the oil. Change the oil and filter. Verify repair.
    b. No; the oil level may have been over filled by the customer. Correct the oil level. Go to step 7.
7. Turn the ignition ON (key ON, engine OFF).
8. Connect DiagnosticLink ® and check for a biased oil pressure sensor at key ON, engine OFF. Does the oil pressure sensor read zero psi?
    a. Yes; Go to step 9.
    b. No; replace the oil pressure sensor. Refer to section "Removal of the Oil Pressure Sensor" . Verify repair.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

9. Start the engine and observe the stability of the oil pressure using the chart. Is the oil pressure stable and within normal operating range as per the chart?
    a. Yes; clear the code. Release the vehicle.
    b. No; Go to step 10.
10. Inspect the vehicle for aftermarket components plumbed into the oil system. Are there any aftermarket components installed?
    a. Yes; isolate the aftermarket components. Recheck the oil pressure.

b. No; Go to step 11.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

NOTE: A code will be set when the engine oil temperature sensor is unplugged.

11. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter" . Is the correct oil filter installed?
    a. Yes; reinstall the oil temperature sensor. Refer to section "Installation of the Engine Oil Temperature Sensor". Replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair. Clear the code. Release the vehicle.
    b. No; Go to step 12.
12. Remove and inspect the inlet air temperature sensor, intake manifold pressure sensor, and charge air temperature sensor for signs of damage. Is there damage present?
    a. Yes; Refer to section "Test-E - Two-Filter Fuel System".
    b. No; Go to step 13.
13. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter". Is the correct oil filter installed?
    a. Yes; Go to step 14.
    b. No; install the correct oil filter. Verify repair.
14. Inspect the outside of the oil filter for signs of metal or bearing material. Is there an excessive amount of metal or bearing material present on the outside of the filter?
    a. Yes; determine the cause of the excessive metal in the oil. Repair as necessary.
    b. No; Go to step 15.
15. Inspect the oil filter stand pipe and oil bypass valve (located on the top of the stand pipe) for damage. Is there any damage present or is the oil bypass valve missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; Go to step 16.
16. Inspect the oil filter drain back valve located in the bottom of the oil filter housing. Is the oil filter drain back valve damaged or missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; reinstall the oil filter. Refer to section "Replacement of the Oil Filter". Go to step 17.
17. Remove the rocker cover. Refer to section "Removal of the Rocker Cover".
18. Use the oil system adapter J-49181 and oil primer pump tool J-45299 to check for leaks in the upper portion of the engine. Refer to section "Priming the Engine Lubrication System". Are there any leaks present?
    a. Yes; repair as necessary. Verify repair.
    b. No; Go to step 19.
19. Remove the oil pan. Refer to section "Removal of the Oil Pan".
20. Check the torque on the oil suction manifold bolts and oil pump using a torque wrench. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Are the bolts torqued to specification?
    a. Yes; Go to step 21.
    b. No; remove the oil suction manifold and the oil pump. Replace the O-rings, then reinstall the oil pump and oil suction manifold. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

21. Remove the oil pump, oil suction manifold, and oil lines. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Check the condition of the oil pump, oil suction manifold, suction lines, and O-rings. Is there any damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 22.
22. Inspect the rod and main bearings; Refer to section "DD Platform Bearing Failure Guide" in the *DDC-SVC-MAN-0196 "DD Platform Bearing Failure Guide."* Are the rod and main bearings excessively worn or damaged?
    a. Yes; repair as necessary. Verify repair.
    b. No; replace the oil pump. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

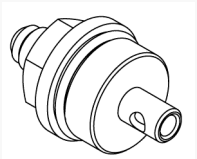
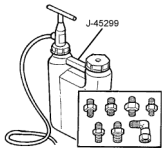
17 SPN 100/FMI 17 - GHG17

Oil Pressure Very Low

Table 41.

SPN 100/FMI 17	
Description	Engine Oil Pressure Plausibility Error
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always On
Monitor Sequence	Key ON, Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	Check at Engine Operating Temperature

Table 42.

Tools		
J-49181	Oil System Priming Adapter	 d580037
J-45299	Oil System Priming Pump	 d580151

NOTE: The Common Powertrain Controller (CPC) digital outputs have the same SPN as some Motor Control Module (MCM) faults. DiagnosticLink ® makes the distinction between the MCM and CPC when diagnosing a fault.

Possible causes:

- Failed oil pressure sensor
- Initial start after oil maintenance
- Vehicle is parked on a steep incline
- Improper oil level
- Oil dilution
- Leaks in the oil suction manifold
- Leaks at the oil suction pipes
- Failed oil pump

Table 43.

DD5 - DD8 Normal Oil Pressure Readings		
Engine State	**Bar**	**psi**
Engine Stopped	0	0
Engine Running	3.5	50.76

NOTE: The oil gauge in the dashboard of the vehicle is NOT used to diagnose or verify low oil pressure concerns.

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Check for multiple codes. Are there multiple oil pressure sensor circuit fault codes?
    a. Yes; diagnose the oil pressure sensor circuit fault codes first.
    b. No; Go to step 2.
2. With the vehicle parked on a flat, level surface, check the engine oil level after the engine has been shut off for at least 20 minutes. Is the engine oil at the correct level?
    a. Yes; Go to step 7.
    b. No; Go to step 3.

NOTE: An increase in the oil level suggests that there may be fuel or coolant entering the engine oil.

3. Is the oil level overfilled?
    a. Yes; Go to step 5.
    b. No; Go to step 4.
4. Use the manufacturer recommended oil to fill the engine oil to the correct level. Check for external engine oil leaks and repair as necessary. Verify repair.
5. Check the oil for signs of coolant intrusion. When there is coolant intrusion, the oil will exhibit a milky appearance or become thick and sludgy. Are there signs of coolant in the oil?
    a. Yes; Refer to section "Coolant in Oil". Verify repair.
    b. No; Go to step 6.
6. Check the oil for signs of fuel intrusion. When there is fuel intrusion into the oil, the oil becomes thin and has a fuel odor. Are there signs of fuel in the oil?
    a. Yes; determine the cause of fuel in the oil. Change the oil and filter. Verify repair.
    b. No; the oil level may have been over filled by the customer. Correct the oil level. Go to step 7.
7. Turn the ignition ON (key ON, engine OFF).
8. Connect DiagnosticLink® and check for a biased oil pressure sensor at key ON, engine OFF. Does the oil pressure sensor read zero psi?
    a. Yes; Go to step 9.
    b. No; replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

9. Start the engine and observe the stability of the oil pressure using the chart. Is the oil pressure stable and within normal operating range as per the chart?
    a. Yes; clear the code. Release the vehicle.
    b. No; Go to step 10.
10. Inspect the vehicle for aftermarket components plumbed into the oil system. Are there any aftermarket components installed?
    a. Yes; isolate the aftermarket components. Recheck the oil pressure.
    b. No; Go to step 11.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

NOTE: A code will be set when the engine oil temperature sensor is unplugged.

11. Remove the oil temperature sensor and connect a manual gauge into the oil temperature sensor port. Refer to section "Removal of the Engine Oil Temperature Sensor". Start and run the engine at the rpm listed in the chart. Is the oil pressure, observed on the manual gauge, stable and within normal operating range as per the chart?
    a. Yes; reinstall the oil temperature sensor; Refer to section "Installation of the Engine Oil Temperature Sensor". Replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair. Clear the code. Release the vehicle.
    b. No; Go to step 12.
12. Remove and inspect the inlet air temperature sensor, intake manifold pressure sensor, and charge air temperature sensor for signs of damage. Is there damage present?
    a. Yes; Refer to section "Test-E - Two-Filter Fuel System".
    b. No; Go to step 13.
13. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter". Is the correct oil filter installed?
    a. Yes; Go to step 14.
    b. No; install the correct oil filter. Verify repair.
14. Inspect the outside of the oil filter for signs of metal or bearing material. Is there an excessive amount of metal or bearing material present on the outside of the filter?
    a. Yes; determine the cause of the excessive metal in the oil. Repair as necessary.
    b. No; Go to step 15.
15. Inspect the oil filter stand pipe and oil bypass valve (located on the top of the stand pipe) for damage. Is there any damage present or is the oil bypass valve missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; Go to step 16.
16. Inspect the oil filter drain back valve located in the bottom of the oil filter housing. Is the oil filter drain back valve damaged or missing?

a. Yes; replace the oil filter module. Verify repair.
b. No; reinstall the oil filter . Refer to section "Replacement of the Oil Filter". Go to step 17.

17. Remove the rocker cover. Refer to section "Removal of the Rocker Cover".
18. Use the oil system adapter J-49181 and oil primer pump tool J-45299 to check for leaks in the upper portion of the engine. Refer to section "Priming the Engine Lubrication System". Are there any leaks present?
    a. Yes; repair as necessary. Verify repair.
    b. No; Go to step 19.
19. Remove the oil pan. Refer to section "Removal of the Oil Pan".
20. Check the torque on the oil suction manifold bolts and oil pump using a torque wrench. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Are the bolts torqued to specification?
    a. Yes; Go to step 21.
    b. No; remove the oil suction manifold and the oil pump. Replace the O-rings, then reinstall the oil pump and oil suction manifold. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.
21. Remove the oil pump, oil suction manifold, and oil lines. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Check the condition of the oil pump, oil suction manifold, suction lines, and O-rings. Is there any damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 22.
22. Inspect the rod and main bearings; Refer to section "DD Platform Bearing Failure Guide" in the *DDC-SVC-MAN-0196 "DD Platform Bearing Failure Guide."* Are the rod and main bearings excessively worn or damaged?
    a. Yes; repair as necessary. Verify repair.
    b. No; replace the oil pump, Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

18 SPN 100/FMI 1 - GHG17

Oil Pressure Very Low

Table 44.

