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Service Information Bulletin

SUBJECT	DATE
Symptom Diagnostics - Oil Leaks	March 2017

Additions, Revisions, or Updates

Publication Number / Title	Platform	Section Title	Change
DDC-SVC-MAN-0193	GHG17 Medium Duty	Engine Oil Leaks	This is a new diagnostic procedure.

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2 Engine Oil Leaks

NOTE: Detroit™ and the Department of Transportation (DOT) define an external fluid leak as a condition where fluids are pooling or leaking onto the ground.

NOTE: Block porosity is an immediate issue and does not happen over time. If there was a block porosity concern present, the porosity issue would be evident when the engine is new.

Check as follows:

1. Was an oil change recently performed on this vehicle?
   a. Yes; check to make sure that the oil filter and drain plug were properly installed and clean any oil presence spilled from the previous service interval.
   b. No; Go to step 2.
2. Is oil pooling or leaking onto the ground?
   a. Yes; Go to step 3.
   b. No; no leaks are present. Release the vehicle. Refer to 12WO-2 (https://ddcsn-ddc.freightliner.com/cps/rde/xbcr/ddcsn/12WO2_Warranty_Component_Evaluation_for_Fluid_Leaks_FINAL_REVIEW.pdf).
3. Check vehicle repair history. Are there any recent repairs that could have resulted on oil spills on the engine that would appear as an oil leak?
   a. Yes; examine the oil spill area of the engine to make sure it is not being perceived as an oil leak.
   b. No; Go to step 4.

NOTE: Isolating the exact location can be difficult due to fan blast and road grime that can cause the leaking oil to migrate. Oil leaks tend to move in a downward and rearward direction. Look for the highest point of any oil trace.

4. Inspect the entire vehicle for signs of leaks, note any leaks that could be confused for an engine oil leak. Was the source of the leak identified as not being caused by the engine?
   a. Yes; the source of the leak is not from the engine.
   b. No; Go to step 5.
5. Check the positioning of the oil filler cap, making sure the tabs on the cap are properly latched onto the rocker cover. When the oil filler cap is not on correctly, oil will tend to pool around the cap. Is the oil filler cap properly installed?

Table 1.

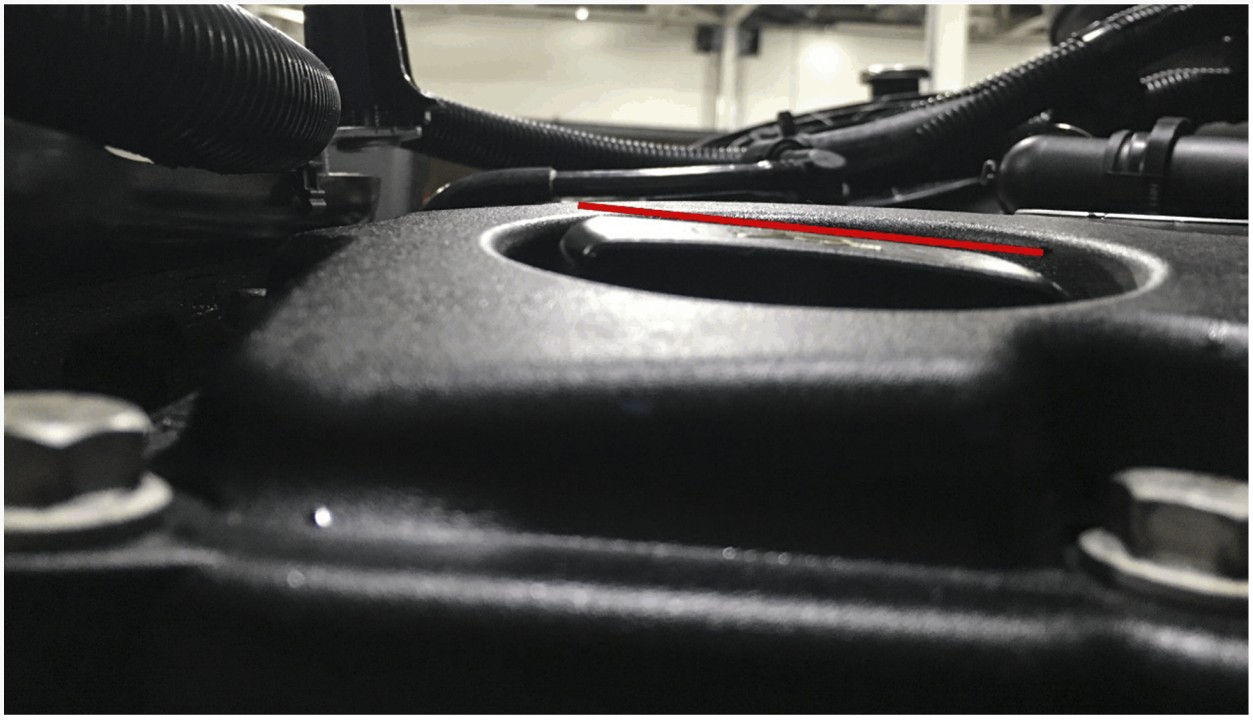
NOTE: Oil fill cap correctly latched. Note the angle of the cap and how the cap sits flush on the front and slightly lower on the back.
 d180128

