

Disassembly and Assembly

854E-E34TA, 854F-E34T and 854F-E34TA Industrial Engines

JR (Engine)
JS (Engine)
JT (Engine)
JV (Engine)

4. Using temporary marks, align support assembly (1) and tighten bolts.
5. Tighten bolts (9) to a torque of 25 N·m (221 lb in)
6. Tighten bolts (6) to a torque of 25 N·m (221 lb in)
7. Tighten bolts (2) to a torque of 45 N·m (33 lb ft)
8. Tighten bolts (4) to a torque of 25 N·m (221 lb in)
9. Tighten bolts (7) to a torque of 25 N·m (221 lb in)

End By:

- a. Install the DPF. Refer to Disassembly and Assembly, "Diesel Particulate Filter - Install" for the correct procedure.

i05270754

Inlet Manifold - Remove and Install

Removal Procedure

Start By:

- a. Remove the exhaust gas recirculation valve. Refer to Disassembly and Assembly, "Exhaust Gas Recirculation Valve - Remove and Install" for the correct procedure.
- b. Remove the exhaust cooler. Refer to Disassembly and Assembly, "Exhaust Cooler (NRS) - Remove and Install" for the correct procedure.
- c. Remove the exhaust back pressure sensor bracket and tube assembly. Refer to Disassembly and Assembly, "Pressure Sensor (Exhaust Back Pressure) - Remove and Install" for the correct procedure.
- d. Remove the throttle valve. Refer to Disassembly and Assembly, "Throttle Valve (Intake Air) - Remove and Install" for the correct procedure.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Plug the apertures in the cylinder head in order to prevent the entry of loose parts into the engine.

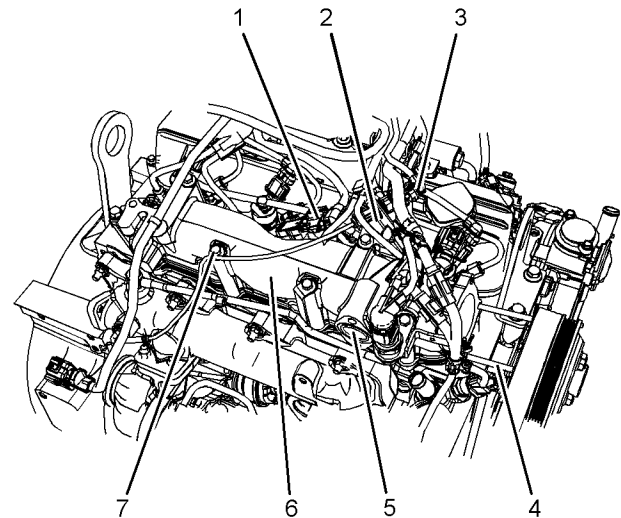


Illustration 132

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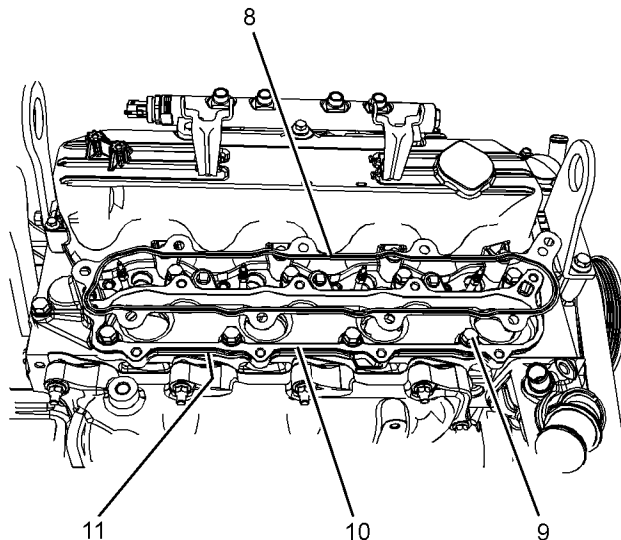


Illustration 133

g02919516

1. Slide the locking tab into the unlocked position and disconnect harness assembly (1) from the inlet manifold temperature and pressure sensor.
2. Position exhaust gas temperature connection (3) away from bracket (2).
3. Remove bolts (7) from inlet manifold (6).
4. Remove the inlet manifold from adaptor plate (10).
5. Remove gasket (8).
6. If necessary, remove studs (4) from inlet manifold (5).