SPN 100/FMI 1	
Description	This Fault Code Sets When the Engine Oil Pressure is Below the Calibrated Threshold
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	This Fault Code Sets When the Engine Oil Pressure Switch Voltage is Between 1.47 to 1.53 Volts
Monitor Sequence	Key On, Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL, SEL
Engine Reaction	None
Verification	Check at Engine Operating Temperature for at Least Four Minutes

NOTE: The Common Powertrain Controller (CPC) may have the same SPN as some Motor Control Module (MCM) faults. DiagnosticLink ® makes the distinction between the MCM and CPC when diagnosing a fault.

Possible causes:

- Failed Oil Pressure Switch
- Initial Start after Oil Maintenance
- Vehicle is Parked on a Steep Incline
- Improper Oil Level
- Oil Dilution
- Leaks in the Oil Suction Manifold
- Failed Oil Pump

Table 45.

DD5 - DD8 Normal Oil Pressure Readings		
Engine State	**Bar**	**psi**
Engine Stopped	0	0
Engine Running	3.5	50.76

NOTE: The oil gauge in the dashboard of the vehicle is NOT used to diagnose or verify low oil pressure concerns.

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Check for multiple codes. Are there any oil pressure circuit fault codes?
    a. Yes; diagnose the oil pressure circuit fault codes first.
    b. No; Go to step 2.
2. With the vehicle parked on a flat, level surface, check the engine oil level after the engine has been shut off for at least 20 minutes. Is the engine oil at the correct level?
    a. Yes; Go to step 7.

b. No; Go to step 3.

NOTE: An increase in the oil level suggests that there may be fuel or coolant entering the engine oil.

3. Is the oil level overfilled?
   a. Yes; Go to step 5.
   b. No; Go to step 4.
4. Use the manufacturer recommended oil to fill the engine oil to the correct level. Check for external engine oil leaks and repair as necessary. Verify repair.
5. Check the oil for signs of coolant intrusion. When there is coolant intrusion, the oil will exhibit a milky appearance or become thick and sludgy. Are there signs of coolant in the oil?
   a. Yes; Refer to section "Coolant in Oil". Verify repair.
   b. No; Go to step 6.
6. Check the oil for signs of fuel intrusion. When there is fuel intrusion into the oil, the oil becomes thin and has a fuel odor. Are there signs of fuel in the oil?
   a. Yes; determine the cause of fuel in the oil. Change the oil and filter. Verify repair.
   b. No; the oil level may have been over filled by the customer. Correct the oil level. Go to step 7.
7. Turn the ignition ON (key ON, engine OFF).
8. Connect DiagnosticLink® and check for a biased engine oil pressure switch at key ON, engine OFF. Does the engine oil pressure switch read 0 Bar (0 psi)?
   a. Yes; Go to step 9.
   b. No; replace the engine oil pressure switch. Refer to section "Removal of the Oil Pressure Switch". Verify repair.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

9. Start the engine and observe the oil pressure. Is the oil pressure at a steady 3.5 Bar (50.76 psi)?
   a. Yes; Go to step 10.
   b. No; replace the engine oil pressure switch.
10. Inspect the vehicle for aftermarket components plumbed into the oil system. Are there any aftermarket components installed?
    a. Yes; isolate the aftermarket components. Recheck the oil pressure.
    b. No; Go to step 11.

NOTE: A code will be set when the engine oil temperature sensor is unplugged.

11. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter" . Is the correct oil filter installed?
    a. Yes; Go to step 12.
    b. No; install the correct oil filter. Verify repair.
12. Inspect the outside of the oil filter for signs of metal or bearing material. Is there an excessive amount of metal or bearing material present on the outside of the filter?
    a. Yes; determine the cause of the excessive metal in the oil. Repair as necessary.
    b. No; Go to step 13.
13. Inspect the oil filter stand pipe and oil bypass valve for damage. Is there any damage present?

a. Yes; repair as necessary. Verify repair.
b. No; Go to step 14.

14. Inspect the oil filter drain back valve located in the bottom of the oil filter housing. Is the oil filter drain back valve damaged or missing?
    a. Yes; repair as necessary. Verify repair.
    b. No; reinstall the oil filter. Refer to section "Replacement of the Oil Filter". Go to step 15.
15. Remove the rocker cover. Refer to section "Removal of the Rocker Cover". Go to step 16.
16. Use the oil system adapter W936589006300 and oil primer pump tool J-45299 to check for leaks in the upper portion of the engine. Refer to section "Priming the Engine Lubrication System". Are there any leaks present?
    a. Yes; repair as necessary. Verify repair.
    b. No; Go to step 17.
17. Remove the oil pan. Refer to section "Removal of the Oil Pan". Go to step 18.
18. Check the condition of the oil suction pipe (part of the oil pan assembly) and its O-ring seal. Is damage present?
    a. Yes; repair as necessary.
    b. No; Go to step 19.
19. Inspect the rod and main bearings; Refer to section "DD Platform Bearing Failure Guide" in the *DDC-SVC-MAN-0196 "DD Platform Bearing Failure Guide."* Are the rod and main bearings excessively worn or damaged?
    a. Yes; repair as necessary. Verify repairs.
    b. No; replace the oil pump. Refer to section "Removal of the Oil Pump". Verify repair.

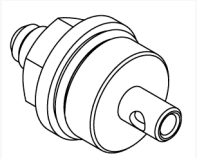
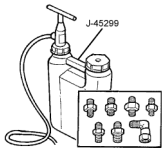
19 SPN 100/FMI 18 - GHG17

Oil Pressure Low

Table 46.

SPN 100/FMI 18	
Description	This Fault Code Sets when the Engine Oil Pressure is Less than a Calibrated Threshold
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always On
Monitor Sequence	Key ON Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	Check At Engine Operating Temperature

Table 47.

Tools		
J-49181	Oil System Priming Adapter	 d580037
J-45299	Oil System Priming Pump	 d580151

NOTE: The Common Powertrain Controller (CPC) may have the same SPN as some Motor Control Module (MCM) faults. DiagnosticLink ® makes the distinction between the MCM and CPC when diagnosing a fault.

Possible causes:

- Failed oil pressure sensor
- Initial start after oil maintenance
- Vehicle is parked on a steep incline
- Improper oil level
- Oil dilution
- Leaks in the oil suction manifold
- Leaks at the oil suction pipes
- Failed oil pump

Table 48.

DD5 - DD8 Normal Oil Pressure Readings		
Engine State	**Bar**	**psi**
Engine Stopped	0	0
Engine Running	3.5	50.76

NOTE: The oil gauge in the dashboard of the vehicle is NOT used to diagnose or verify low oil pressure concerns.

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Check for multiple codes. Are there multiple oil pressure sensor circuit fault codes?
    a. Yes; diagnose the oil pressure sensor circuit fault codes first.
    b. No; Go to step 2.
2. With the vehicle parked on a flat, level surface, check the engine oil level after the engine has been shut off for at least 20 minutes. Is the engine oil at the correct level?
    a. Yes; Go to step 7.
    b. No; Go to step 3.

NOTE: An increase in oil level suggests that there may be fuel or coolant entering the engine oil.

3. Is the oil level overfilled?
    a. Yes; Go to step 5.
    b. No; Go to step 4.
4. Use the manufacturer recommended oil to fill the engine oil to the correct level. Check for external engine oil leaks and repair as necessary. Verify repair.
5. Check the oil for signs of coolant intrusion. When there is coolant intrusion, the oil will exhibit a milky appearance or become thick and sludgy. Are there signs of coolant in the oil?
    a. Yes; Refer to section "Coolant in Oil". Verify repair.
    b. No; Go to step 6.
6. Check the oil for signs of fuel intrusion. When there is fuel intrusion into the oil, the oil becomes thin and has a fuel odor. Are there signs of fuel in the oil?
    a. Yes; determine the cause of fuel in the oil. Change the oil and filter. Verify repair.
    b. No; the oil level may have been over filled by the customer. Correct the oil level. Go to step 7.
7. Turn the ignition ON (key ON, engine OFF).
8. Connect DiagnosticLink ® and check for a biased oil pressure sensor at key ON, engine OFF. Does the oil pressure sensor read zero psi?
    a. Yes; Go to step 9.
    b. No; replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

9. Start the engine and observe the stability of the oil pressure using the chart. Is the oil pressure stable and within normal operating range as per the chart?
    a. Yes; clear the code. Release the vehicle.
    b. No; Go to step 10.
10. Inspect the vehicle for aftermarket components plumbed into the oil system. Are there any aftermarket components installed?
    a. Yes; isolate the aftermarket components. Recheck the oil pressure.
    b. No; Go to step 11.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

NOTE: A code will be set when the engine oil temperature sensor is unplugged.

