
Table of Contents

Component Exploded View.....	255
Removal.....	257
Oil System Module.....	257
Secondary Filtration Assembly.....	260
Disassembling the Oil System Module.....	260
Disassembling the Secondary Filtration Filter.....	263
Cleaning and Inspection.....	263
Cleaning the Oil System Module.....	263
Checking the Oil Cooler for Leakage.....	264
External.....	264
Internal.....	266
Installation.....	266
Assembling the Oil System Module.....	266
Assembling the Secondary Filtration Filter.....	268
Secondary Filtration Assembly.....	268
Oil System Module.....	269
Priming the Lubrication System.....	271
Specifications.....	272
Special Torque.....	272
Special Service Tools.....	272

Component Exploded View

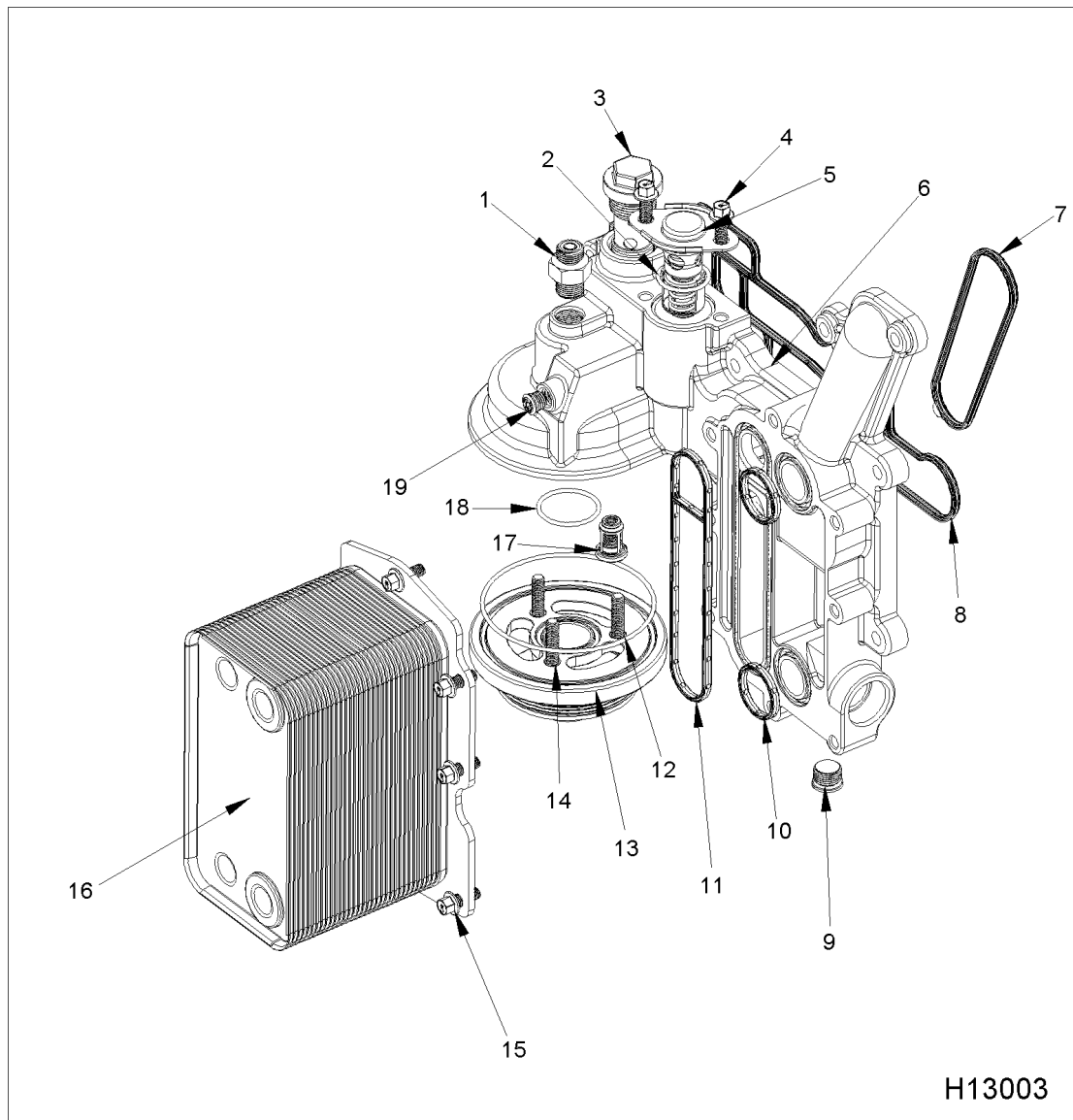


Figure 369 Oil system module assembly

- | | | |
|---------------------------------------|------------------------------------|----------------------------------|
| 1. Oil supply tube fitting and O-ring | 8. Oil gasket | 15. Bolt, M8 x 20 (8) |
| 2. O-ring gasket | 9. Plug assembly, M18 (coolant) | 16. Oil cooler (23 or 33 plates) |
| 3. Regulator valve assembly | 10. Coolant seal (2) | 17. Bypass valve |
| 4. Hex flange screw, M8 x 20 (2) | 11. Oil gasket | 18. O-ring gasket |
| 5. Oil thermal valve assembly | 12. O-ring gasket | 19. Plug assembly, M12 |
| 6. Oil cooler housing | 13. Lube adapter (not serviceable) | |
| 7. Coolant seal | 14. Bolt, M8 x 25 (3) | |