Table 2.

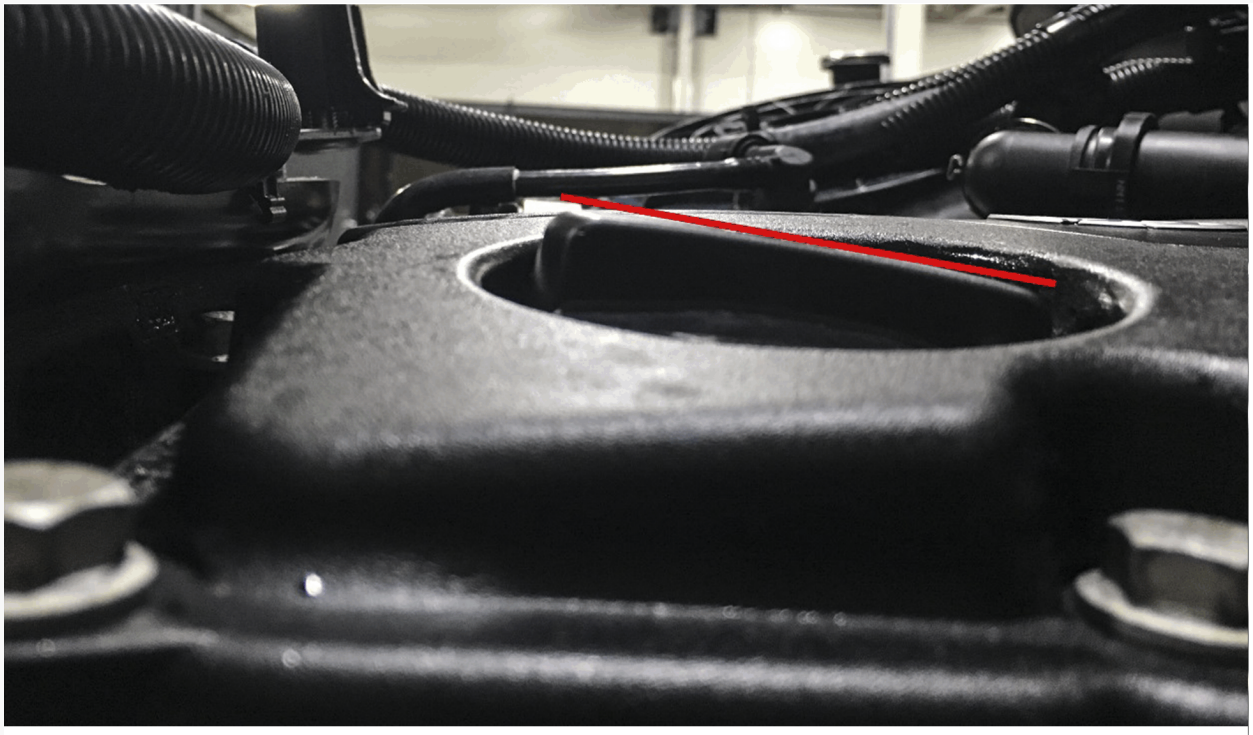
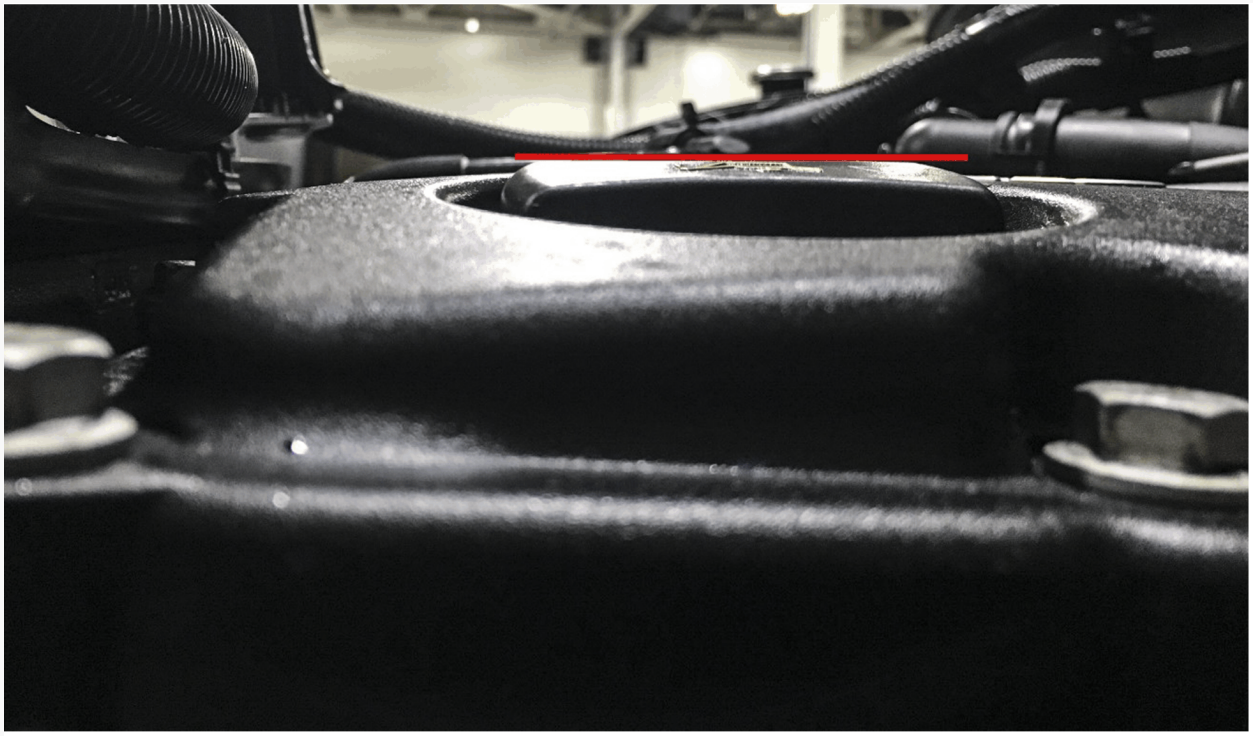
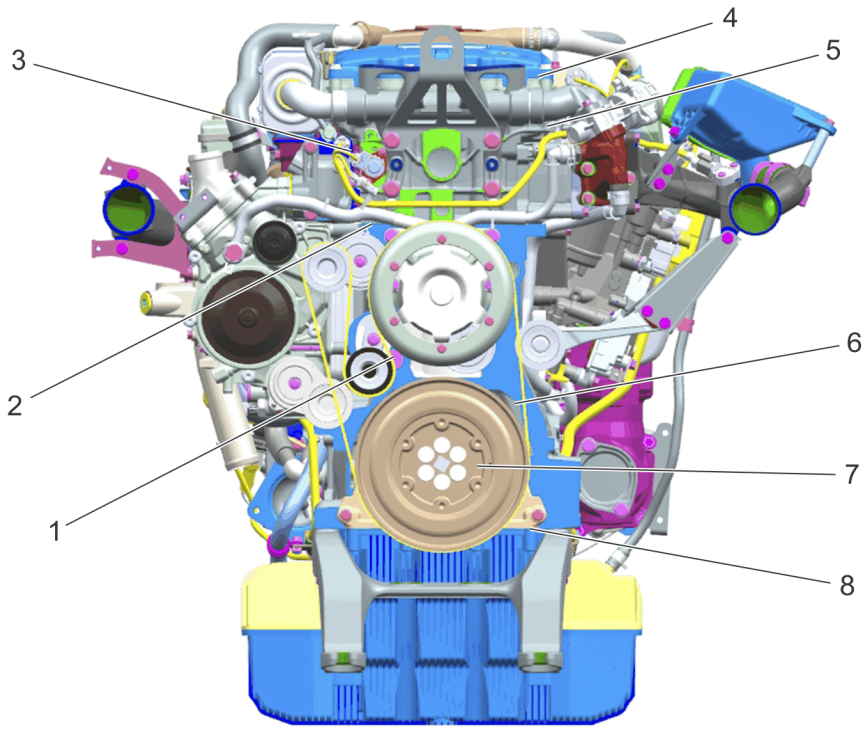
NOTE: Oil fill cap incorrectly latched only on the back. Note the high angle of the cap and how the cap sits higher on the front.
 d180129

Table 3.