7. If necessary, remove diffuser (5) from inlet manifold (6).
8. If necessary, follow Step 8.a through Step 8.d in order to remove adaptor plate (10).
 - a. Remove the electronic unit injectors. Refer to Disassembly and Assembly, "Electronic Unit Injector - Remove" for the correct procedure.
 - b. Remove bolts (9) from adaptor plate (10).
 - c. Remove adaptor plate (10) from the cylinder head.
 - d. Remove O-ring seals (11) (not shown).

Installation Procedure

Table 19

Required Tools			
Tool	Part Number	Part Description	Qty
A	-	Guide Stud M8 x 1.25mm by 90mm	2

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Remove the plugs that were installed during the disassembly procedure prior to installing components. Care must be taken to ensure that loose parts and debris do not enter the engine.

1. Clean all gasket surfaces.

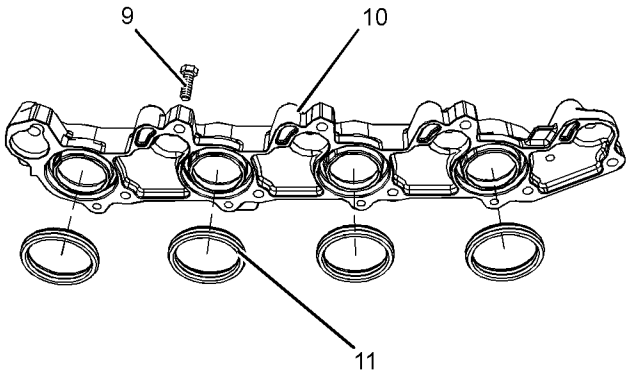


Illustration 134

g02921858

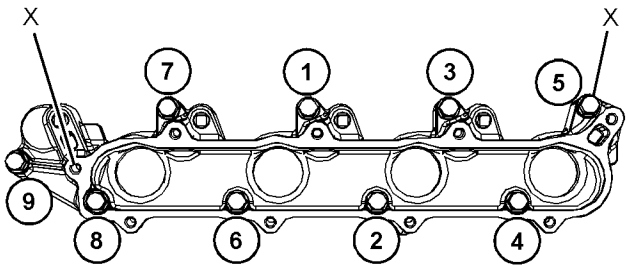


Illustration 135

g02922116

2. If necessary, follow Step 2.a through Step 2.d in order to install adaptor plate (10).
 - a. Install new O-ring seals (11) into adaptor plate (10).
 - b. Position adaptor plate assembly (10) onto the cylinder head.
 - c. Install bolts (9) finger tight. Tighten the bolts evenly in the sequence that is shown in Illustration 135 to a torque of 25 N·m (221 lb in).
 - d. Install the electronic unit injectors. Refer to Disassembly and Assembly, "Electronic Unit Injector - Install" for the correct procedure.