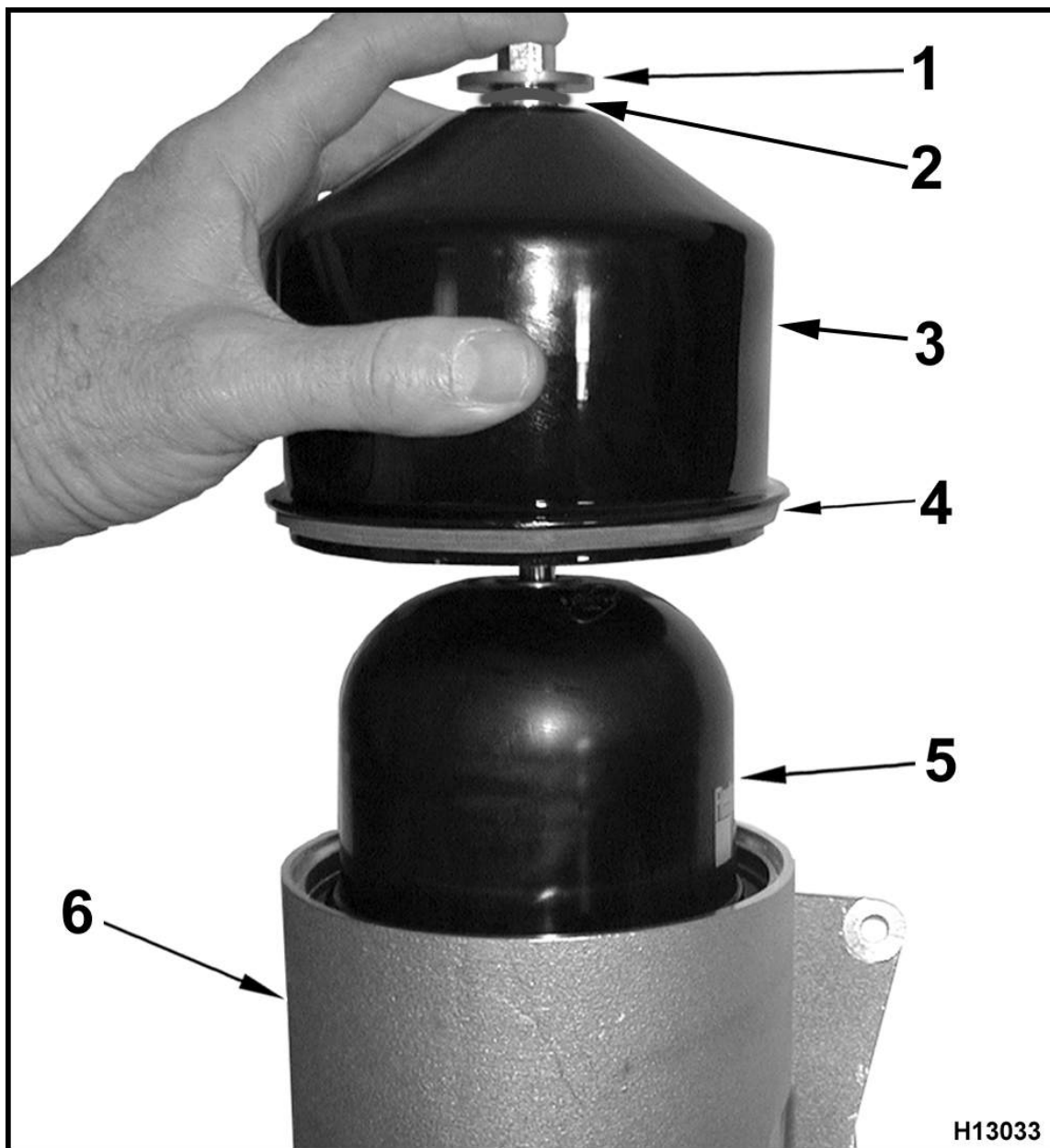


Figure 370 Secondary filter components

- | | | |
|------------------|------------------|-------------------|
| 1. Stud assembly | 3. Cover | 5. Filter element |
| 2. O-ring | 4. O-ring gasket | 6. Filter header |

Removal

Oil System Module

! WARNING: To avoid serious personal injury, possible death, or damage to the engine or vehicle, read all safety instructions in the "Safety Information" section of this manual.

! WARNING: To avoid serious personal injury, possible death, or damage to the engine or vehicle, make sure the transmission is in neutral, parking brake is set, and wheels are blocked before doing diagnostic or service procedures on engine or vehicle.

! WARNING: To avoid serious personal injury or possibly death, do not remove the oil system module from a hot engine. Wait until engine cools down before removing.

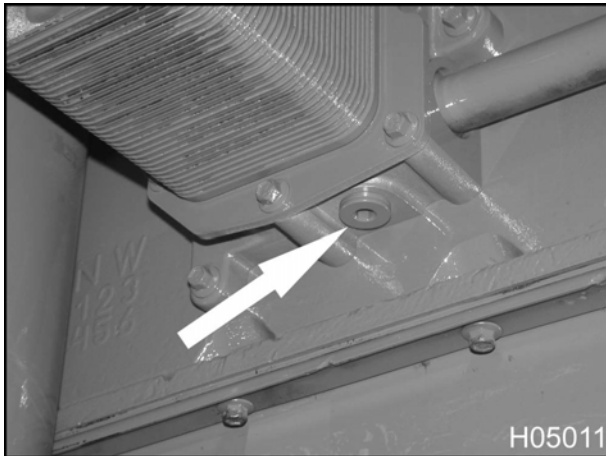


Figure 371 Coolant drain plug

1. Place a coolant drain pan under the oil system module.

2. Remove the coolant drain plug (M18) at the bottom of the oil system module.
3. Remove coolant drain plug O-ring and discard.

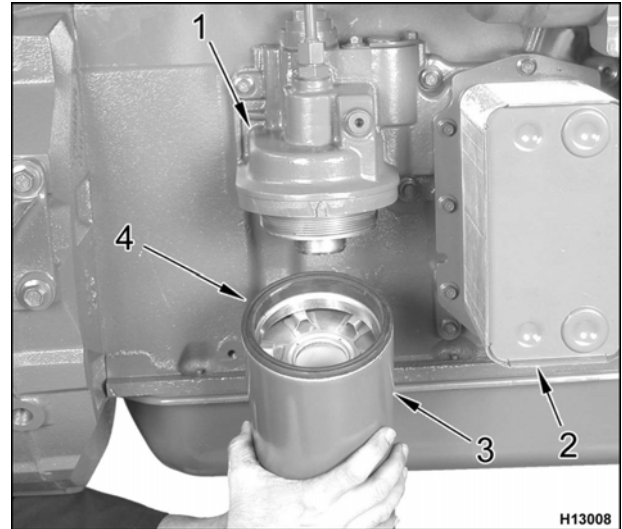


Figure 372 Removing the oil filter

1. Oil system module assembly
2. Oil cooler
3. Oil filter
4. Gasket

4. Place an oil drain pan under oil filter. After waiting for oil to cool down, remove, drain, and discard oil filter. Dispose or recycle oil and filter in accordance with local regulations.