NOTE: Oil fill cap incorrectly latched only on the front. Note the horizontal position of the cap and how the cap does not sit lower on the back.
 d180130

a. Yes; Go to step 6.
b. No; reinstall the oil cap making sure both tabs are latched onto the rocker cover.

6. Visually inspect the rocker cover gasket starting at the left front of the engine and continue down the left side to the rear of the engine. Are there any external oil leaks coming from the rocker cover gasket?
   a. Yes; replace the rocker cover gasket.
      For DD5; Refer to section "Removal of the Rocker Cover"
      For DD8; Refer to section "Removal of the Rocker Cover"
   b. No; Go to step 7.
7. Visually inspect the rocker arm housing seal starting at the front left and continue down the left side to the rear. Pay special attention to the rear corner as leaks are hard to see in this area. Are there any external oil leaks coming from the rocker arm housing seal?
   a. Yes; replace the rocker arm housing seal.
      For DD5; Refer to section "Removal of the Rocker Arm Housing and Camshafts"
      For DD8; Refer to section "Removal of the Rocker Arm Housing and Camshafts"
   b. No; Go to step 8.
8. Visually inspect the cylinder head gasket, starting at the left front of the engine and continue down the left side to the rear of the engine. Are there any external oil leaks coming from the cylinder head gasket?
   a. Yes; remove the cylinder head and inspect the head gasket oil supply and return seals for damage. Repair as necessary.
      For DD5; Refer to section "Removal of the Cylinder Head Assembly"
      For DD8; Refer to section "Removal of the Cylinder Head Assembly"
   b. No; Go to step 9.
9. Is oil leaking from the front of the engine? (See figure below).

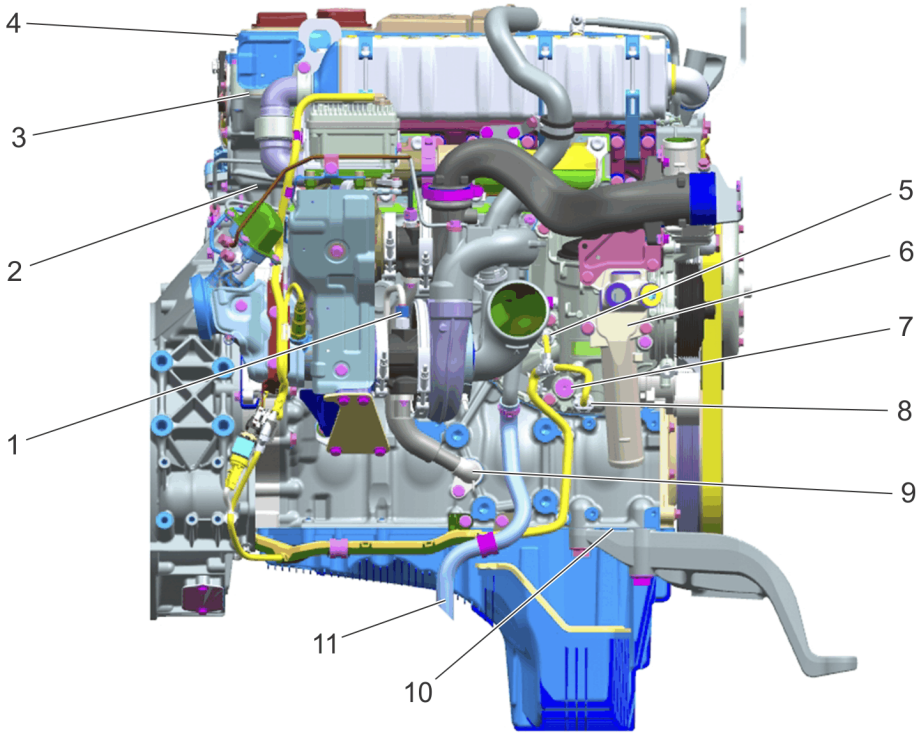


1. Oil Gallery Cup Plugs
2. Cylinder Head Gasket
3. Engine Brake Solenoid
4. Rocker Cover Gasket
5. Rocker Arm Housing Seal
6. Front Cover Seal (behind damper)
7. Crankshaft Seal (behind damper)
8. Oil Pan Gasket

Figure 1. Front of Engine

a. Yes; Go to step 10.
b. No; Go to step 13.