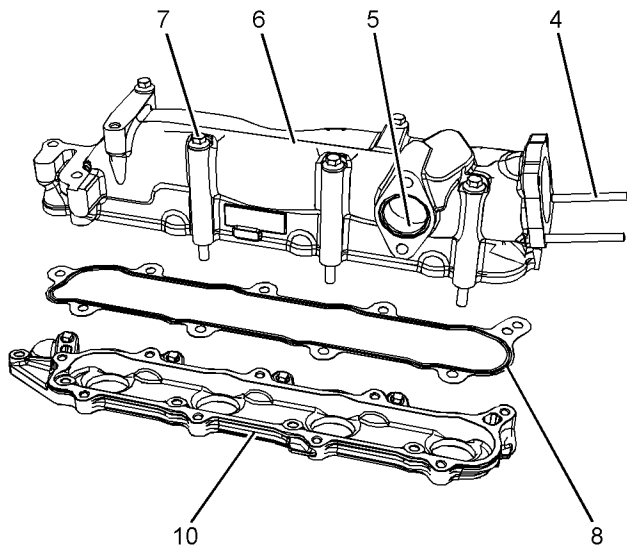


Illustration 136

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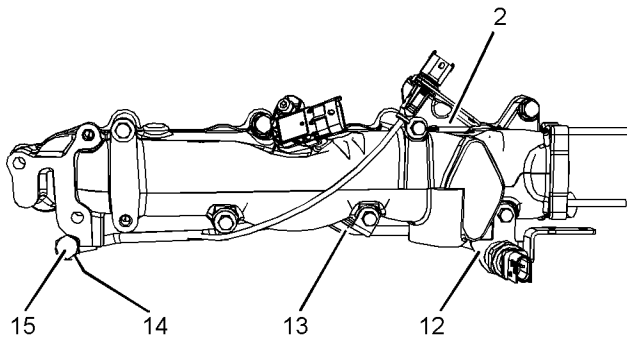


Illustration 137

g02922879

3. If necessary, install studs (4) into inlet manifold (6). Tighten the studs to a torque of 5 N·m (44 lb in).
4. If necessary, install diffuser (5) into inlet manifold (6).
5. Install Tooling (A) in Positions (X) in adaptor plate assembly (10). Refer to Illustration 135 .
6. Position new gasket (8) onto Tooling (A).
7. Install inlet manifold (6) onto Tooling (A).
8. Position bracket (2) onto inlet manifold (6) and install bolt (7) finger tight.
9. Position tube and bracket assembly (13) onto inlet manifold (6) and install bolt (7) finger tight.

10. Install sealing washers (14) (not shown) and banjo bolt (15) to tube and bracket assembly (13). Refer to Disassembly and Assembly, "Pressure Sensor (Exhaust Back Pressure) - Remove and Install" for the correct procedure.

11. Position bracket (12) onto inlet manifold (6) and install bolt (7) finger tight. Connect tube and bracket assembly (13) onto bracket (12). Refer to Disassembly and Assembly, "Pressure Sensor (Exhaust Back Pressure) - Remove and Install" for the correct procedure.

12. Remove Tooling (A).

13. Install remaining bolts (7) in available positions.

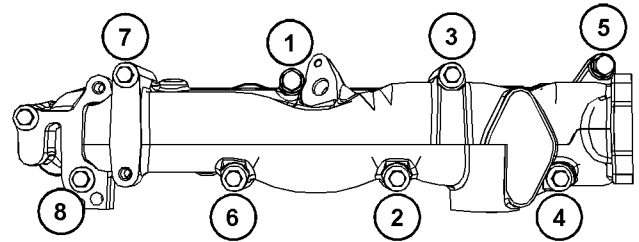


Illustration 138

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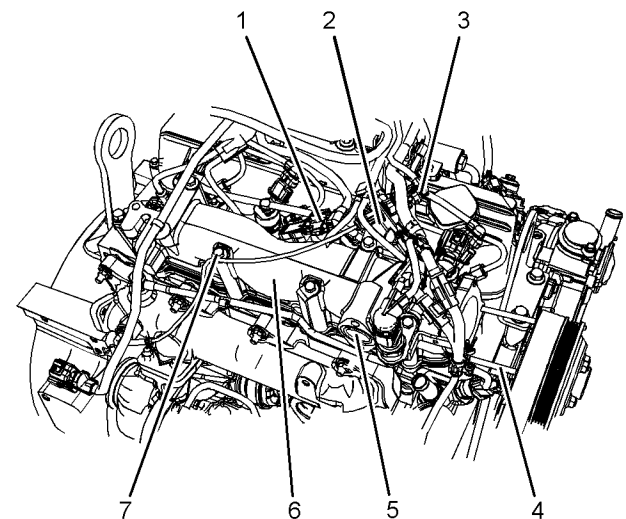


Illustration 139

g02924916

14. Tighten bolts (7) in the sequence that is shown in Illustration 138 to a torque of 27 N·m (239 lb in).

15. Install exhaust gas temperature connection (3) into bracket (2).

16. Connect harness assembly (1) to the inlet manifold temperature and pressure sensor and slide the locking tab into the locked position.