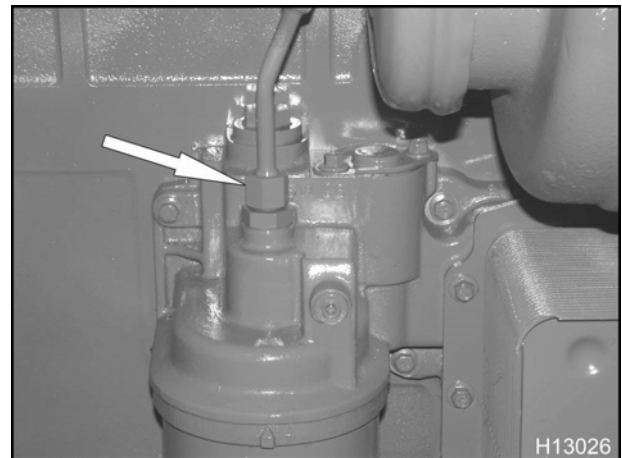


Figure 373 VGT oil supply tubing

5. Remove the VGT oil supply tube fitting from the oil system module assembly.

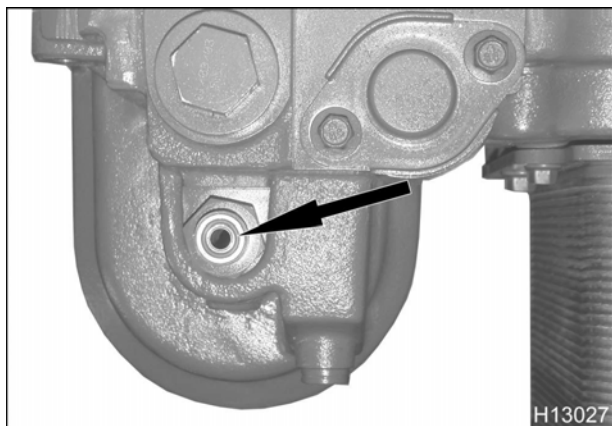
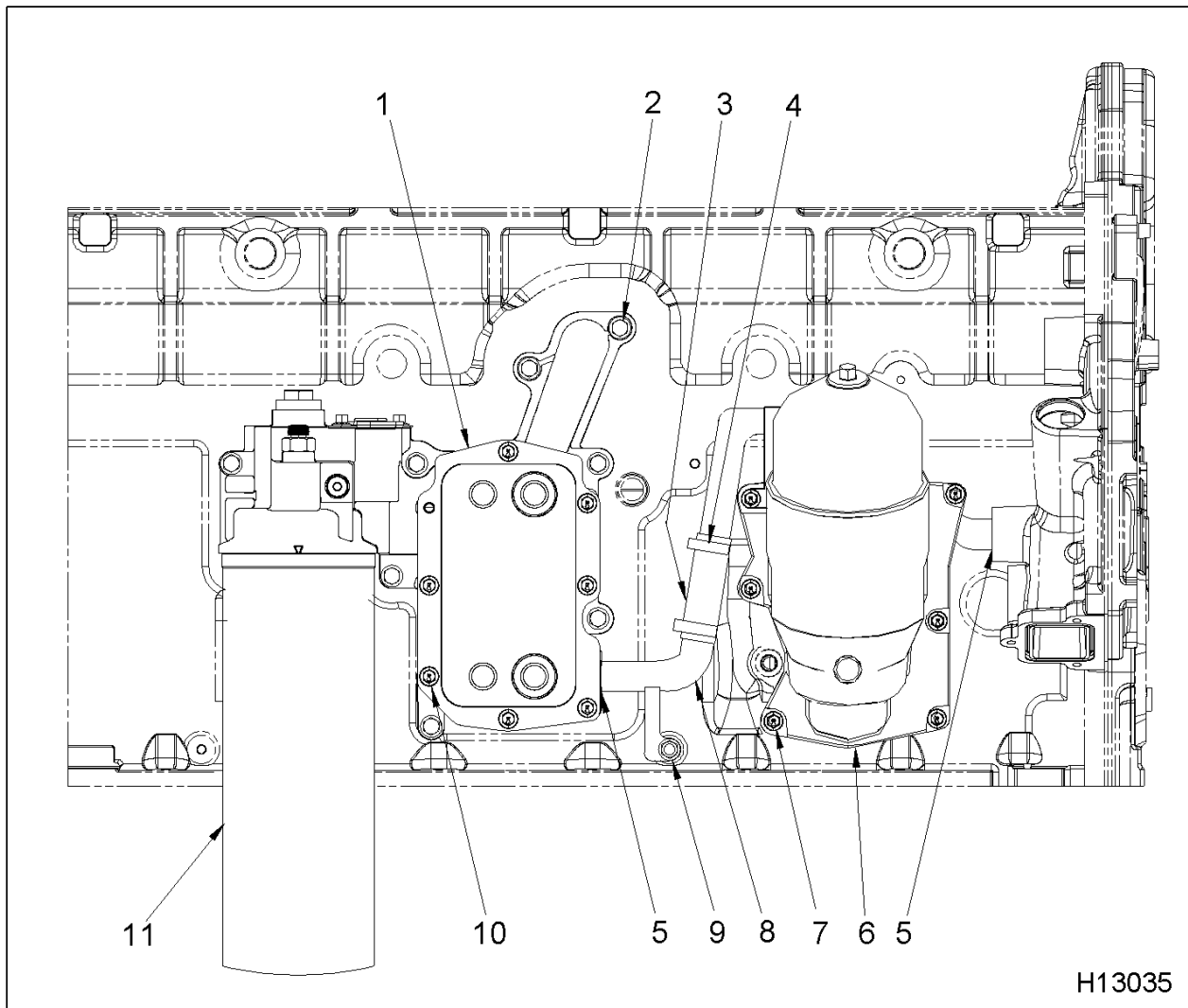


Figure 374 VGT oil supply tubing O-ring

6. Remove the VGT oil supply tube O-ring and discard.



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Figure 375 Oil system module and secondary filter assembly

- | | | |
|-------------------------------|---|----------------------------------|
| 1. Oil system module assembly | 5. O-ring (2) | 8. Oil cooler drain tube |
| 2. Bolt, M8 x 30 (8) | 6. Secondary filtration filter assembly | 9. Support bracket bolt, M8 x 16 |
| 3. Hose, 1 in O.D. | 7. Bolt, M8 x 25 (6) | 10. Bolt, M8 x 20 (8) |
| 4. Hose clamp (2) | | 11. Oil filter (spin-on) |
-
7. Remove oil cooler drain tube support bracket bolt (M8 x 16) at lower end.
 8. Pull oil cooler drain tube (lower end) out of oil cooler module and discard O-ring.
 9. Remove eight oil system module assembly bolts (M8 x 30).
 10. Remove the complete oil system module including the oil cooler and filter header as a unit (less oil filter) and place onto a clean workbench.

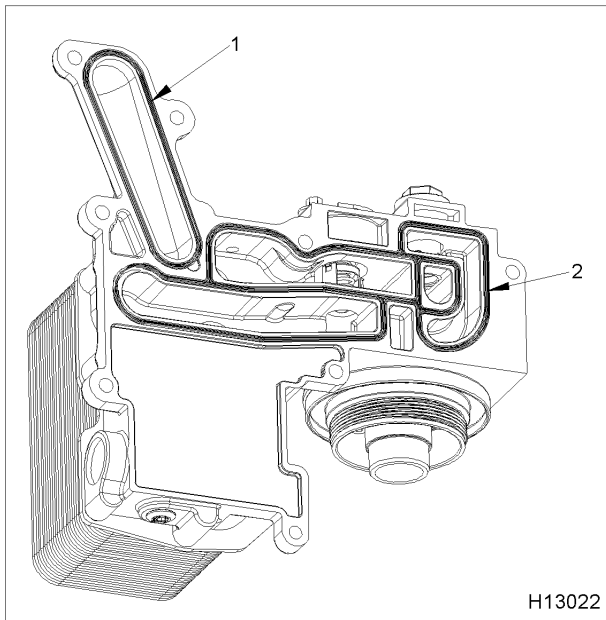


Figure 376 Oil and coolant seal locations

1. Coolant seal
2. Oil seal

11. Remove and discard the oil and coolant seals.
12. Cap the open end of the VGT oil supply tube and fitting.

Secondary Filtration Assembly

NOTE: Remove only if evidence of external leakage has occurred or oil cooler drain tube requires servicing.

Oil in secondary filter drains back into crankcase, therefore no additional draining procedures are required.

1. Remove six bolts (M8 x 25) securing secondary filter assembly to crankcase.

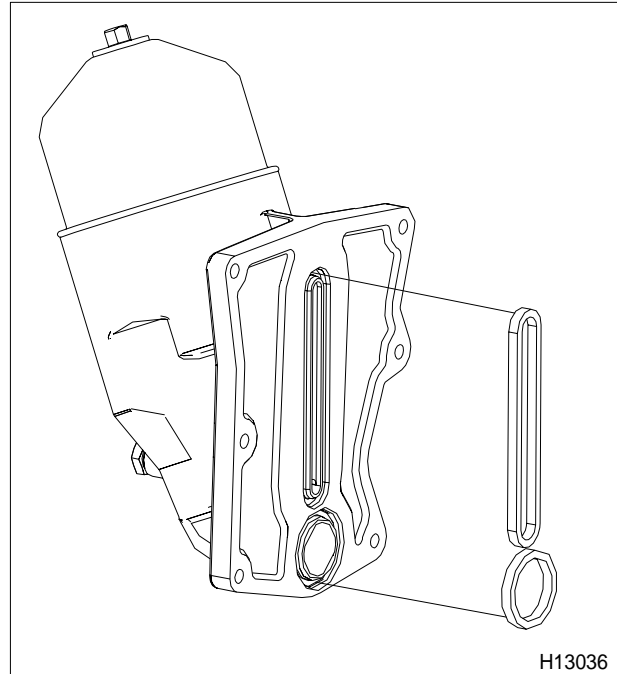


Figure 377 Secondary filtration gasket seals

2. Remove assembly and discard secondary filtration gasket seals.
3. Pull oil cooler drain tube (upper end) out of front cover assembly. Remove O-ring from tube and discard.

Disassembling the Oil System Module

NOTE: Perform the following disassembly procedures as required for your particular repair situation. Do not disassemble any components unless component failure or leakage has been detected.