11. Remove the oil temperature sensor and connect a manual gauge into the oil temperature sensor port. Refer to section "Removal of the Engine Oil Temperature Sensor". Start and run the engine at the rpm listed in the chart. Is the oil pressure, observed on the manual gauge, stable and within normal operating range as per the chart?
    a. Yes; reinstall the oil temperature sensor. Refer to section "Installation of the Engine Oil Temperature Sensor". Replace the oil pressure sensor. Refer to section "Removal of the Engine Oil Pressure Sensor". Verify repair. Clear the code. Release the vehicle.
    b. No; Go to step 12.
12. Remove and inspect the inlet air temperature sensor, intake manifold pressure sensor, and charge air temperature sensor for signs of damage. Is there damage present?
    a. Yes; Refer to section "Test-E - Two-Filter Fuel System".
    b. No; Go to step 13.
13. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter". Is the correct oil filter installed?
    a. Yes; Go to step 14.
    b. No; install the correct oil filter. Verify repair.
14. Inspect the outside of the oil filter for signs of metal or bearing material. Is there an excessive amount of metal or bearing material present on the outside of the filter?
    a. Yes; determine the cause of the excessive metal in the oil. Repair as necessary.
    b. No; Go to step 15.
15. Inspect the oil filter stand pipe and oil bypass valve (located on the top of the stand pipe) for damage. Is there any damage present or is the oil bypass valve missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; Go to step 16.
16. Inspect the oil filter drain back valve located in the bottom of the oil filter housing. Is the oil filter drain back valve damaged or missing?

a. Yes; replace the oil filter module. Verify repair.
b. No; reinstall the oil filter . Refer to section "Replacement of the Oil Filter". Go to step 17.

17. Remove the rocker cover. Refer to section "Removal of the Rocker Cover".
18. Use the oil system adapter J-49181 and oil primer pump tool J-45299 to check for leaks in the upper portion of the engine. Refer to section "Priming the Engine Lubrication System". Are there any leaks present?
    a. Yes; repair as necessary. Verify repair.
    b. No; Go to step 19.
19. Remove the oil pan. Refer to section "Removal of the Oil Pan".
20. Check the torque on the oil suction manifold bolts and oil pump using a torque wrench. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Are the bolts torqued to specification?
    a. Yes; Go to step 21.
    b. No; Remove the oil suction manifold and the oil pump. Replace the O-rings, then reinstall the oil pump and oil suction manifold. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.
21. Remove the oil pump, oil suction manifold, and oil lines. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Check the condition of the oil pump, oil suction manifold, suction lines, and O-rings. Is there any damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 22.
22. Inspect the rod and main bearings; Refer to section "DD Platform Bearing Failure Guide" in the *DDC-SVC-MAN-0196 "DD Platform Bearing Failure Guide."* Are the rod and main bearings excessively worn or damaged?
    a. Yes; repair as necessary. Verify repair.
    b. No; replace the oil pump, Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

20 SPN 100/FMI 0 - GHG14

Oil Pressure Stuck

Table 49.

SPN 100/FMI 0	
Description	This fault code sets when the engine oil pressure is higher than a calibrated pressure for the specific RPM.
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always On
Monitor Sequence	Key On Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	While the engine is at normal operating temperature, road test performing several decelerations.

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Connect DiagnosticLink ®.
2. Turn the ignition ON, (key ON, engine OFF).
3. Check for multiple fault codes. Are fault codes SPN 100/FMI 3 or FMI 4 present?
    a. Yes; diagnose the other fault codes first.
    b. No; Go to step 4.
4. Monitor the engine oil pressure. Does the engine oil pressure read zero psi?
    a. Yes; Go to step 5.
    b. No; replace the engine oil pressure sensor. Refer to section "Removal of the Oil Pressure Sensor".
5. Turn the ignition OFF.
6. Remove the engine oil temperature sensor; Refer to section "Removal of the Engine Oil Temperature Sensor".
7. Reconnect the oil temperature sensor to the electrical connector while the engine oil temperature sensor is still removed.
8. Plumb a manual gauge into the oil temperature sensor port.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

9. Start and warm the engine to operating temperature.
10. Perform several neutral run-ups. Does the oil pressure reading on the manual gauge match the engine oil pressure sensor reading in DiagnosticLink?

a. Yes; Go to step 11.
b. No; replace the engine oil pressure sensor. Refer to section "Removal of the Oil Pressure Sensor". Reinstall the engine oil temperature sensor; Refer to section "Installation of the Engine Oil Temperature Sensor" and verify repair.

11. Road test the vehicle. Does the engine oil pressure reading on the manual gauge match the engine oil pressure reading in DiagnosticLink when the fault is present?
    a. Yes; replace the oil pump. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Reinstall the engine oil temperature sensor; Refer to section "Installation of the Engine Oil Temperature Sensor" and verify repair.
    b. No; replace the engine oil pressure sensor. Refer to section "Removal of the Oil Pressure Sensor". Reinstall the engine oil temperature sensor; Refer to section "Installation of the Engine Oil Temperature Sensor" and verify repair.

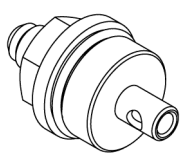
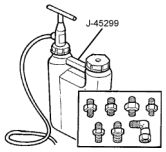
21 SPN 100/FMI 1 - EPA07 - EPA10 - GHG14

Low Engine Oil Pressure

Table 50.

SPN 100/FMI 1	
Description	This Fault Code Sets when the Engine Oil Pressure is Less than a Calibrated Threshold
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always On
Monitor Sequence	Key On Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	Check at Engine Operating Temperature

Table 51.

J-49181	Oil System Priming Adapter	 d580037
J-45299	Oil System Priming Pump	 d580151

Possible causes:
- Failed Oil Pressure Sensor
- Initial Start After Oil Maintenance
- Vehicle is Parked on a Steep Incline
- Improper Oil Level
- Oil Dilution
- Leaks in the Oil Suction Manifold
- Leaks at the Oil Suction Pipes
- Failed Oil Pump

Table 52.

DD15TC and DD16 Minimum Oil Pressure at Operating Temperature		
rpm	**BAR**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

Table 53.

DD15AT Minimum Oil Pressure at Operating Temperature		
rpm	**BAR**	**psi**
600	0.689	10
1200	1.65	24
1800	2.55	37

Table 54.

DD13 Minimum Oil Pressure at Operating Temperature		
rpm	**BAR**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

NOTE: The oil gauge in the dash is NOT used to diagnose or verify low oil pressure concerns.

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Check for multiple codes. Are there multiple oil pressure sensor circuit fault codes?
    a. Yes; diagnose the oil pressure sensor circuit fault codes first.
    b. No; Go to step 2.
2. With the vehicle parked on a flat, level surface, check the engine oil level after the engine has been shut off for at least 20 minutes. Is the engine oil at the correct level?
    a. Yes; Go to step 7.
    b. No; Go to step 3.

NOTE: An increase in the oil level suggests that there may be fuel or coolant entering the engine oil.

3. Is the oil level overfilled?
    a. Yes; Go to step 5.
    b. No; Go to step 4.
4. Use the manufacturer recommended oil to fill the engine oil to the correct level. Check for external engine oil leaks and repair as necessary. Verify repair.
5. Check the oil for signs of coolant intrusion. When there is coolant intrusion, the oil will exhibit a milky appearance or become thick and sludgy. Are there signs of coolant in the oil?
    a. Yes; Refer to section "Coolant in Oil". Verify repair.
    b. No; Go to step 6.
6. Check the oil for signs of fuel intrusion. When there is fuel intrusion into the oil, the oil becomes thin and has a fuel odor. Are there signs of fuel in the oil?
    a. Yes; determine the cause of fuel in the oil. Change the oil and filter. Verify repair.
    b. No; the oil level may have been overfilled by the customer. Correct the oil level. Go to step 7.
7. Turn the ignition ON (key ON, engine OFF).
8. Connect DiagnosticLink ® and check for a biased oil pressure sensor at key ON, engine OFF. Does the oil pressure sensor read zero psi?
    a. Yes; Go to step 9.
    b. No; replace the oil pressure sensor. Refer to section "Removal of the Oil Pressure Sensor". Verify repair.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

9. Start the engine and observe the stability of the oil pressure using the chart. Is the oil pressure stable and within normal operating range as per the appropriate "Minimum Oil Pressure at Operating Temperature" chart at the top of this procedure?
    a. Yes; Go to step 10.
    b. No; Go to step 11.
10. Check the Motor Control Module (MCM) software level. Is the MCM software level equal or greater to the levels listed below?
    - GHG14 - 4.7.0.00 fuel map ZGS002
    - EPA10 - 7.6.0.46
    - EPA07 - 13.4.2.0
    a. Yes; Go to step 11.
    b. No; update the MCM software level and release the vehicle. Perform the repair verification. If fault SPN 100/FMI 1 becomes active, Go to step 11.
11. Inspect the vehicle for aftermarket components plumbed into the oil system. Are there any aftermarket components installed?
    a. Yes; isolate the aftermarket components. Recheck the oil pressure.
    b. No; Go to step 12.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

NOTE: A code will be set when the oil temperature sensor is unplugged.