End By:

a. Install the throttle valve. Refer to Disassembly and Assembly, "Throttle Valve (Intake Air) - Remove and Install" for the correct procedure.

b. Install the remaining components for the exhaust back pressure sensor. Refer to Disassembly and Assembly, "Pressure Sensor (Exhaust Back Pressure) - Remove and Install" for the correct procedure.

c. Install the exhaust cooler. Refer to Disassembly and Assembly, "Exhaust Cooler (NRS) - Remove and Install" for the correct procedure.

d. Install the exhaust gas recirculation valve. Refer to Disassembly and Assembly, "Exhaust Gas Recirculation Valve - Remove and Install" for the correct procedure.

i05270759

Inlet and Exhaust Valve Springs - Remove and Install

Removal Procedure

Table 20

Required Tools			
Tool	Part Number	Part Description	Qty
A ⁽¹⁾	T400156	Housing	1
	T400157	Engine Turning Tool	1
B	T400158	Valve Spring Compressor	1
	-	Stud M6 by 25mm	1

⁽¹⁾ This Tool is used in the aperture for the electric starting motor.

Start By:

a. Remove the rocker shaft assembly. Refer to Disassembly and Assembly, "Rocker Shaft and Pushrod - Remove".

Note: Either Tooling (A) can be used. Use the Tooling that is most suitable.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: The following procedure should be adopted in order to remove the valve springs when the cylinder head is installed to the engine. Refer to Disassembly and Assembly, "Inlet and Exhaust Valves - Remove and Install" for the procedure to remove the valve springs from a cylinder head that has been removed from the engine.

Note: Ensure that the appropriate piston is at the top center position before the valve spring is removed. Failure to ensure that the piston is at the top center position may allow the valve to drop into the cylinder bore.

NOTICE

Plug the apertures for the push rods in the cylinder head in order to prevent the entry of loose parts into the engine.



WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

NOTICE

Ensure that the valve spring is compressed squarely or damage to the valve stem may occur.

1. Follow Steps 1.a through 1.d in order to position the appropriate piston at top center.

a. Install Tooling (B) in position on the cylinder head in order to compress a valve spring for the appropriate piston.

b. Use Tooling (B) in order to compress valve spring (3) and open the valve slightly.

Note: Do not compress the spring so that valve spring retainer (2) touches the valve stem seal.

c. Use Tooling (A) in order to rotate the crankshaft carefully, until the piston touches the valve.

Note: Do not use excessive force to turn the crankshaft. The use of force can result in bent valve stems.

- d. Continue to rotate the crankshaft and gradually release the pressure on Tooling (B) until the piston is at the top center position. The valve is now held in a position that allows the valve spring to be safely removed.

NOTICE

Do not turn the crankshaft while the valve springs are removed.

Note: Valve springs must be replaced in pairs for the inlet valve or the exhaust valve of each cylinder. If all valve springs require replacement, the procedure can be carried out on two cylinders at the same time. The procedure can be carried out on the following pairs of cylinders, 1 with 4 and 2 with 3. Ensure that all of the valve springs are installed before changing from one pair of cylinders to another pair of cylinders.

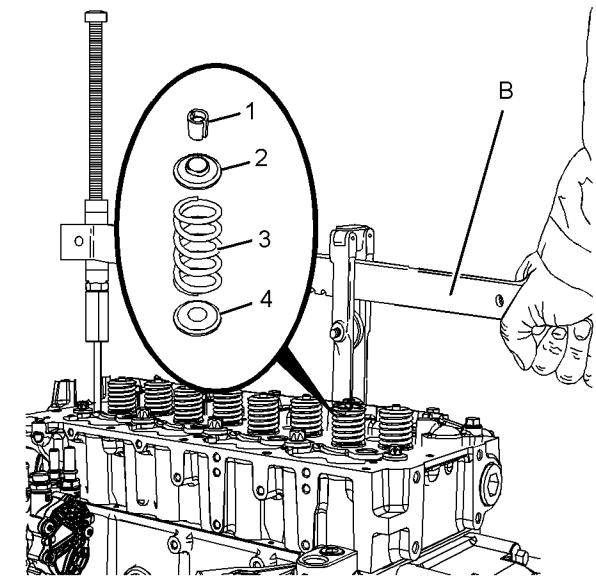


Illustration 140 g03001601

Typical example

- 2. Apply sufficient pressure to Tooling (B) in order to allow removal of valve keepers (1). Remove valve keepers (1).