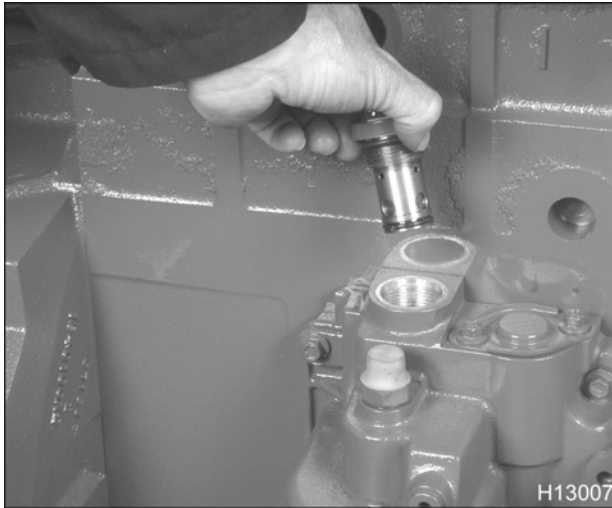


Figure 378 Removing the regulating valve

1. Using a 24 mm or 15/16 in wrench, remove the regulating valve from the oil system module. Remove and discard both O-ring seals.
2. Remove two bolts (M8 x 20) retaining the oil thermal valve assembly.

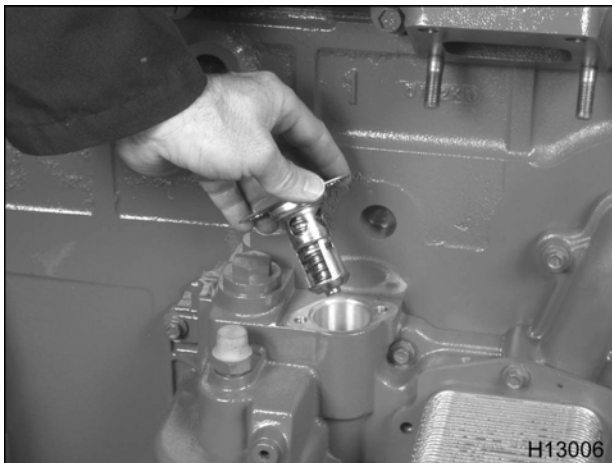


Figure 379 Removing the oil thermal valve

3. Remove the oil thermal valve from the oil system module. Remove O-ring and discard.

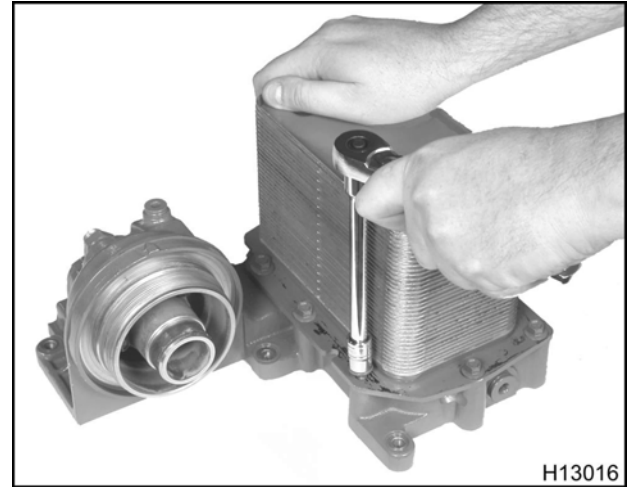


Figure 380 Separating the oil cooler from oil cooler housing

4. Remove eight bolts (M8 x 20) and separate the oil cooler from the oil cooler housing.

NOTE: Bolts are thread-forming fasteners. These bolts may be removed and reinstalled, or may be replaced with standard machined bolts.

CAUTION: To avoid engine damage, when removing the oil cooler from its base housing, do not use excessive force against the aluminum cooler plate to separate from base. Do not apply any force to the oil cooler fins.

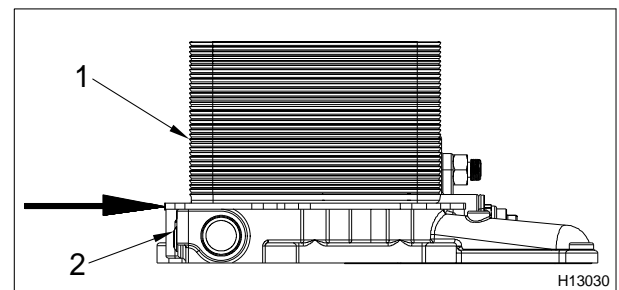


Figure 381 Separating the oil cooler

1. Oil cooler
2. Oil cooler housing base

5. Using a small hammer and a piece of wood, apply just enough force (at large arrow) to break the coolant and oil gasket bonds.

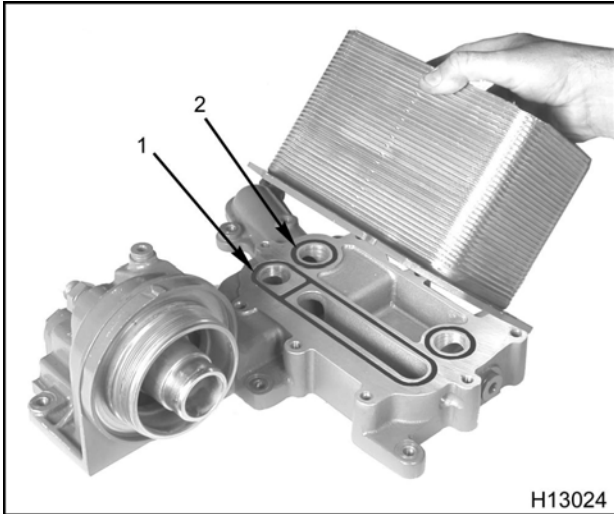


Figure 382 Oil and coolant seal locations

1. Oil gasket
2. Coolant seal (2)

6. Discard the two coolant seals and one oil gasket.
7. Remove the three bolts (M8 x 25) retaining the lube adapter to the oil cooler housing.

NOTE: Bolts are thread-forming fasteners. These bolts may be removed and reinstalled, or may be replaced with standard machined bolts.

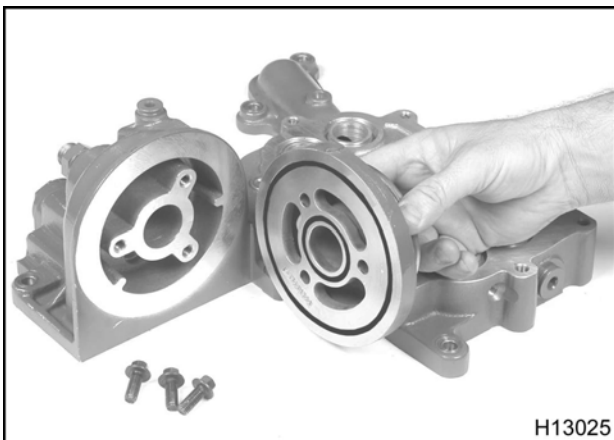


Figure 383 Lube adapter assembly and gaskets

8. Remove the lube adapter to provide access to the oil bypass valve, which is pressed into the housing. Discard the two O-ring gaskets.