12. Remove the oil temperature sensor and connect a manual gauge into the oil temperature sensor port. Refer to section "Removal of the Engine Oil Temperature Sensor". Start and run the engine at the rpm listed in the chart. Is the oil pressure, observed on the manual gauge, stable and within normal operating range as per the appropriate "Minimum Oil Pressure at Operating Temperature" chart at the top of this procedure?
    a. Yes; reinstall the oil temperature sensor. Refer to section "Installation of the Engine Oil Temperature Sensor". Replace the oil pressure sensor. Refer to section "Removal of the Oil Pressure Sensor". Verify repair. Clear the code. Release the vehicle.
    b. No; Go to step 13.
13. Remove and inspect the inlet air temperature sensor, intake manifold pressure sensor, and charge air temperature sensor for signs of damage. Is there damage present?
    a. Yes;

Refer to section "Test-E - Two-Filter Fuel System"
Refer to section "Test-E - Three-Filter Fuel System"

b. No; Go to step 14.

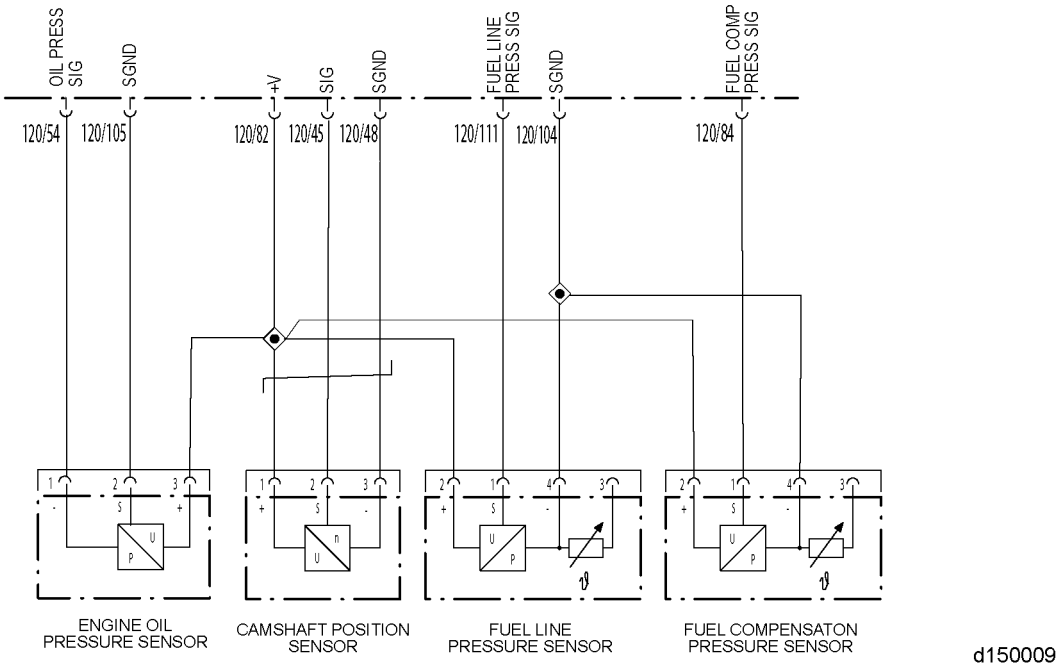
14. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter". Is the correct oil filter installed?
    a. Yes; Go to step 15.
    b. No; install the correct oil filter. Verify repair.
15. Inspect the outside of the oil filter for signs of metal or bearing material. Is there an excessive amount of metal or bearing material present on the outside of the filter?
    a. Yes; determine the cause of the excessive metal in the oil. Repair as necessary.
    b. No; Go to step 16.
16. Inspect the oil filter stand pipe and oil bypass valve (located on the top of the stand pipe) for damage. Is there any damage present or is the oil bypass valve missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; Go to step 17.
17. Inspect the oil filter drain back valve located in the bottom of the oil filter housing. Is the oil filter drain back valve damaged or missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; reinstall the oil filter. Refer to section "Replacement of the Oil Filter". Go to step 18.
18. Remove the rocker cover. Refer to section "Removal of the Rocker Cover".
19. Use the oil system adapter J-49181 and oil primer pump tool J-45299 to check for leaks in the upper portion of the engine. Refer to section "Priming the Engine Lubrication System". Are there any leaks present?
    a. Yes; repair as necessary. Verify repair.
    b. No; Go to step 20.
20. Remove the oil pan. Refer to section "Removal of the Oil Pan".
21. Check the torque on the oil suction manifold bolts and oil pump using a torque wrench. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Are the bolts torqued to specification?
    a. Yes; Go to step 22.
    b. No; remove the oil suction manifold and the oil pump. Replace the O-rings, then reinstall the oil pump and oil suction manifold. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.
22. Remove the oil pump, oil suction manifold, and oil lines. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Check the condition of the oil pump, oil suction manifold, suction lines and O-rings. Is there any damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 23.
23. Inspect the rod and main bearings; Refer to section "DD Platform Bearing Failure Guide" in the *DDC-SVC-MAN-0196 "DD Platform Bearing Failure Guide."* Are the rod and main bearings excessively worn or damaged?
    a. Yes; repair as necessary. Verify repair.
    b. No; replace the oil pump. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

22 SPN 100/FMI 3 - EPA07 - EPA10 - GHG14

Engine Oil Pressure Sensor Circuit Failed High

Table 55.

SPN 100/FMI 3	
Description	Short to Voltage or Open on Engine Oil Pressure (EOP) Circuit
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always On
Monitor Sequence	Key On Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None
Verification	Check at Engine Operating Temperature



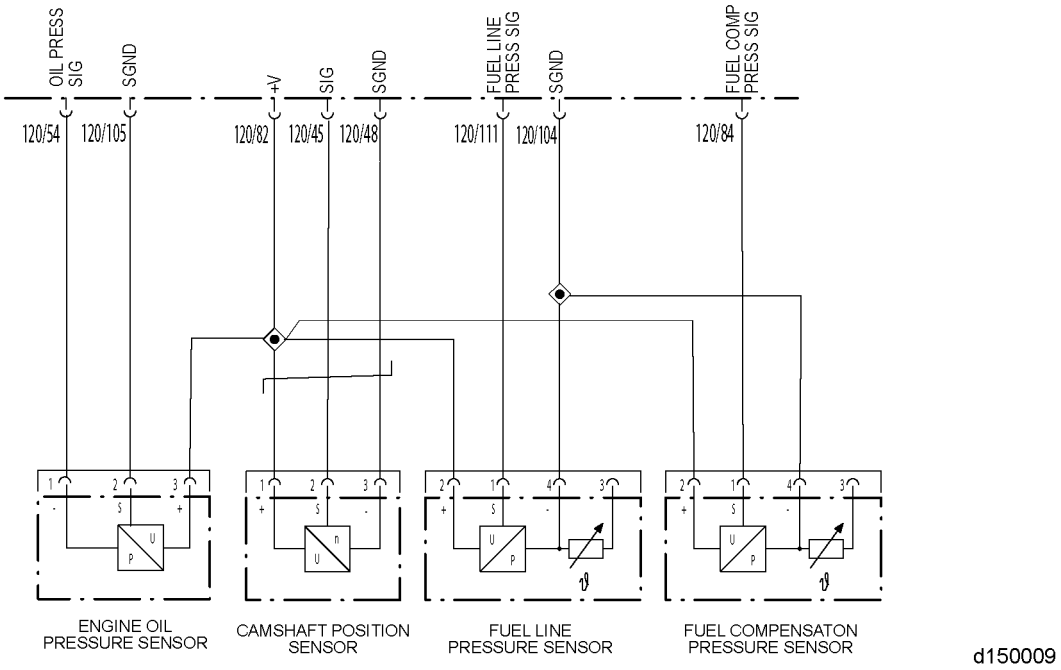
NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

1. Turn the ignition ON (key ON, engine OFF).
2. Check for multiple codes. Is SPN 3510/FMI 3 also present?
   a. Yes; diagnose 3510/FMI 3 fault first.
   b. No; Go to step 3.
3. Disconnect the Engine Oil Pressure (EOP) sensor and inspect the electrical connector for damage, corrosion or spread pins. Is damage, corrosion or spread pins present?
   a. Yes; repair as necessary.
   b. No; Go to step 4.

4. Measure the resistance between pin 2 of the EOP sensor harness connector and ground. Is the resistance greater than five ohms?
    a. Yes; repair open between pin 2 of the EOP sensor and pin 105 of the MCM 120-pin connector.
    b. No; Go to step 5.
5. Measure the voltage between pin 3 of the EOP sensor harness connector and ground. Is voltage present?
    a. Yes; Go to step 6.
    b. No; repair open between pin 3 of the EOP sensor and pin 82 of the MCM 120-pin connector.
6. Is the voltage from step 5 greater than five volts?
    a. Yes; repair short to battery power between pin 3 of the EOP sensor and pin 82 of the MCM 120-pin connector.
    b. No; Go to step 7.
7. Measure the voltage between pin 2 of the EOP sensor harness connector and ground. Is voltage present?
    a. Yes; repair the short to power between pin 2 of the EOP sensor and pin 105 of the MCM 120-pin connector.
    b. No; Go to step 8.
8. Measure the resistance between pin 1 of the EOP sensor harness connector and pin 54 of the MCM 120-pin connector. Is the resistance greater than five ohms?
    a. Yes; repair an open between pin 1 of the EOP sensor harness connector and pin 54 of the MCM 120-pin connector.
    b. No; replace the EOP sensor.