Note: Do not compress the spring so that valve spring retainer (2) touches the valve stem seal.

- 3. Slowly release the pressure on Tooling (B).
- 4. Remove valve spring retainer (2) and remove valve spring (3).
- 5. If necessary, remove the valve stem seal in order to remove valve spring seat (4).

- 6. Repeat Steps 2 through 5 in order to remove the remaining valve spring from the appropriate cylinder.

- 7. Remove Tooling (B).

Installation Procedure

Table 21

Required Tools			
Tool	Part Number	Part Description	Qty
A ⁽¹⁾	T400156	Housing	1
	T400157	Engine Turning Tool	1
B	T400158	Valve Spring Compressor	1
	-	Stud M6 by 25mm	1
C	T400154	Valve Stem Seal Installer	1

⁽¹⁾ This Tool is used in the aperture for the electric starting motor.

Note: Either Tooling (A) can be used. Use the Tooling that is most suitable.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Do not turn the crankshaft while the valve springs are removed.

- 1. Inspect the valve springs for the correct length. Refer to Specifications, “Cylinder Head Valves ” for more information.

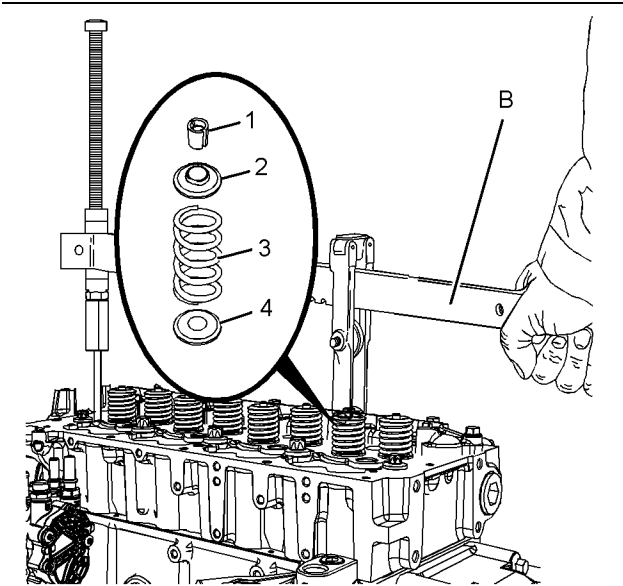


Illustration 141

g03001601

Typical example

2. If necessary, valve spring seat (4) onto cylinder head.
 3. If necessary, use Tooling (C) in order to install a new valve stem seal onto the valve guide.
- Note:** The outer face of the valve guide must be clean and dry before installing the valve stem seal.
4. Install valve spring (3) onto the cylinder head. Position valve spring retainer (2) onto valve spring (3).

⚠ WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

5. Install Tooling (B) in the appropriate position on the cylinder head in order to compress the valve spring.

NOTICE

Ensure that the valve spring is compressed squarely or damage to the valve stem may occur.

6. Apply sufficient pressure to Tooling (B) in order to install valve keepers (1). Install valve spring keepers (1).

Note: Do not compress the spring so that valve spring retainer (2) touches the valve stem seal.

7. Carefully release the pressure on Tooling (B).

Note: Ensure that the valve keepers are correctly seated.

8. Repeat Steps 3 to 7 for the remaining valves.

⚠ WARNING

The valve spring keepers can be thrown from the valve when the valve spring compressor is released. Ensure that the valve spring keepers are properly installed on the valve stem. To help prevent personal injury, keep away from the front of the valve spring keepers and valve springs during the installation of the valves.

9. Remove Tooling (B).

End By:

- a. Install the rocker shaft assembly. Refer to Disassembly and Assembly, "Rocker Shaft and Pushrod - Install".

i05270766

Inlet and Exhaust Valves - Remove and Install

Removal Procedure

Table 22

Required Tools			
Tool	Part Number	Part Description	Qty
A	T400158	Valve Spring Compressor	1
	-	Stud M6 by 25mm	1

Start By:

- a. Remove the cylinder head. Refer to Disassembly and Assembly, "Cylinder Head - Remove".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Clean the bottom face of the cylinder head. Check the depth of the valves below the face of the cylinder head before the valve springs are removed. Refer to Specifications, "Cylinder Head Valves" for the correct dimensions.