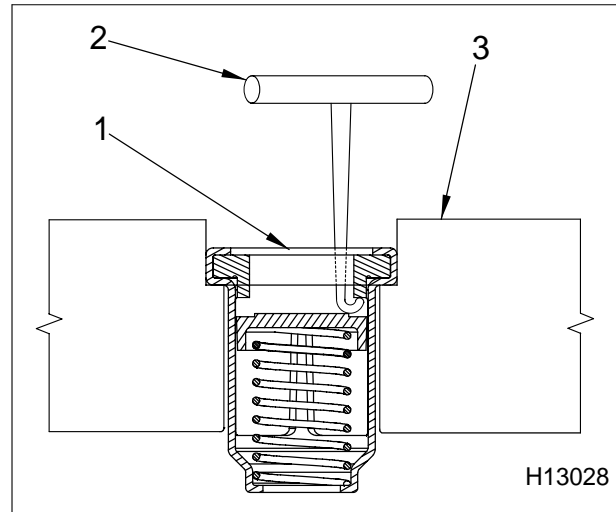
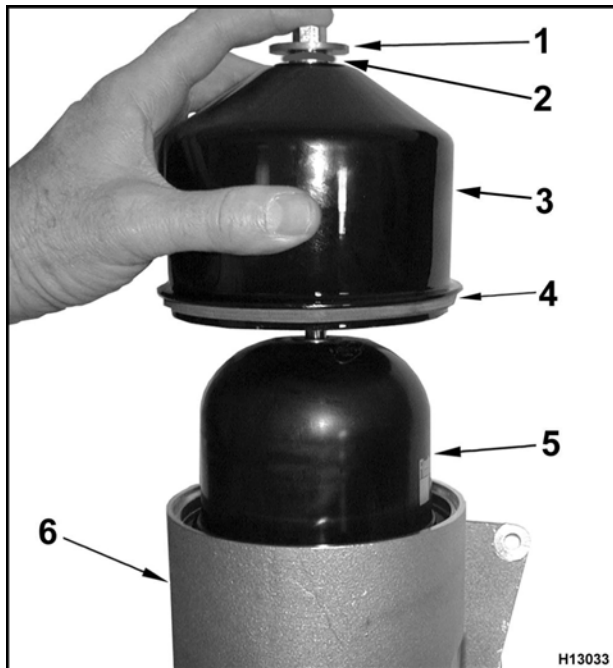


Figure 384 Removing the oil bypass valve

1. Oil bypass valve
2. Hooked shaped tool (tool size shown not to scale)
3. Oil system module casting

9. Remove the oil bypass valve (only if determined to be defective) by inserting a hook shaped tool (make locally) and depressing the check valve, while catching the valve seat. The use of a slide hammer threaded completely through valve is an alternative method.

Disassembling the Secondary Filtration Filter**Figure 385 Secondary filter components**

1. Stud assembly
 2. O-ring
 3. Cover
 4. O-ring gasket
 5. Filter element
 6. Filter header
1. Remove stud assembly from the top of the secondary filtration filter and O-ring.
 2. Lift cover off of filter header and discard O-ring gasket.

**Figure 386 Secondary filter removed**

1. Filter removed
 2. Filter header
3. Lift out filter and dispose of properly.

Cleaning and Inspection**Cleaning the Oil System Module**

CAUTION: To avoid engine damage, the oil cooler must be replaced if there was a bearing failure. Debris from a bearing failure cannot be removed from the oil cooler.

CAUTION: To avoid engine damage, do not attempt to clean the assembled oil system module in solvent. Solvent will be trapped in the oil cooler, regulator valve assembly, and oil thermal valve assembly. Failure to follow this caution could result in engine damage.

The following items should be removed:

- Oil cooler
- Regulator valve assembly
- Oil thermal valve assembly

The oil system module housing and lube adapter can be cleaned in solvent and blown dry with clean filtered compressed air page 3.

1. Immerse the disassembled oil cooler housing and lube adapter into a suitable solvent.
2. Flush and drain the oil cooler housing and lube adapter to remove any residue. Dry all components with filtered compressed air page 3.
3. Check the oil cooler housing for blocked orifices and damaged threads. Replace oil cooler housing if required.
4. Remove any debris that may be blocking the filter bypass valve.
5. Remove turbocharger oil supply fitting (M18) on top of oil filter header and discard O-ring seal.

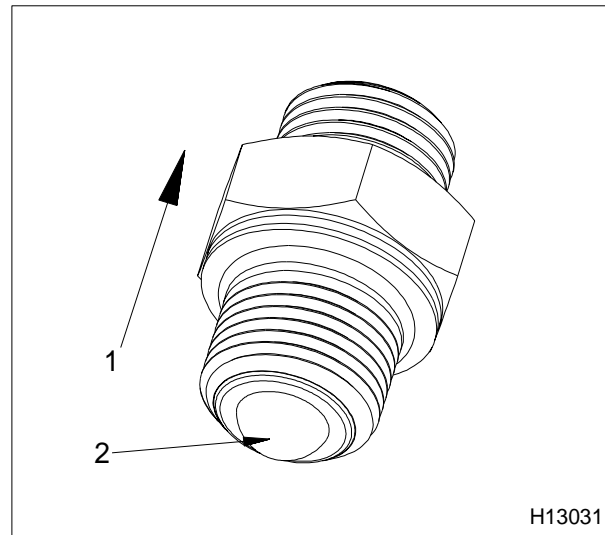


Figure 387 Oil supply tube fitting

1. Direction of oil flow
2. Oil supply wire mesh screen
6. Inspect screen for damage or particle obstruction. Clean or replace oil supply tube fitting screen as necessary.
7. Install a new O-ring onto fitting and thread into oil filter header. Tighten to the special torque value (Table 42).

Checking the Oil Cooler for Leakage

External

CAUTION: To avoid engine damage, do not allow water to enter oil side of oil cooler assembly.

1. Remove the eight bolts (M8 x 20) securing the oil cooler to the oil system module, if not done so already.
2. Fasten oil cooler test plate (Table 43) to oil cooler.
3. Make sure oil port valve is closed.
4. Immerse the oil cooler and test plate combination into a suitably sized container of **clean** tap water (large shop sink).
5. Open coolant valve and allow water to fill **coolant side** of the oil cooler.

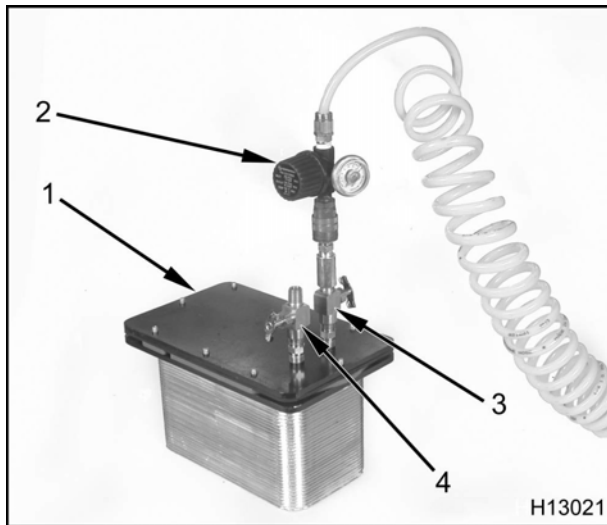


Figure 388 Checking the oil cooler for external leakage

1. Test plate set
2. Air pressure regulator
3. Coolant port
4. Oil port (closed)

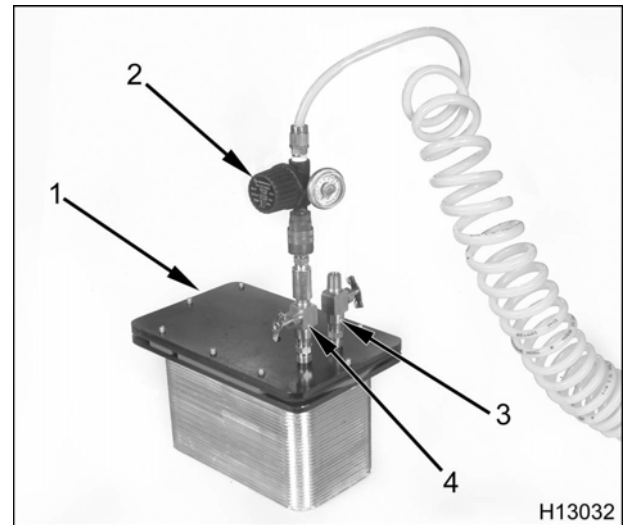


Figure 389 Checking the oil cooler for external leakage

1. Test plate set
2. Air pressure regulator
3. Coolant port (closed)
4. Oil port

6. Connect an air pressure regulator between the test plate coolant port and the shop air supply.
7. Apply approximately 172-276 kPa (25-40 psi) of air pressure to the test plate while the assembly is immersed in water.
8. Observe exterior of oil cooler and test plate surfaces for signs of leakage. If test plate fittings leak, lift out of water, tighten fittings then continue to look for leaks at oil cooler. Air bubbles evident at any external location indicate a leak from the coolant passage. Replace the oil cooler.