23 SPN 100/FMI 4 - EPA07 - EPA10 - GHG14

Engine Oil Pressure Sensor Circuit Failed Low



NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Connect DiagnosticLink ®.
2. Turn the ignition ON (key ON, engine OFF).
3. Check for multiple codes. Are there additional circuit failed low codes (FMI 4) for the Camshaft Position (CMP) sensor, fuel line pressure sensor and fuel compensation pressure present?
    a. Yes; Go to step 14.
    b. No; Go to step 4.
4. Disconnect the Engine Oil Pressure (EOP) sensor harness connector.
5. Inspect the EOP connector and EOP harness connector for damage, bent, spread or unseated (pushed out) pins, corrosion or wire damage. Is damage present?
    a. Yes; repair as necessary.
    b. No; Go to step 6.
6. Measure the voltage between pin 3 of the EOP sensor and battery ground. Is the voltage is between 4.5 and 5.5 volts?
    a. Yes; Go to step 7.
    b. No; Go to step 14.
7. Measure the voltage between pins 2 and 3 of the EOP sensor harness connector. Is the voltage is less than 4.5 volts?
    a. Yes; repair the wire between pin 2 of the EOP sensor harness connector and pin 105 of the MCM 120-pin harness connector.
    b. No; Go to step 8.
8. Turn the ignition OFF.
9. Disconnect the MCM 120-pin harness connector.
10. Inspect the MCM 120-pin connector and the MCM 120-pin harness connector for damage, bent, spread or unseated (pushed out) pins, corrosion or wire damage. Is damage present?

a. Yes; repair as necessary.
b. No; Go to step 11.

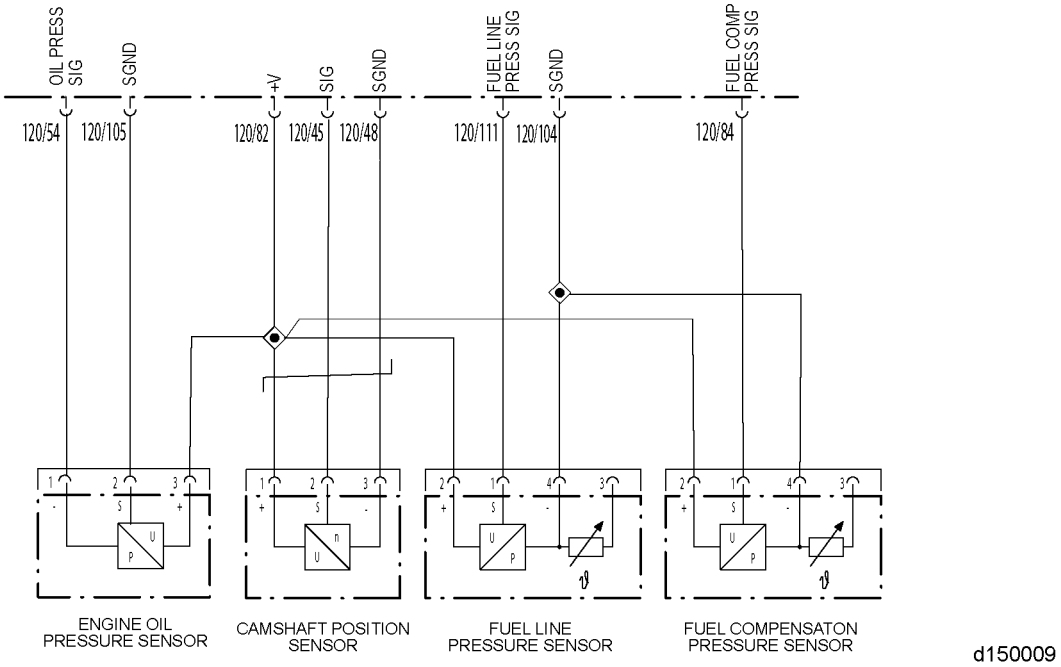
11. Measure the resistance between pin 1 of the EOP harness connector and pin 54 of the MCM 120-pin harness connector. Is the resistance is greater than 5 ohms?
    a. Yes; repair the wire between pin 1 of the EOP harness connector and pin 54 of the MCM 120-pin harness connector.
    b. No; Go to step 12.
12. Measure the resistance between pins 1 and 2 of the EOP sensor harness connector. Is the resistance is less than 10K ohms?
    a. Yes; repair the short between pins 1 and 2 of the EOP sensor harness.
    b. No; Go to step 13.
13. Measure the resistance between pins 2 and 3 of the EOP sensor harness connector. Is the resistance is less than 10K ohms?
    a. Yes; repair the short between pins 2 and 3 of the EOP sensor harness.
    b. No; replace the EOP sensor.
14. Turn the ignition OFF.
15. Disconnect the MCM 120-pin harness connector.
16. Inspect the MCM 120-pin connector and the MCM 120-pin harness connector for damage, bent, spread or unseated (pushed out) pins, corrosion or wire damage. Is damage present?
    a. Yes; repair as necessary.
    b. No; Go to step 17.
17. Measure the resistance between pin 3 of the EOP sensor harness connector and battery ground. Is the resistance is less than 10K ohms?
    a. Yes; repair the short to ground between pin 3 of the EOP sensor harness connector and pin 82 of the MCM 120-pin connector.
    b. No; Go to step 18.
18. Measure the resistance between pin 3 of the EOP sensor harness connector and pin 82 of the MCM 120-pin harness connector. Is the resistance is greater than 5 ohms?
    a. Yes; repair the wire between pin 82 of the MCM 120-pin harness connector and pin 3 of the EOP sensor harness connector, pin 1 of the Camshaft Position (CMP) sensor harness connector and pin 2 of the fuel line pressure and fuel compensation pressure sensors.
    b. No; repeat this procedure. If the results are the same, replace the MCM. Refer to section "Removal of the Motor Control Module".

24 SPN 100/FMI 5 - EPA10 - GHG14

Oil Pressure Sensor Stuck High - Low Speed

Table 56.

SPN 100/FMI 5	
Description	This diagnosis is Typically Oil Pressure Stuck
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always Enabled
Monitor Sequence	Key On Engine Running at Speeds Below 625 rpm
Execution Frequency	Continuous When Enabling Conditions are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	While the Engine is at Normal Operating Temperature, Road Test Performing Several Decelerations



NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

1. Connect DiagnosticLink ®.
2. Turn the ignition ON (key ON, engine OFF).

3. Check for multiple fault codes. Are fault codes SPN 100/FMI 3 or FMI 4 present?
    a. Yes; diagnose the other fault codes first.
    b. No; Go to step 4.
4. Disconnect the engine oil pressure sensor. Inspect the connector for damage, bent, spread or unseated (pushed out) pins, corrosion or wire damage. Is damage present?
    a. Yes; repair as necessary.
    b. No; Go to step 5.
5. Measure the resistance between pin 2 of the engine oil pressure sensor and ground. Is the resistance greater than five ohms?
    a. Yes; repair the open circuit between pin 2 of the Engine Oil Pressure sensor and pin 105 of the MCM 120-pin connector.
    b. No; replace the engine oil pressure sensor. Refer to section " *Removal of the Engine Oil Pressure Sensor*" .

25 SPN 100/FMI 10 - GHG14

Low Oil Pressure Derate

Table 57.

SPN 100/FMI 10	
Description	This Fault Code Sets When the Engine Power has Been Limited to Prevent Engine Damage Due to a Low Oil Pressure Condition
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always On
Monitor Sequence	Key On Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	Engine Derate or Engine Shut Down - Calibration Dependent
Verification	Check at Engine Operating Temperature

Possible causes:
- Failed Oil Pressure Sensor
- Initial Start After Oil Maintenance
- Vehicle is Parked on a Steep Incline
- Improper Oil Level
- Oil Dilution
- Leaks in the Oil Suction Manifold
- Leaks at the Oil Suction Pipes
- Failed Oil Pump

Table 58.

DD15TC and DD16 Minimum Oil Pressure at Operating Temperature		
rpm	**BAR**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

Table 59.

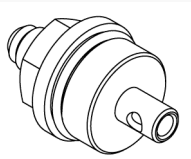
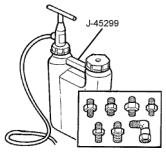
DD15AT Minimum Oil Pressure at Operating Temperature		
rpm	**BAR**	**psi**
600	0.689	10
1200	1.65	24
1800	2.55	37

Table 60.

DD13 Minimum Oil Pressure at Operating Temperature		
rpm	**BAR**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

NOTE: The oil gauge in the dash is NOT used to diagnose or verify low oil pressure concerns.

Table 61.

J-49181	Oil System Priming Adapter	 d580037
J-45299	Oil System Priming Pump	 d580151

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Check for multiple codes. Are there multiple oil pressure sensor circuit fault codes?
    a. Yes; diagnose the oil pressure sensor circuit fault codes first.
    b. No; Go to step 2.
2. With the vehicle parked on a flat, level surface, check the engine oil level after the engine has been shut off for at least 20 minutes. Is the engine oil at the correct level?
    a. Yes; Go to step 7.
    b. No; Go to step 3.