2. Place a temporary identification mark on the heads of the valves in order to identify the correct position. Inlet valves have a recess in the center of the head.

Note: Do not stamp the heads of the valve. Stamping or punching the heads of the valves could cause the valves to fracture.

3. Use a suitable lifting device to position the cylinder head with the valve springs upward. The weight of the cylinder head is approximately 56 kg (125 lb).

Note: Ensure that the cylinder head is kept on a clean, soft surface in order to prevent damage to the machined face.



WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

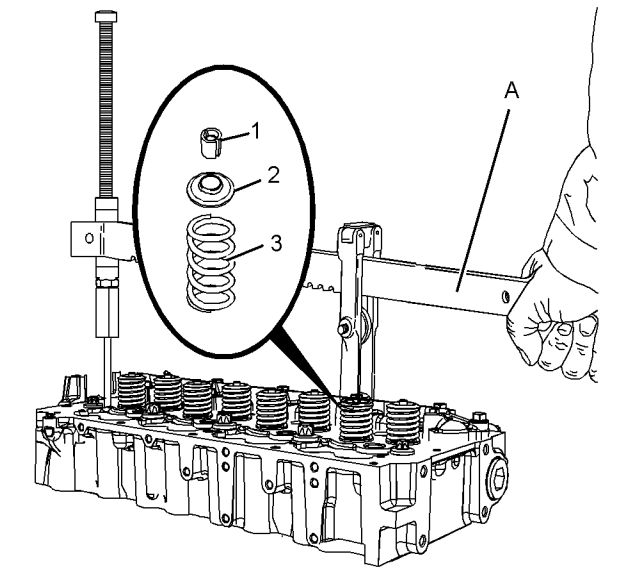


Illustration 142

g03003297

Typical example

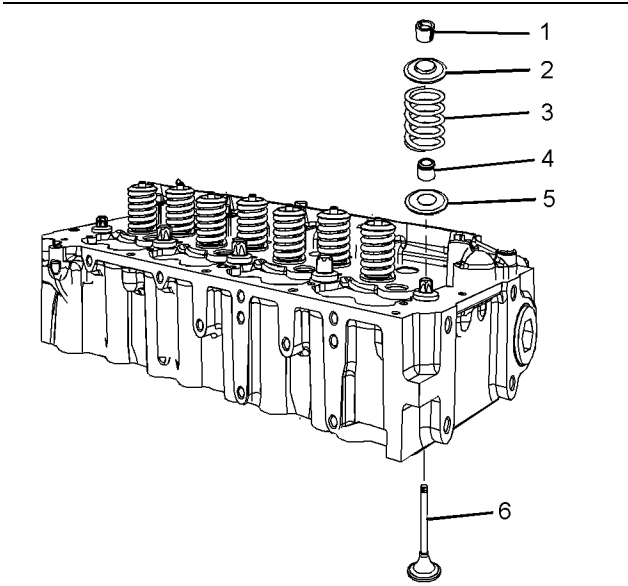


Illustration 143

g03003337

Typical example

4. Install Tooling (A) in position on the cylinder head in order to compress the appropriate valve spring.

NOTICE
Ensure that the valve spring is compressed squarely or damage to the valve stem may occur.

5. Apply sufficient pressure to Tooling (A) in order to remove valve keepers (1).

Note: Do not compress the spring so that valve spring retainer (2) touches valve stem seal (4).