CAUTION: To avoid engine damage, do not allow water to enter oil side of oil cooler assembly.

9. Connect an air pressure regulator between the test plate oil port and the shop air supply.
10. Immerse the oil cooler and test plate combination into a suitably sized container of **clean** tap water (large shop sink).
11. Apply approximately 172-276 kPa (25-40 psi) of air pressure to the test plate while the assembly is immersed in water.
12. Observe exterior of oil cooler and test plate surfaces for signs of leakage. If test plate fittings leak, lift out of water, tighten fittings, then continue to look for leaks at oil cooler. Air bubbles evident at any external location indicate a leak from the oil passage. Replace the oil cooler.

Internal

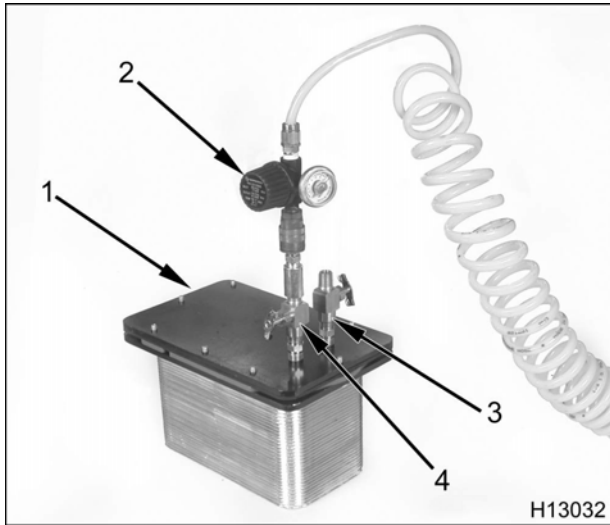


Figure 390 Checking the oil cooler for internal leakage

1. Test plate set
 2. Air pressure regulator
 3. Coolant port (open)
 4. Oil port
1. Connect an air pressure regulator between the test plate oil port and the shop air supply.
 2. Open coolant valve and allow water to fill **coolant side** of the oil cooler.
 3. Immerse the oil cooler and test plate combination into a suitably sized container of **clean** tap water (large shop sink).
 4. Apply approximately 172-276 kPa (25-40 psi) of air pressure to the test plate while the assembly is immersed in water.
 5. Observe coolant port valve for air bubbles. Bubbles at this point indicate a leak path between the oil and coolant fluid passages. Replace the oil cooler.

Installation

Assembling the Oil System Module

NOTE: Do the following assembly procedures as required for your particular situation. Not all of these components may have been removed.

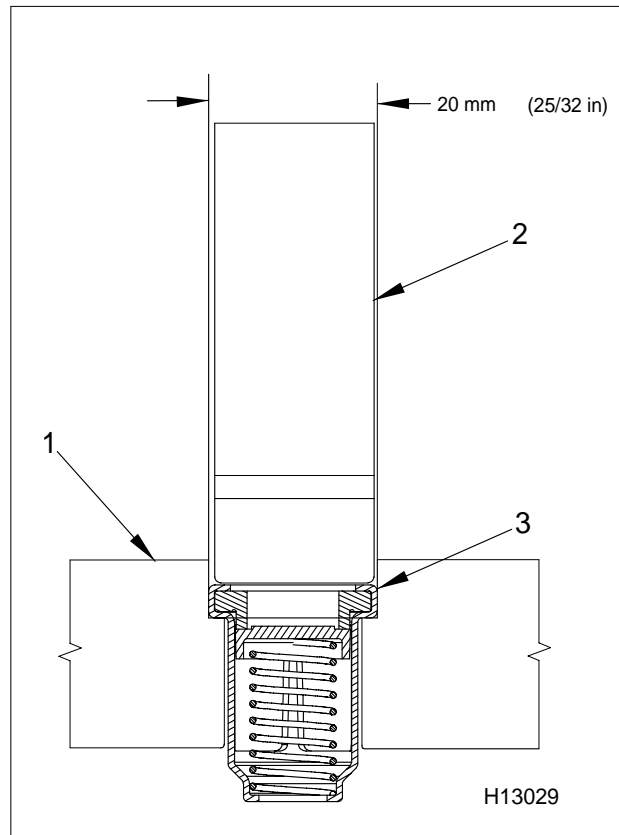


Figure 391 Installing the oil bypass valve

1. Oil system module casting
2. Deep socket
3. Oil bypass valve

NOTE: Measure socket outside diameter. Do not go by the socket bolt size stamped on the socket.

1. Install oil filter bypass valve (only if removed) by placing a deep socket with a **physical outside diameter** of < 20 mm (25/32 in) but > 16 mm (5/8 in). Tap socket and bypass valve into oil system module casting, until oil bypass valve has been thoroughly seated.

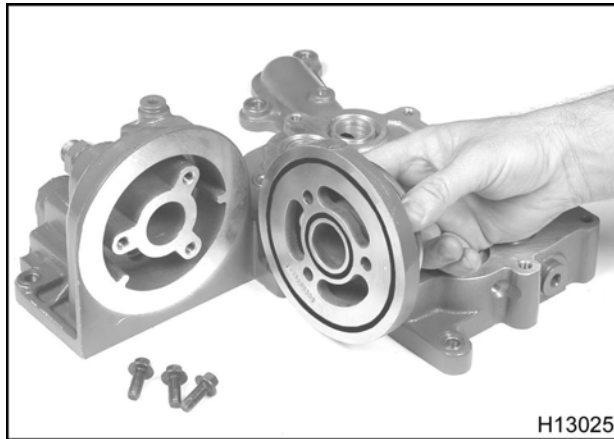


Figure 392 Lube adapter assembly and gaskets

2. Install small and large diameter O-rings into the grooves of the oil lube adapter. Fasten the oil lube adapter to the oil cooler header using three bolts (M8 x 25). Tighten bolts to the special torque value (Table 42).

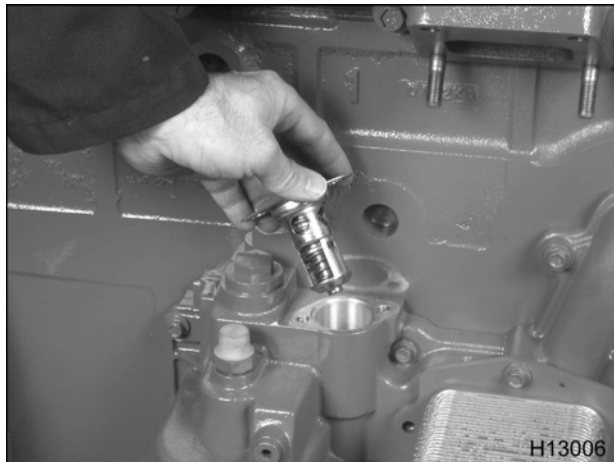


Figure 393 Installing the oil thermal valve

3. Install the oil thermal valve assembly into the oil system module with a new O-ring. Tighten two bolts (M8 x 20) to the special torque value (Table 42).
4. Install two new O-rings onto the oil pressure regulator valve. Only lubricate the bottom O-ring with clean engine oil.



Figure 394 Installing the oil pressure regulating valve

5. Install the oil pressure regulator valve into the oil system module and tighten to the special torque value (Table 42).