10. Visually inspect the engine brake solenoid. Are there any external leaks present?
    a. Yes; repair as necessary.
    b. No; Go to step 11.
11. Visually inspect the oil gallery cup plugs in the cylinder block. Is there an external leak present?
    a. Yes, repair as necessary.
    b. No; Go to step 12.
12. Looking behind the damper inspect for a leaking front cover seal or a leaking crankshaft seal. Is either seal leaking?
    a. Yes; repair as necessary.
    b. No; Go to step 40.
13. Is oil leaking from the right side of the engine? (See figure below).



1. Turbo Oil Supply
2. Cylinder Head Gasket
3. Rocker Arm Housing Seal
4. Rocker Cover Gasket
5. Oil Temperature Sensor
6. Oil Coolant Module
7. Oil Priming Port Plug
8. Oil Pressure Switch
9. Turbo Oil Return
10. Oil Pan Gasket
11. Crankcase Breather Pipe

Figure 2. Right Side

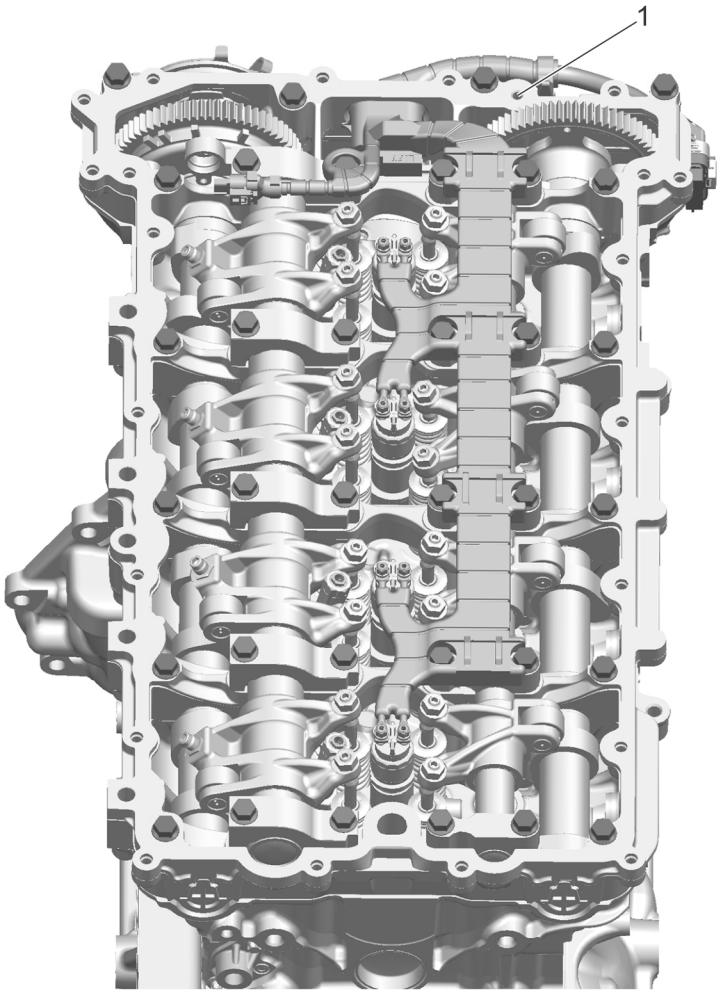
a. Yes; Go to step 14.
b. No; Go to step 25.

NOTE: When inspecting the oil coolant module, keep in consideration that oil will sometimes get spilled around the filler neck and oil filter cap area during service intervals. These spills can sometimes lead to misdiagnosis.

14. Inspect the oil coolant module. Check for leaks at the oil fill neck, oil filter cap, at the oil thermostat cover, at the plugs, and around the sealing surface between the oil coolant module and the engine block. Are there any external oil leaks present?
    a. Yes; repair as necessary.
    b. No; Go to step 15.
15. Visually inspect the oil priming port plug. Are there any external leaks present?
    a. Yes; repair as necessary.
    b. No; Go to step 16.
16. Visually inspect the oil pressure switch. Are there any external leaks present?
    a. Yes; repair as necessary.
    b. No; Go to step 17.
17. Visually inspect the oil temperature sensor. Are there any external leak present?
    a. Yes; repair as necessary.
    b. No; Go to step 18.
18. Is oil leaking at the boost pipe?
    a. Yes; inspect for loose clamps, seeping, worn or damaged boost pipe and for a dirty air filter. Then go to step 19

b. No; Go to step 19.