6. Slowly release the pressure on Tooling (A).

7. Remove valve spring retainer (2). Remove valve spring (3).

8. Repeat Steps 4 to 7 for the remaining valves.

9. Remove Tooling (A).

10. Remove valve stem seals (4) and valve spring seats (4).

11. Use a suitable lifting device to carefully turn over the cylinder head.

12. Remove valves (6).

Installation Procedure

Table 23

Required Tools			
Tool	Part Number	Part Description	Qty

(continued)

(Table 23, contd)

A	T400158	Valve Spring Compressor	1
	-	Stud M6 by 25mm	1
B	T400154	Valve Stem Seal Installer	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Clean all components of the cylinder head assembly. Ensure that all ports, all coolant passages, and all lubrication passages in the cylinder head are free from debris. Follow Steps 1. a through 1.e in order to inspect the components of the cylinder head assembly. Replace any components that are worn or damaged.
 - a. Inspect the cylinder head for wear and for damage. Refer to Systems Operation, Testing and Adjusting, "Cylinder Head Inspect".
 - b. Inspect the valve seats for wear and for damage. Refer to Specifications, "Cylinder Head Valves" for further information.
 - c. Inspect the valve guides for wear and for damage. Refer to Specifications, "Cylinder Head Valves" and Systems Operation, Testing and Adjusting, "Valve Guide - Inspect" for further information.
 - d. Inspect the valves for wear and for damage. Refer to Specifications, "Cylinder Head Valves".
 - e. Inspect the valve springs for the correct length. Refer to Specifications, "Cylinder Head Valves".

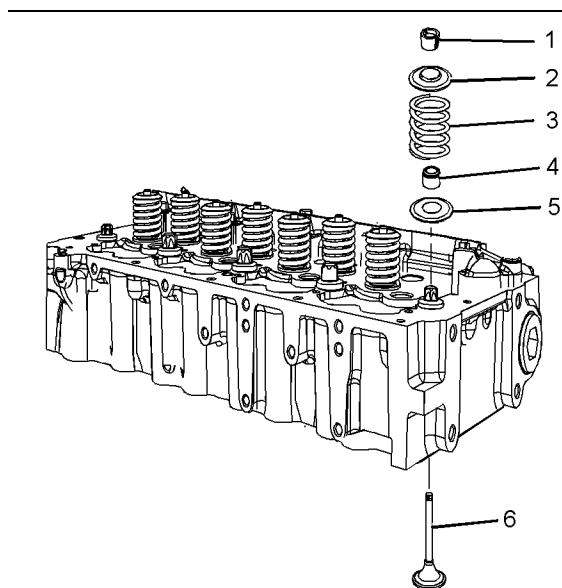


Illustration 144

g03003337

2. Lubricate the stems of valves (6) with clean engine oil. Install valves (6) in the appropriate positions in the cylinder head. Check the depth of the valves below the face of the cylinder head. Refer to Systems Operation, Testing and Adjusting, "Valve Depth - Inspect" for more information.
 3. Use a suitable lifting device to carefully turn over the cylinder head. The weight of the cylinder head is approximately 56 kg (125 lb).
- Note:** Ensure that all of the valves remain in place.
4. Install valve spring seats (5).
 5. Use Tooling (B) in order to install new valve stem seals (4) onto each of the valve guides.
- Note:** The outer face of the valve guides must be clean and dry before installing the valve stem seals.
6. Install valve spring (3) onto the cylinder head. Position valve spring retainer (2) onto valve spring (3).

 WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

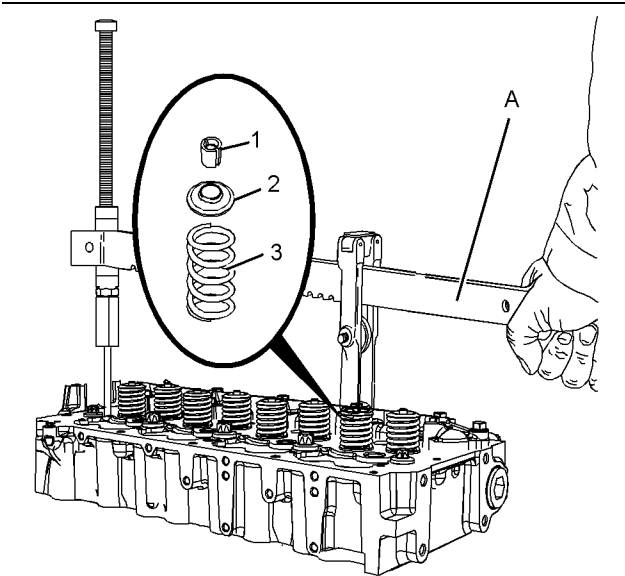


Illustration 145 g03003297

Typical example

7. Install Tooling (A) in the appropriate position on the cylinder head in order to compress valve spring (3).

NOTICE

Ensure that the valve spring is compressed squarely or damage to the valve stem may occur.