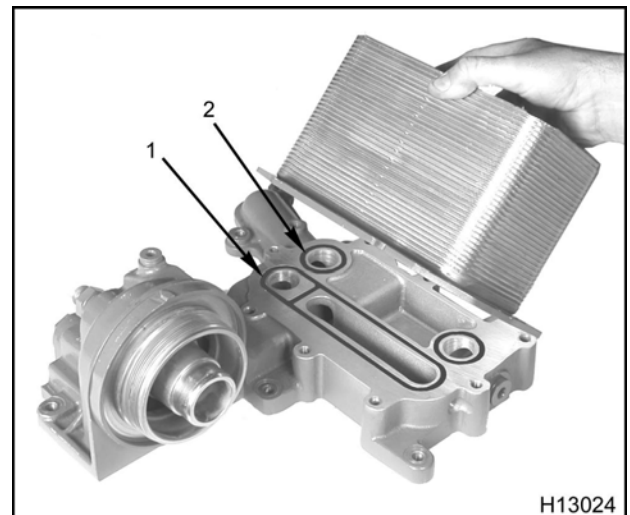


Figure 395 Oil cooler gaskets

1. Oil seals
2. Coolant seal (2)
6. Install one new oil seal and two new coolant seals to the oil cooler housing seal grooves.

CAUTION: To avoid engine damage, do not use pneumatic tools when installing the oil cooler. Only use a calibrated torque wrench appropriate for the oil cooler bolts.

7. Install the oil cooler to the cooler housing using eight bolts (M8 x 20). Tighten bolts to the special torque value (Table 42).

Assembling the Secondary Filtration Filter



Figure 396 Secondary filter installation

1. Filter element
 2. Filter header
1. Install a new secondary oil filter.

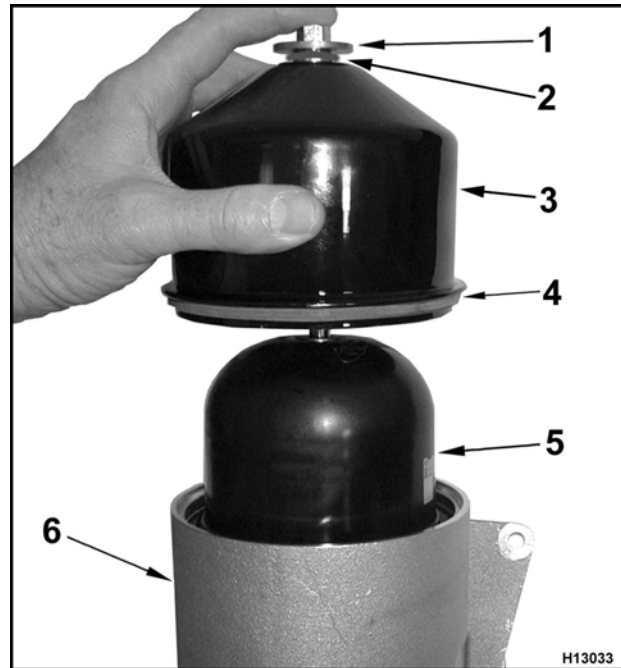


Figure 397 Secondary filter components

1. Stud assembly
2. O-ring
3. Cover
4. O-ring Gasket
5. Filter element
6. Filter header

2. Place a new O-ring gasket onto filter cover.
3. Position cover onto filter header.
4. Place a new O-ring onto stud assembly and thread into top of secondary filter cover and tighten to the special torque value (Table 42) .

Secondary Filtration Assembly

1. If oil cooler drain tube was removed for any reason, install new O-rings onto each end of the tube assembly.
2. Install oil cooler drain tube into front cover assembly.

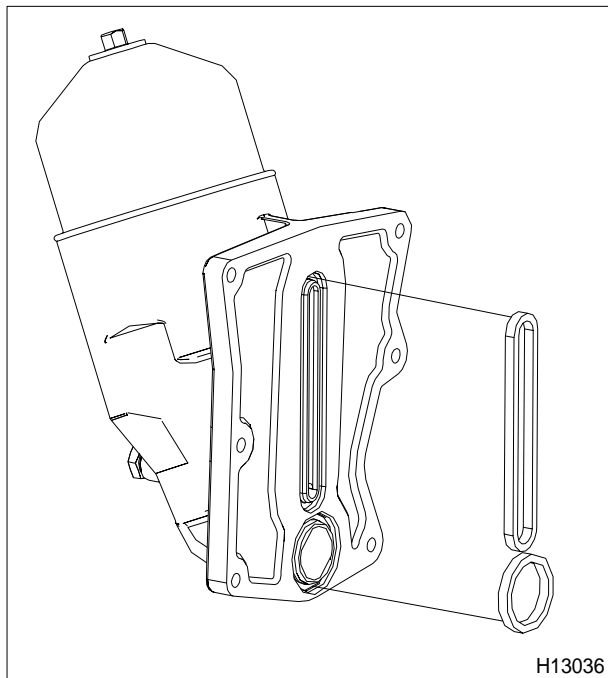


Figure 398 Secondary filtration gasket seals

3. If secondary filtration filter assembly was removed, install new oil gasket seals to assembly.
4. Secure secondary filter assembly to crankcase with six bolts (M8 x 25). Make sure oil cooler drain tube bracket is secured by upper left side bolt. Do not torque upper left mounting bolt until oil system module and oil cooler drain tube have been installed. Tighten bolts to the special torque value (Table 42).

Oil System Module

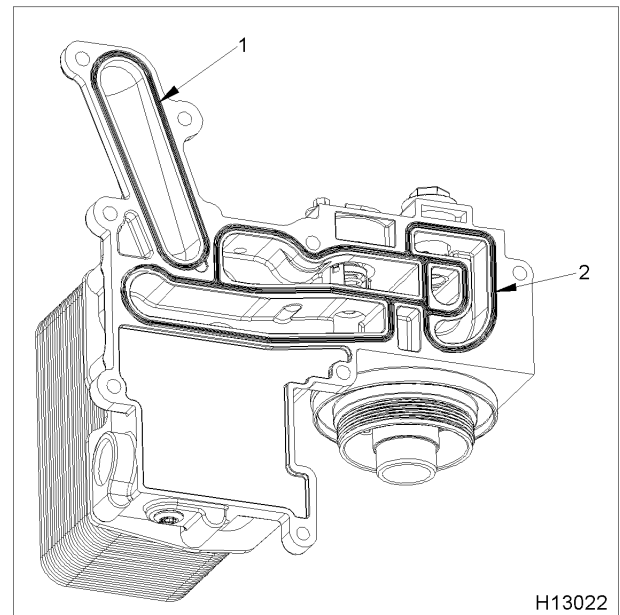


Figure 399 Oil and coolant seal locations

1. Coolant seal
 2. Oil seal
1. Position oil and coolant gasket seals onto the oil cooler housing and begin working the seals into the seal recesses at intersections and mid-points. Do not work the seal from one end to the other, or seal may stretch resulting in difficult installation.
 2. Ensure that the machined surface of the crankcase is clean and free of debris, old seals or damage that could affect the new seals of the oil system module.
 3. Position oil system module onto the crankcase mounting surface and install eight mounting bolts (M8 x 20). Tighten these bolts to the special torque value (Table 42).