NOTE: An increase in the oil level suggests that there may be fuel or coolant entering the engine oil.

3. Is the oil level overfilled?
    a. Yes; Go to step 5.
    b. No; Go to step 4.
4. Use the manufacturer recommended oil to fill the engine oil to the correct level. Check for external engine oil leaks and repair as necessary. Verify repair.
5. Check the oil for signs of coolant intrusion. When there is coolant intrusion, the oil will exhibit a milky appearance or become thick and sludgy. Are there signs of coolant in the oil?
    a. Yes; Refer to section "Coolant in Oil". Verify repair.
    b. No; Go to step 6.
6. Check the oil for signs of fuel intrusion. When there is fuel intrusion into the oil, the oil becomes thin and has a fuel odor. Are there signs of fuel in the oil?

a. Yes; determine the cause of fuel in the oil. Change the oil and filter. Verify repair.
b. No; the oil level may have been overfilled by the customer. Correct the oil level. Go to step 7.

7. Turn the ignition ON (key ON, engine OFF).
8. Connect DiagnosticLink ® and check for a biased oil pressure sensor at key ON engine OFF. Does the oil pressure sensor read zero psi?
   a. Yes; Go to step 9.
   b. No; replace the oil pressure sensor. Refer to section "Removal of the Oil Pressure Sensor". Verify repair.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

9. Start the engine and observe the stability of the oil pressure using the chart. Is the oil pressure stable and within normal operating range as per the appropriate "Minimum Oil Pressure at Operating Temperature" chart at the top of this procedure?
   a. Yes; Go to step 10.
   b. No; Go to step 11.
10. Check the Motor Control Module (MCM) software level. Is the MCM software level equal or greater to the levels listed below?
    - GHG14 - 4.7.0.00 fuel map ZGS002
    - EPA10 - 7.6.0.46
    - EPA07 - 13.4.2.0
      a. Yes; Go to step 11.
      b. No; update the MCM software level and release the vehicle. Perform the repair verification. If fault SPN 100/FMI 1 or 17 becomes active, Go to step 11.
11. Inspect the vehicle for aftermarket components plumbed into the oil system. Are there any aftermarket components installed?
    a. Yes; isolate the aftermarket components. Recheck the oil pressure.
    b. No; Go to step 12.

NOTE: A code will be set when the oil temperature sensor is unplugged.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

12. Remove the oil temperature sensor and connect a manual gauge into the oil temperature sensor port. Refer to section "Removal of the Engine Oil Temperature Sensor". Start and run the engine at the rpm listed in the chart. Is the oil pressure, observed on the manual gauge, stable and within normal operating range as per the appropriate "Minimum Oil Pressure at Operating Temperature" chart at the top of this procedure?

a. Yes; reinstall the oil temperature sensor; Refer to section "Installation of the Engine Oil Temperature Sensor". Replace the oil pressure sensor. Refer to section "Removal of the Oil Pressure Sensor". Verify repair. Clear the code. Release the vehicle.
b. No; Go to step 13.

13. Remove and inspect the inlet air temperature sensor, intake manifold pressure sensor, charge air temperature sensor for signs of damage. Is there damage present?
    a. Yes;
       Refer to section "Test-E - Two-Filter Fuel System"
       Refer to section "Test-E - Three-Filter Fuel System"
    b. No; Go to step 14.
14. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter". Is the correct oil filter installed?
    a. Yes; Go to step 15.
    b. No; install the correct oil filter. Verify repair.
15. Inspect the outside of the oil filter for signs of metal or bearing material. Is there an excessive amount of metal or bearing material present on the outside of the filter?
    a. Yes; determine the cause of the excessive metal in the oil. Repair as necessary.
    b. No; Go to step 16.
16. Inspect the oil filter stand pipe and oil bypass valve (located on the top of the stand pipe) for damage. Is there any damage present or is the oil bypass valve missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; Go to step 17.
17. Inspect the oil filter drain back valve located in the bottom of the oil filter housing. Is the oil filter drain back valve damaged or missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; reinstall the oil filter. Refer to section "Replacement of the Oil Filter". Go to step 18.
18. Remove the rocker cover. Refer to section "Removal of the Rocker Cover".
19. Use the oil system adapter J-49181 and oil primer pump tool J-45299 to check for leaks in the upper portion of the engine. Refer to section "Priming the Engine Lubrication System". Are there any leaks present?
    a. Yes; repair as necessary. Verify repair.
    b. No; Go to step 20.
20. Remove the oil pan. Refer to section "Removal of the Oil Pan".
21. Check the torque on the oil suction manifold bolts and oil pump using a torque wrench. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Are the bolts torqued to specification?
    a. Yes; Go to step 22.
    b. No; remove the oil suction manifold and the oil pump. Replace the O-rings, then reinstall the oil pump and oil suction manifold. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.
22. Remove the oil pump, oil suction manifold, and oil lines. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Check the condition of the oil pump, oil suction manifold, suction lines and O-rings. Is there any damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 23.
23. Inspect the rod and main bearings; Refer to section "DD Platform Bearing Failure Guide" in the *DDC-SVC-MAN-0196 "DD Platform Bearing Failure Guide."* Are the rod and main bearings excessively worn or damaged?
    a. Yes; repair as necessary. Verify repair.
    b. No; replace the oil pump. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

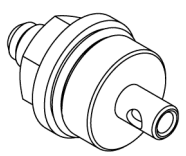
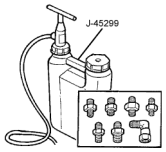
26 SPN 100/FMI 17 - EPA07 - EPA10 - GHG14

Very Low Engine Oil Pressure

Table 62.

SPN 100/FMI 17	
Description	This Fault Code Sets When the Engine Oil Pressure is less than a Calibrated Threshold
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always On
Monitor Sequence	Key On Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	Check At Engine Operating Temperature

Table 63.

J-49181	Oil System Priming Adapter	 d580037
J-45299	Oil System Priming Pump	 d580151

Possible causes:
- Failed Oil Pressure Sensor
- Initial Start After Oil Maintenance
- Vehicle is Parked on a Steep Incline
- Improper Oil Level
- Oil Dilution
- Leaks in the Oil Suction Manifold
- Leaks at the Oil Suction Pipes
- Failed Oil Pump

Table 64.

DD15TC and DD16 Minimum Oil Pressure at Operating Temperature		
rpm	**BAR**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

Table 65.

DD15AT Minimum Oil Pressure at Operating Temperature		
rpm	**BAR**	**psi**
600	0.689	10
1200	1.65	24
1800	2.55	37

Table 66.

DD13 Minimum Oil Pressure at Operating Temperature		
rpm	**BAR**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

NOTE: The oil gauge in the dash is NOT used to diagnose or verify low oil pressure concerns.

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Check for multiple codes. Are there multiple oil pressure sensor circuit fault codes?
    a. Yes; diagnose the oil pressure sensor circuit fault codes first.
    b. No; Go to step 2.
2. With the vehicle parked on a flat, level surface, check the engine oil level after the engine has been shut off for at least 20 minutes. Is the engine oil at the correct level?
    a. Yes; Go to step 7.
    b. No; Go to step 3.

NOTE: An increase in the oil level suggests that there may be fuel or coolant entering the engine oil.

3. Is the oil level overfilled?
    a. Yes; Go to step 5.
    b. No; Go to step 4.
4. Use the manufacturer recommended oil to fill the engine oil to the correct level. Check for external engine oil leaks and repair as necessary. Verify repair.
5. Check the oil for signs of coolant intrusion. When there is coolant intrusion, the oil will exhibit a milky appearance or become thick and sludgy. Are there signs of coolant in the oil?
    a. Yes; Refer to section "Coolant in Oil". Verify repair.
    b. No; Go to step 6.

6. Check the oil for signs of fuel intrusion. When there is fuel intrusion into the oil, the oil becomes thin and has a fuel odor. Are there signs of fuel in the oil?
    a. Yes; determine the cause of fuel in the oil. Change the oil and filter. Verify repair.
    b. No; the oil level may have been overfilled by the customer. Correct the oil level. Go to step 7.
7. Turn the ignition ON (key ON, engine OFF).
8. Connect DiagnosticLink ® and check for a biased oil pressure sensor at key ON engine OFF. Does the oil pressure sensor read zero psi?
    a. Yes; Go to step 9.
    b. No; replace the oil pressure sensor. Refer to section "Removal of the Oil Pressure Sensor". Verify repair.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

9. Start the engine and observe the stability of the oil pressure using the chart. Is the oil pressure stable and within normal operating range as per the chart?
    a. Yes; Go to step 10.
    b. No; Go to step 11.
10. Check the Motor Control Module (MCM) software level. Is the MCM software level equal or greater to the levels listed below?
    - GHG14 - 4.7.0.00 fuel map ZGS002
    - EPA10 - 7.6.0.46
    - EPA07 - 13.4.2.0
    a. Yes; Go to step 11.
    b. No; update the MCM software level and release the vehicle. Perform the repair verification. If fault SPN 100/FMI 1 or 17 becomes active, Go to step 11.
11. Inspect the vehicle for aftermarket components plumbed into the oil system. Are there any aftermarket components installed?
    a. Yes; isolate the aftermarket components. Recheck the oil pressure.
    b. No; Go to step 12.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

NOTE: A code will be set when the oil temperature sensor is unplugged.