19. Inspect the turbocharger assembly and related parts. Check for leaks at the inlet and outlet pipes, around the oil supply and drain lines, around the sealing surface between the turbocharger assembly and the engine block. Are there any external oil leaks present?
    For DD5; Refer to section "Cleaning and Inspection of the Turbocharger Assembly"
    For DD8 dual stage; Refer to section "Cleaning and Inspection of the Turbocharger Assembly"
    For DD8 single stage; Refer to section "Cleaning and Inspection of the Turbocharger Assembly"
    a. Yes; repair as necessary.
    b. No; Go to step 20.
20. Inspect the Crankcase Breather Pipe. Is there oil leaking from the pipe?
    a. Yes; Go to step 21.
    b. No; Go to step 40.
21. Check crankcase pressure; Refer to section "Crankcase Pressure Test". Is the crankcase pressure within specifications?
    a. Yes; Go to step 22.
    b. No; diagnose the cause of high crankcase pressure. Refer to section "Mechanical Cylinder Compression Test".
22. Perform a relative cylinder compression test; Refer to section "Relative Cylinder Compression Test". Do all of the cylinders have compression values above 87%?
    a. Yes; Go to step 23.
    b. No; diagnose the cause of low cylinder compression pressure. Refer to section "Mechanical Cylinder Compression Test".
23. Remove the rocker cover.
    For DD5; Refer to section "Removal of the Rocker Cover"
    For DD8; Refer to section "Removal of the Rocker Cover"



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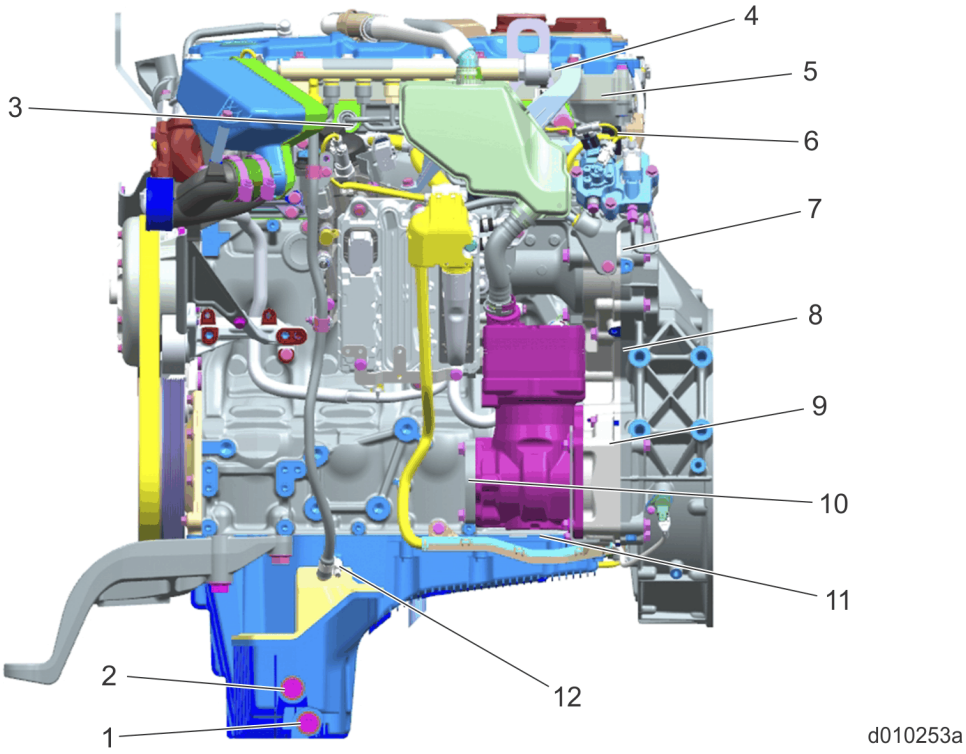
24. Install a gauged vacuum pump on the port indicated by the image above. Apply vacuum pressure to the port and hold the pressure for 30 seconds. Does the port hold pressure?
    a. Yes; replace the rocker cover.
    b. No; remove the cylinder head and replace the Crankcase Ventilation Oil Return Check valve.
       For DD5; Refer to section "Removal of the Cylinder Head Assembly"
       For DD8; Refer to section "Removal of the Cylinder Head Assembly"
25. Is oil leaking from the left side of the engine? (See figure below).