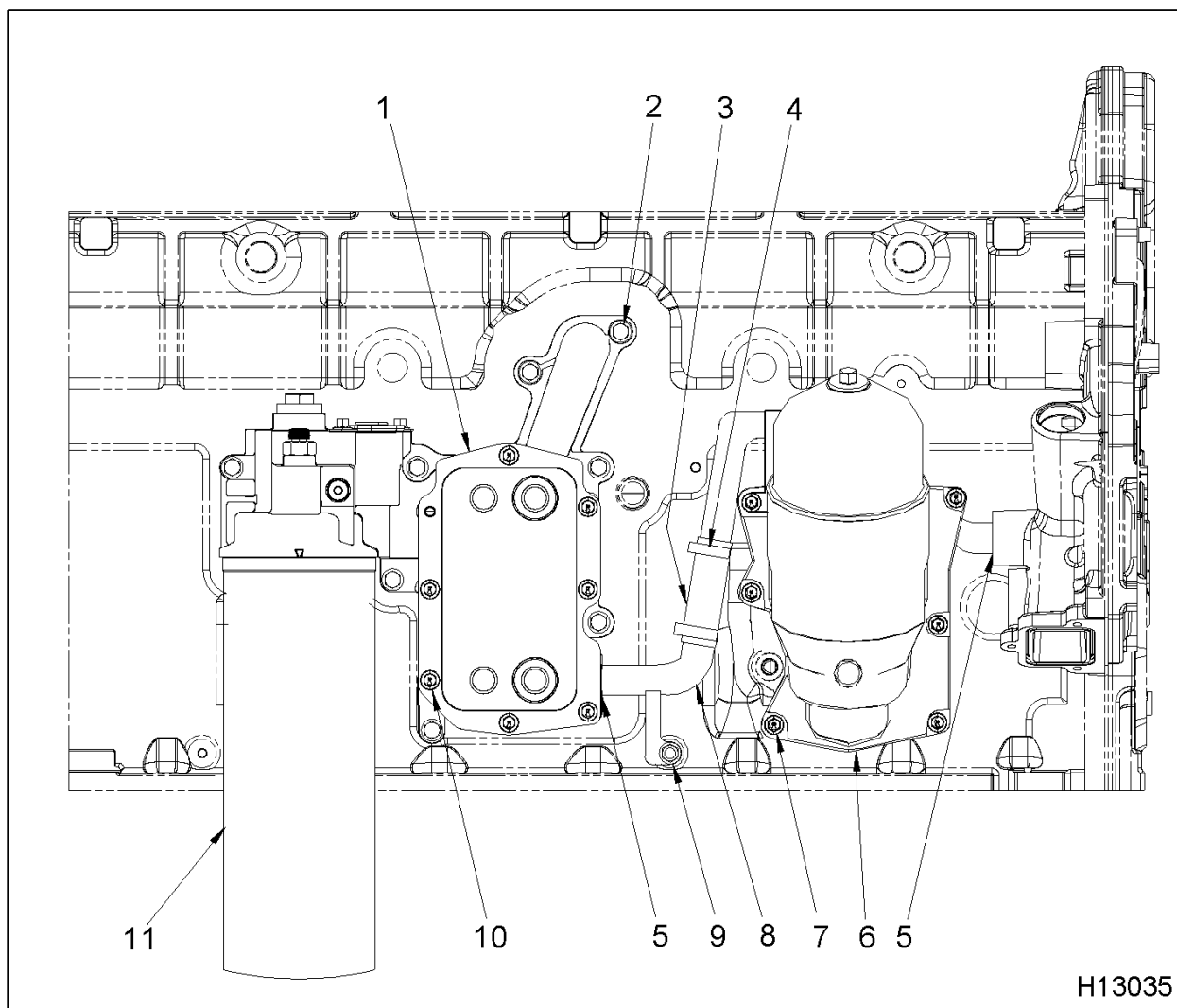


Figure 400 Oil system module and secondary filter assembly

- | | | |
|-------------------------------|---|-----------------------------------|
| 1. Oil system module assembly | 5. O-ring (2) | 8. Oil cooler drain tube assembly |
| 2. Bolt, M8 x 30 (8) | 6. Secondary filtration filter assembly | 9. Support bracket bolt, M8 x 16 |
| 3. Hose, 1 in O.D. | 7. Bolt, M8 x 25 (6) | 10. Bolt, M8 x 20 (8) |
| 4. Hose clamp (2) | | 11. Oil filter (spin-on) |

4. Make sure a new O-ring has been installed onto the oil cooler drain tube. Slide tube into front side of oil cooler and position a support bracket bolt

(M8 x 16) through bracket and into crankcase. Torque both oil cooler drain tube bracket bolts to the special torque value (Table 42).

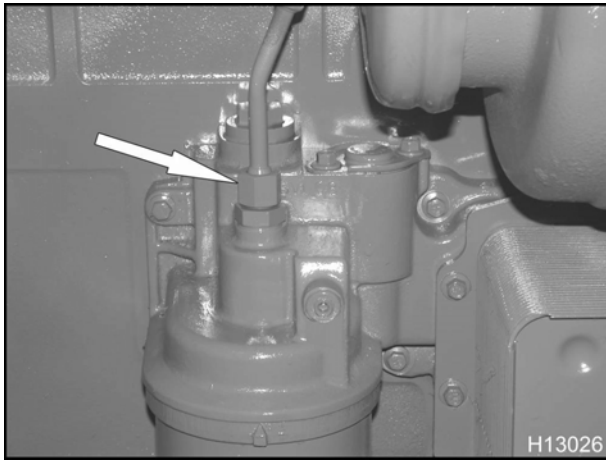


Figure 401 Installing oil supply tube

5. Connect the oil supply tube fitting to the filter header. Tighten nut on the tube to the special torque value (Table 42).
6. Fill oil filter with the proper grade and viscosity of engine oil, refer to the *DT 466, DT 570 and HT 570 Engine Operation and Maintenance Manual*.
7. Lubricate new oil filter gasket with clean engine oil.
8. Spin oil filter onto header until the gasket initially makes contact. Using an oil filter wrench with a band width of 38 mm (1.5 in) or greater, tighten filter an additional 1 full turn.

NOTE: Do not overtighten filter. A damaged filter may fracture or leak.

9. Install oil pan drain plug (M18).

10. Refill cooling system.

Priming the Lubrication System

Preferred Method

When the engine has been assembled, lubricate the engine with oil before starting. This will aid internal components with the proper lubrication requirements during the critical initial startup phase. The following procedure is the preferred method to use when priming the lubrication system.

1. If engine was completely disassembled and rebuilt, remove the plug assembly (M12) (Figure 369) and pressurize the lubrication system with sufficient oil to fill the oil filter and charge the entire lubrication system.
2. Check the oil level before starting engine.

Alternate Method

CAUTION: To avoid engine damage, make sure that all moving internal components of the engine have been well oiled during assembly, if using this procedure.

3. Crank the engine - but do not start the engine (ensure CMP sensor is disconnected) - until the oil pressure gauge indicates sufficient oil pressure.
4. After oil pressure is evident in the lubrication system, reconnect CMP sensor connector and start engine.

SPECIFICATIONS

Table 41 Oil System Module Specifications

Oil cooler, DT 466	23 plates
Oil cooler, HT 570	33 plates
Oil cooler, all engines with front drive axle	33 plates
Oil pressure regulating valve, opening pressure	380 kPa (55 psi) @ 38° C (100° F)
Oil filter bypass valve, opening pressure	345 kPa (50 psi)
Oil thermal valve, opening temperature	111° C (232° F)

Special Torque

Table 42 Oil System Module and Secondary Filter Special Torques

Coolant drain plug, M18	24 N·m (18 lbf·ft)
Lube adapter bolts	29 N·m (21 lbf·ft)
Oil system module mounting bolts	26 N·m (19 lbf·ft)
Oil pressure regulator valve	68 N·m (50 lbf·ft)
Oil thermal valve assembly	29 N·m (21 lbf·ft)
Oil cooler mounting bolts, M8	29 N·m (21 lbf·ft)
Oil cooler drain tube bracket bolt	26 N·m (19 lbf·ft)
Oil supply tube fitting (turbocharger)	24-26 N·m (17-19 lbf·ft)
Plug assembly, M12	5 N·m (46 lbf·in)
Secondary filter mounting bolts	26 N·m (19 lbf·ft)
Secondary filter stud assembly	20 N·m (15 lbf·ft)

SPECIAL SERVICE TOOLS

Table 43 Oil System Module Special Tools

Air pressure regulator	Obtain locally
Oil cooler test plate	ZTSE4654