12. Remove the oil temperature sensor and connect a manual gauge into the oil temperature sensor port. Refer to section "Removal of the Engine Oil Temperature Sensor". Start and run the engine at the rpm listed in the chart. Is the oil pressure, observed on the manual gauge, stable and within normal operating range as per the chart?

a. Yes; reinstall the oil temperature sensor, Refer to section "Installation of the Engine Oil Temperature Sensor". Replace the oil pressure sensor. Refer to section "Removal of the Oil Pressure Sensor". Verify repair. Clear the code. Release the vehicle.
b. No; Go to step 13.

13. Remove and inspect the inlet air temperature sensor, intake manifold pressure sensor, charge air temperature sensor for signs of damage. Is there damage present?
    a. Yes;
       Refer to section "Test-E - Two-Filter Fuel System".
       Refer to section "Test-E - Three-Filter Fuel System".
    b. No; Go to step 14.
14. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter". Is the correct oil filter installed?
    a. Yes; Go to step 15.
    b. No; install the correct oil filter. Verify repair.
15. Inspect the outside of the oil filter for signs of metal or bearing material. Is there an excessive amount of metal or bearing material present on the outside of the filter?
    a. Yes; determine the cause of the excessive metal in the oil. Repair as necessary.
    b. No; Go to step 16.
16. Inspect the oil filter stand pipe and oil bypass valve (located on the top of the stand pipe) for damage. Is there any damage present or is the oil bypass valve missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; Go to step 17.
17. Inspect the oil filter drain back valve located in the bottom of the oil filter housing. Is the oil filter drain back valve damaged or missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; reinstall the oil filter . Refer to section "Replacement of the Oil Filter". Go to step 18.
18. Remove the rocker cover. Refer to section "Removal of the Rocker Cover".
19. Use the oil system adapter J-49181 and oil primer pump tool J-45299 to check for leaks in the upper portion of the engine. Refer to section "Priming the Engine Lubrication System". Are there any leaks present?
    a. Yes; repair as necessary. Verify repair.
    b. No; Go to step 20.
20. Remove the oil pan. Refer to section "Removal of the Oil Pan".
21. Check the torque on the oil suction manifold bolts and oil pump using a torque wrench. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Are the bolts torqued to specification?
    a. Yes; Go to step 22.
    b. No; remove the oil suction manifold and the oil pump. Replace the O-rings, then reinstall the oil pump and oil suction manifold. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.
22. Remove the oil pump, oil suction manifold, and oil lines. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Check the condition of the oil pump, oil suction manifold, suction lines, and O-rings. Is there any damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 23.
23. Inspect the rod and main bearings; Refer to section "DD Platform Bearing Failure Guide" in the *DDC-SVC-MAN-0196 "DD Platform Bearing Failure Guide."* Are the rod and main bearings excessively worn or damaged?
    a. Yes; repair as necessary. Verify repair.
    b. No; replace the oil pump, Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

27 SPN 100/FMI 1 - EPA10 - GHG14

Oil Pressure Very Low

Table 67.

SPN 100/FMI 1	
Description	Fault Code Sets when Engine Oil Pressure is Less than a Calibrated Threshold
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always ON
Monitor Sequence	Key On Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	SEL, CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	Check At Engine Operating Temperature

NOTE: The Common Powertrain Controller (CPC) digital outputs have the same SPN as some Motor Control Module (MCM) faults. DiagnosticLink ® makes the distinction between the MCM and CPC when diagnosing a fault.

Possible causes:
- Failed Oil Pressure Sensor
- Initial Start After Oil Maintenance
- Vehicle is Parked on a Steep Incline
- Improper Oil Level
- Oil Dilution
- Leaks in the Oil Suction Manifold
- Leaks at the Oil Suction Pipes
- Failed Oil Pump

Table 68.

DD15TC and DD16 Minimum Oil Pressure at Operating Temperature		
rpm	**BAR**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

Table 69.

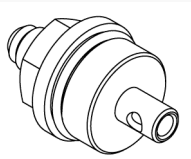
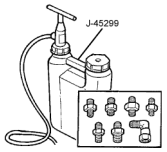
DD15AT Minimum Oil Pressure at Operating Temperature		
rpm	**BAR**	**psi**
600	0.689	10
1200	1.65	24
1800	2.55	37

Table 70.

DD13 Minimum Oil Pressure at Operating Temperature		
rpm	**BAR**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

NOTE: The oil gauge in the dash is NOT used to diagnose or verify low oil pressure concerns.

Table 71.

J-49181	Oil System Priming Adapter	 d580037
J-45299	Oil System Priming Pump	 d580151

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Check for multiple codes. Are there multiple oil pressure sensor circuit fault codes?
    a. Yes; diagnose the oil pressure sensor circuit fault codes first.
    b. No; Go to step 2.
2. With the vehicle parked on a flat, level surface, check the engine oil level after the engine has been shut off for at least 20 minutes. Is the engine oil at the correct level?
    a. Yes; Go to step 7.
    b. No; Go to step 3.

NOTE: An increase in the oil level suggests that there may be fuel or coolant entering the engine oil.

3. Is the oil level overfilled?
    a. Yes; Go to step 5.
    b. No; Go to step 4.
4. Use the manufacturer recommended oil to fill the engine oil to the correct level. Check for external engine oil leaks and repair as necessary. Verify repair.
5. Check the oil for signs of coolant intrusion. When there is coolant intrusion, the oil will exhibit a milky appearance or become thick and sludgy. Are there signs of coolant in the oil?
    a. Yes; Refer to section "Coolant in Oil". Verify repair.
    b. No; Go to step 6.
6. Check the oil for signs of fuel intrusion. When there is fuel intrusion into the oil, the oil becomes thin and has a fuel odor. Are there signs of fuel in the oil?

a. Yes; determine the cause of fuel in the oil. Change the oil and filter. Verify repair.
b. No; the oil level may have been overfilled by the customer. Correct the oil level. Go to step 7.

7. Turn the ignition ON (key ON, engine OFF).
8. Connect DiagnosticLink ® and check for a biased oil pressure sensor at key ON engine OFF. Does the oil pressure sensor read zero psi?
   a. Yes; Go to step 9.
   b. No; replace the oil pressure sensor. Refer to section "Removal of the Oil Pressure Sensor". Verify repair.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

9. Start the engine and observe the stability of the oil pressure using the chart. Is the oil pressure stable and within normal operating range as per the chart?
   a. Yes; Go to step 10.
   b. No; Go to step 11.
10. Check the Motor Control Module (MCM) software level. Is the MCM software level equal or greater to the levels listed below?
    - GHG14 - 4.7.0.00 fuel map ZGS002
    - EPA10 - 7.6.0.46
    - EPA07 - 13.4.2.0
    a. Yes; Go to step 11.
    b. No; update the MCM software level and release the vehicle. Perform the repair verification. If fault SPN 100/FMI 1 or 17 becomes active, Go to step 11.
11. Inspect the vehicle for aftermarket components plumbed into the oil system. Are there any aftermarket components installed?
    a. Yes; isolate the aftermarket components. Recheck the oil pressure.
    b. No; Go to step 12.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

NOTE: A code will be set when the oil temperature sensor is unplugged.

12. Remove the oil temperature sensor and connect a manual gauge into the oil temperature sensor port. Refer to section "Removal of the Engine Oil Temperature Sensor". Start and run the engine at the rpm listed in the chart. Is the oil pressure, observed on the manual gauge, stable and within normal operating range as per the chart?

a. Yes; reinstall the oil temperature sensor. Refer to section "Installation of the Engine Oil Temperature Sensor". Replace the oil pressure sensor. Refer to section "Removal of the Oil Pressure Sensor". Verify repair. Clear the code. Release the vehicle.
b. No; Go to step 13.

13. Remove and inspect the inlet air temperature sensor, intake manifold pressure sensor, charge air temperature sensor for signs of damage. Is there damage present?
    a. Yes;
       Refer to section "Test-E - Two-Filter Fuel System".
       Refer to section "Test-E - Three-Filter Fuel System".
    b. No; Go to step 14.
14. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter". Is the correct oil filter installed?
    a. Yes; Go to step 15.
    b. No; install the correct oil filter. Verify repair.
15. Inspect the outside of the oil filter for signs of metal or bearing material. Is there an excessive amount of metal or bearing material present on the outside of the filter?
    a. Yes; determine the cause of the excessive metal in the oil. Repair as necessary.
    b. No; Go to step 16.
16. Inspect the oil filter stand pipe and oil bypass valve (located on the top of the stand pipe) for damage. Is there any damage present or is the oil bypass valve missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; Go to step 17.
17. Inspect the oil filter drain back valve located in the bottom of the oil filter housing. Is the oil filter drain back valve damaged or missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; reinstall the oil filter . Refer to section "Replacement of the Oil Filter". Go to step 18.
18. Remove the rocker cover. Refer to section "Removal of the Rocker Cover".
19. Use the oil system adapter J-49181 and oil primer pump tool J-45299 to check for leaks in the upper portion of the engine. Refer to section "Priming the Engine Lubrication System". Are there any leaks present?
    a. Yes; repair as necessary. Verify repair.
    b. No; Go to step 20.
20. Remove the oil pan. Refer to section "Removal of the Oil Pan".
21. Check the torque on the oil suction manifold bolts and oil pump using a torque wrench. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Are the bolts torqued to specification?
    a. Yes; Go to step 22.
    b. No; remove the oil suction manifold and the oil pump. Replace the O-rings, then reinstall the oil pump and oil suction manifold. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.
22. Remove the oil pump, oil suction manifold, and oil lines. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Check the condition of the oil pump, oil suction manifold, suction lines, and O-rings. Is there any damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 23.
23. Inspect the rod and main bearings; Refer to section "DD Platform Bearing Failure Guide" in the *DDC-SVC-MAN-0196 "DD Platform Bearing Failure Guide."* Are the rod and main bearings excessively worn or damaged?
    a. Yes; repair as necessary. Verify repair.
    b. No; replace the oil pump, Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

28 SPN 100/FMI 18 - EPA10 - GHG14

Oil Pressure Low

Table 72.