1. Oil Drain Plug
2. Oil Pan Upper Plug
3. High Pressure Transfer Line Seals
4. Rocker Cover Gasket
5. Rocker Arm Housing Seal
6. Cylinder Head Gasket
7. High Pressure Pump Mounting Seal
8. Flywheel Housing
9. Air Compressor Mounting Seal
10. Power Steering Pump Mounting Gasket
11. Oil Pan Gasket
12. Oil Dipstick Tube

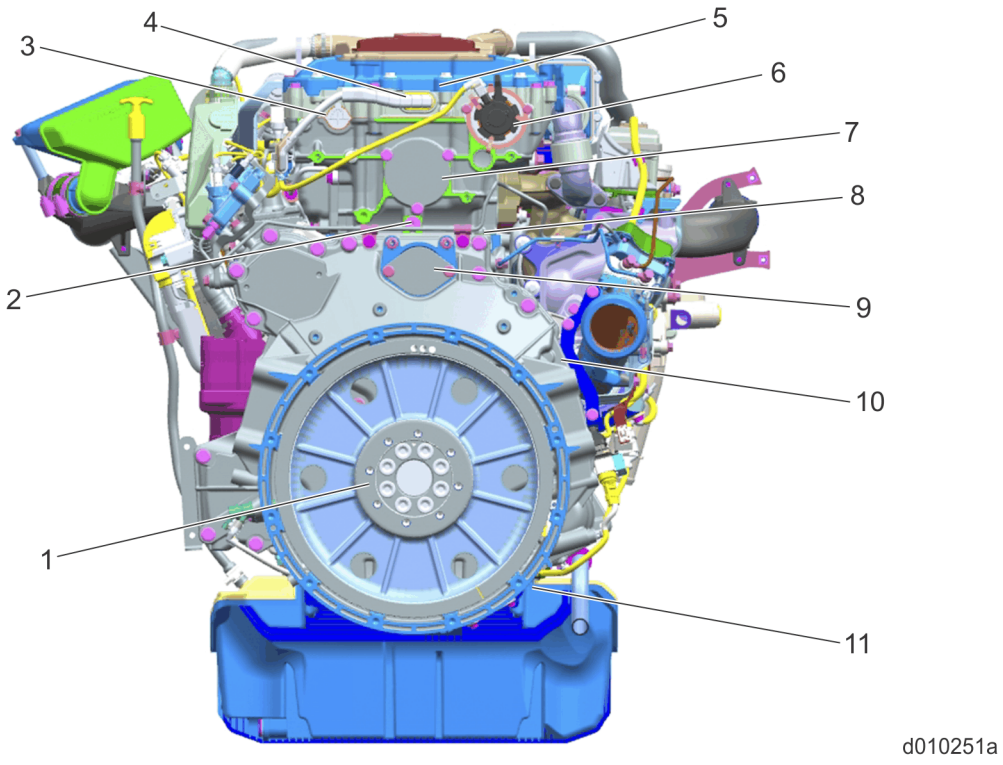
Figure 3. Left Side

a. Yes; Go to step 26.
b. No; Go to step 33.

26. Inspect the oil drain plug and oil pan upper plug. Is there an oil leak present?
    a. Yes; repair as necessary.
    b. No; Go to step 27.
27. Visually inspect the high pressure fuel injector line seals for each cylinder. Are any of the high pressure fuel injector line seals leaking?
    a. Yes; replace the high pressure fuel line injector line seal(s) that are leaking.
    b. No; Go to step 28.
28. Check for leaks at the High Pressure Fuel Pump (HPFP). Are there any external oil leaks at the HPFP or where the HPFP mates to the engine block?
    a. Yes; repair as necessary.
    b. No; Go to step 29.
29. Visually inspect the air compressor assembly for leaks. Are there any external oil leaks present?
    a. Yes; replace the air compressor.
    b. No; Go to step 30.
30. Inspect the air compressor flange where it mates to the engine block. Is there an external oil leak present?
    a. Yes; remove the air compressor, clean the area, replace the seal and reinstall the air compressor.
    b. No; Go to step 31.
31. Inspect the seal between the rear of the air compressor and the power steering pump. Is there an external oil leak present?

a. Yes; remove the power steering pump, replace the seal and reinstall the power steering pump.
b. No; Go to step 32.

32. Inspect the oil dipstick tube. Are there any external oil leaks present? (See figure below).



1. Crankshaft Seal
2. Cylinder Head Plug
3. Rocker Arm Housing Seal
4. Injector Harness Seal
5. Rocker Cover Gasket
6. Variable Cam Phaser Solenoid
7. Access Plate for #5 Idler
8. Cylinder Head Gasket
9. Access Plate for #4 Idler
10. Flywheel Housing
11. Oil Pan Gasket

Figure 4. Rear of Engine

a. Yes; repair as necessary.
b. No; Go to step 40.

33. Visually inspect the injector harness seal. Are there any external leaks present?
a. Yes; replace the injector harness seal.
b. No; Go to step 34.

34. Visually inspect the variable cam phaser solenoid for leaks. Is an external oil leak present?
a. Yes; replace the variable cam phaser solenoid.
b. No; Go to step 35.

35. Visually inspect the rocker arm housing seal. Is there an external oil leak present?
a. Yes; replace the cam housing seal.
For DD5; Refer to section "Removal of the Rocker Arm Housing and Camshafts"
For DD8; Refer to section "Removal of the Rocker Arm Housing and Camshafts"
b. No; Go to step 36.

36. Visually inspect the cylinder head plug. Is there an external oil leak present?
a. Yes; repair as necessary.
b. No; Go to step 37.

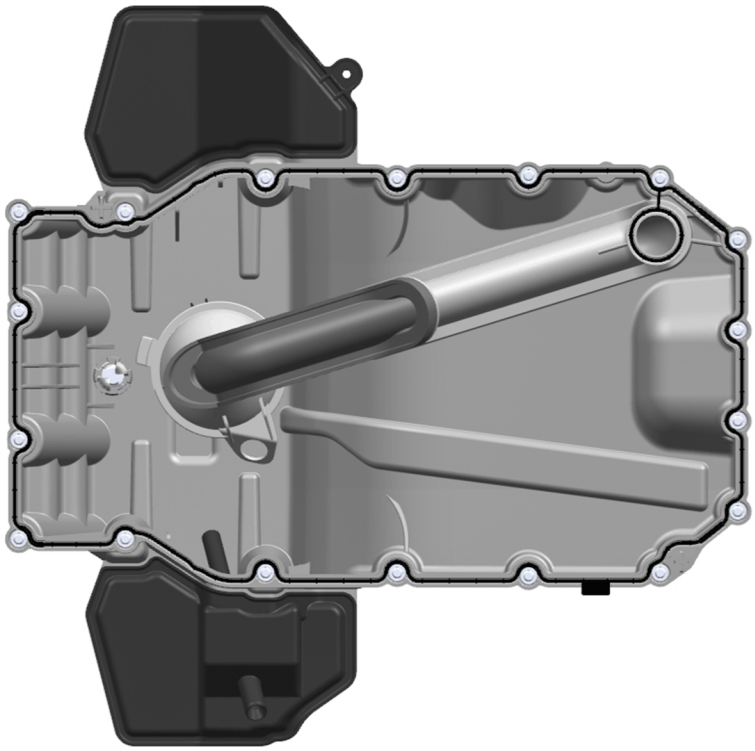
37. Visually inspect the access plate for #5 idler. Is there an external oil leak present?
a. Yes; remove and reseal access plate #5.

b. No; Go to step 38.

38. Visually inspect the access plate for #4 idler. Is there an external oil leak present?
    a. Yes; remove and reseal access plate #4.
    b. No; Go to step 39.
39. Visually inspect the flywheel housing for leaks. Is there a leak on the lower six inches of the flywheel housing?
    a. Yes; Go to step 40.
    b. No; the oil leak is generated by either the flywheel housing gasket or the rear crank seal. Inspect and repair as necessary.

NOTE: For oil pan gasket warranty submissions, you may choose to use the image below to mark the location of the leak on the oil pan gasket. When replacing a DD5 oil pan gasket, Refer to section "Installation of the Oil Pan". When replacing a DD8 oil pan gasket, Refer to section "Installation of the Oil Pan".

40. Inspect the oil pan starting at the front of the engine working towards the rear of the engine. Is there an external oil leak present?



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    a. Yes; repair as necessary.
       For DD5; Refer to section "Removal of the Oil Pan"
       For DD8; Refer to section "Removal of the Oil Pan"
    b. No; the exact location of the leak was not identified. Refer to section "Engine Oil Leaks - Oil Developer Method".