SPN 100/FMI 18	
Description	Fault Code Sets when Engine Oil Pressure is Less than a Calibrated Threshold
Monitored Parameter	Engine Oil Pressure
Typical Enabling Conditions	Always ON
Monitor Sequence	Key On Engine Running
Execution Frequency	Continuous When Enabling Conditions Are Met
Typical Duration	Two Seconds
Dash Lamps	SEL, CEL
Engine Reaction	None, Engine Derate or Engine Shut Down - Calibration Dependent
Verification	Check At Engine Operating Temperature

NOTE: The Common Powertrain Controller (CPC) digital outputs have the same SPN as some Motor Control Module (MCM) faults. DiagnosticLink ® makes the distinction between the MCM and CPC when diagnosing a fault.

Possible causes:
- Failed Oil Pressure Sensor
- Initial Start After Oil Maintenance
- Vehicle is Parked on a Steep Incline
- Improper Oil Level
- Oil Dilution
- Leaks in the Oil Suction Manifold
- Leaks at the Oil Suction Pipes
- Failed Oil Pump

Table 73.

DD15TC and DD16 Minimum Oil Pressure at Operating Temperature		
rpm	**BAR**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

Table 74.

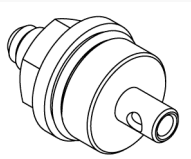
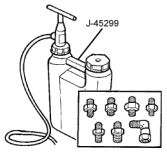
DD15AT Minimum Oil Pressure at Operating Temperature		
rpm	**BAR**	**psi**
600	0.689	10
1200	1.65	24
1800	2.55	37

Table 75.

DD13 Minimum Oil Pressure at Operating Temperature		
rpm	**BAR**	**psi**
600	0.758	11
1200	1.65	24
1800	2.55	37

NOTE: The oil gauge in the dash is NOT used to diagnose or verify low oil pressure concerns.

Table 76.

J-49181	Oil System Priming Adapter	 d580037
J-45299	Oil System Priming Pump	 d580151

NOTE: If diagnostic leads to a mechanical (non-electrical) low oil pressure condition, all mains and connecting rods should be inspected. Refer to section "Inspection of the Main and Connecting Rod Bearings in Chassis".

Check as follows:

1. Check for multiple codes. Are there multiple oil pressure sensor circuit fault codes?
    a. Yes; diagnose the oil pressure sensor circuit fault codes first.
    b. No; Go to step 2.
2. With the vehicle parked on a flat, level surface, check the engine oil level after the engine has been shut off for at least 20 minutes. Is the engine oil at the correct level?
    a. Yes; Go to step 7.
    b. No; Go to step 3.

NOTE: An increase in the oil level suggests that there may be fuel or coolant entering the engine oil.

3. Is the oil level overfilled?
    a. Yes; Go to step 5.
    b. No; Go to step 4.
4. Use the manufacturer recommended oil to fill the engine oil to the correct level. Check for external engine oil leaks and repair as necessary. Verify repair.
5. Check the oil for signs of coolant intrusion. When there is coolant intrusion, the oil will exhibit a milky appearance or become thick and sludgy. Are there signs of coolant in the oil?
    a. Yes; Refer to section "Coolant in Oil". Verify repair.
    b. No; Go to step 6.
6. Check the oil for signs of fuel intrusion. When there is fuel intrusion into the oil, the oil becomes thin and has a fuel odor. Are there signs of fuel in the oil?

a. Yes; determine the cause of fuel in the oil. Change the oil and filter. Verify repair.
b. No; the oil level may have been overfilled by the customer. Correct the oil level. Go to step 7.

7. Turn the ignition ON (key ON, engine OFF).
8. Connect DiagnosticLink ® and check for a biased oil pressure sensor at key ON engine OFF. Does the oil pressure sensor read zero psi?
   a. Yes; Go to step 9.
   b. No; replace the oil pressure sensor. Refer to section "Removal of the Oil Pressure Sensor". Verify repair.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

9. Start the engine and observe the stability of the oil pressure using the chart. Is the oil pressure stable and within normal operating range as per the appropriate "Minimum Oil Pressure at Operating Temperature" chart at the top of this procedure?
   a. Yes; Go to step 10.
   b. No; Go to step 11.
10. Check the Motor Control Module (MCM) software level. Is the MCM software level equal or greater to the levels listed below?
    - GHG14 - 4.7.0.00 fuel map ZGS002
    - EPA10 - 7.6.0.46
    - EPA07 - 13.4.2.0
      a. Yes; Go to step 11.
      b. No; update the MCM software level and release the vehicle. Perform the repair verification. If fault SPN 100/FMI 1 becomes active, Go to step 11.
11. Inspect the vehicle for aftermarket components plumbed into the oil system. Are there any aftermarket components installed?
    a. Yes; isolate the aftermarket components. Recheck the oil pressure.
    b. No; Go to step 12.

WARNING: PERSONAL INJURY

To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked.

WARNING: ENGINE EXHAUST

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

NOTE: A code will be set when the oil temperature sensor is unplugged.

12. Remove the oil temperature sensor and connect a manual gauge into the oil temperature sensor port. Refer to section "Removal of the Engine Oil Temperature Sensor". Start and run the engine at the rpm listed in the chart. Is the oil pressure, observed on the manual gauge, stable and within normal operating range as per the appropriate "Minimum Oil Pressure at Operating Temperature" chart at the top of this procedure?

a. Yes; reinstall the oil temperature sensor. Refer to section "Installation of the Engine Oil Temperature Sensor". Replace the oil pressure sensor. Refer to section "Removal of the Oil Pressure Sensor". Verify repair. Clear the code. Release the vehicle.
b. No; Go to step 13.

13. Remove and inspect the inlet air temperature sensor, intake manifold pressure sensor, charge air temperature sensor for signs of damage. Is there damage present?
    a. Yes;
       Refer to section "Test-E - Two-Filter Fuel System".
       Refer to section "Test-E - Three-Filter Fuel System".
    b. No; Go to step 14.
14. Remove the oil filter and verify that the correct oil filter is installed. Refer to section "Replacement of the Oil Filter". Is the correct oil filter installed?
    a. Yes; Go to step 15.
    b. No; install the correct oil filter. Verify repair.
15. Inspect the outside of the oil filter for signs of metal or bearing material. Is there an excessive amount of metal or bearing material present on the outside of the filter?
    a. Yes; determine the cause of the excessive metal in the oil. Repair as necessary.
    b. No; Go to step 16.
16. Inspect the oil filter stand pipe and oil bypass valve (located on the top of the stand pipe) for damage. Is there any damage present or is the oil bypass valve missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; Go to step 17.
17. Inspect the oil filter drain back valve located in the bottom of the oil filter housing. Is the oil filter drain back valve damaged or missing?
    a. Yes; replace the oil filter module. Verify repair.
    b. No; reinstall the oil filter. Refer to section "Replacement of the Oil Filter". Go to step 18.
18. Remove the rocker cover. Refer to section "Removal of the Rocker Cover".
19. Use the oil system adapter J-49181 and oil primer pump tool J-45299 to check for leaks in the upper portion of the engine. Refer to section "Priming the Engine Lubrication System". Are there any leaks present?
    a. Yes; repair as necessary. Verify repair.
    b. No; Go to step 20.
20. Remove the oil pan. Refer to section "Removal of the Oil Pan".
21. Check the torque on the oil suction manifold bolts and oil pump using a torque wrench. Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Are the bolts torqued to specification?
    a. Yes; Go to step 22.
    b. No; remove the oil suction manifold and the oil pump. Replace the O-rings, then reinstall the oil pump and oil suction manifold. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.
22. Remove the oil pump, oil suction manifold, and oil lines. Refer to section "Removal of the Oil Pump, Oil Suction Manifold, and Oil Lines". Check the condition of the oil pump, oil suction manifold, suction lines, and O-rings. Is there any damage present?
    a. Yes; repair as necessary. Verify repairs.
    b. No; Go to step 23.
23. Inspect the rod and main bearings; Refer to section "DD Platform Bearing Failure Guide" in the *DDC-SVC-MAN-0196 "DD Platform Bearing Failure Guide."* Are the rod and main bearings excessively worn or damaged?
    a. Yes; repair as necessary. Verify repair.
    b. No; replace the oil pump, Refer to section "Installation of the Oil Pump, Oil Suction Manifold, and Oil Lines". Verify repair.