8. Apply sufficient pressure to Tooling (A) in order to install valve keepers (1).

Note: Do not compress the spring so that valve spring retainer (2) touches valve stem seal (4).

WARNING

The valve spring keepers can be thrown from the valve when the valve spring compressor is released. Ensure that the valve spring keepers are properly installed on the valve stem. To help prevent personal injury, keep away from the front of the valve spring keepers and valve springs during the installation of the valves.

9. Carefully release the pressure on Tooling (A).
10. Repeat Steps 6 to 9 for the remaining valves.
11. Remove Tooling (A) from the cylinder head.

End By:

- a. Install the cylinder head. Refer to Disassembly and Assembly, "Cylinder Head - Install".

i05270769

Inlet and Exhaust Valve Guides - Remove and Install

Removal Procedure

Table 24

Required Tools			
Tool	Part Number	Part Description	Qty
A	T400159	Valve Guide Driver	1

Start By:

- a. Remove the inlet valves and the exhaust valves. Refer to Disassembly and Assembly, "Inlet and Exhaust Valves - Remove and Install".

NOTICE

Removal and installation of the valve guide and valve seat must be carried out by personnel with the correct training. Also special machinery is required. For more information, refer to your authorized Perkins dealer.

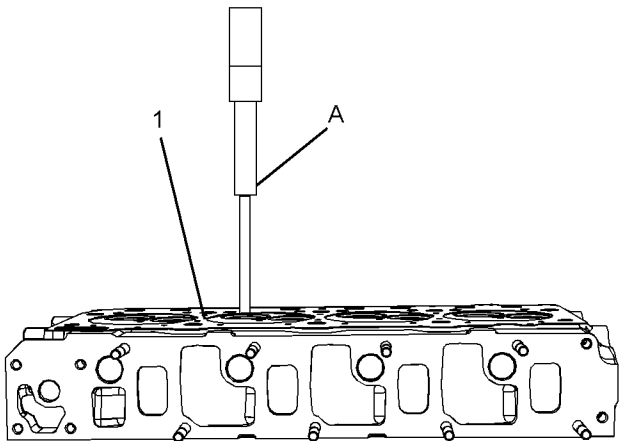


Illustration 146

g03003636

1. Use Tooling (A) in order to remove valve guides (2) from cylinder head (1).
2. Repeat the Step 1 for the remaining valve guides.

Installation Procedure

Table 25

Required Tools			
Tool	Part Number	Part Description	Qty
A	T400159	Valve Guide Driver	1
	T400153	Stop Collar	1
B	T400155	Valve Guide Reamer	1

NOTICE

Removal and installation of the valve guide and valve seat must be carried out by personnel with the correct training. Also special machinery is required. For more information, refer to your authorized Perkins dealer.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Clean the parent bores in the cylinder head for the valve guides.

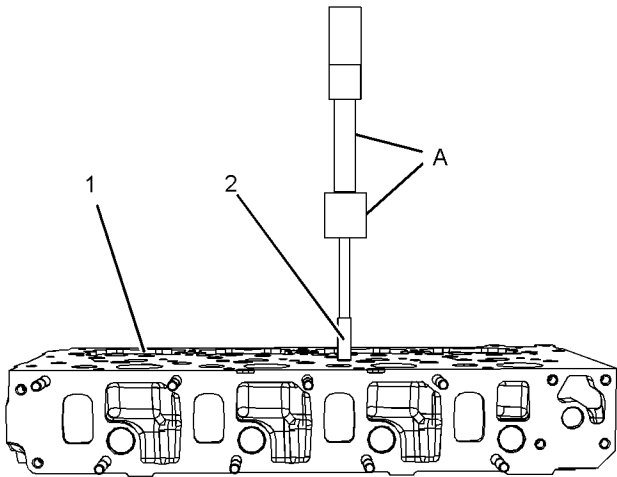


Illustration 147

g03003639

2. Lubricate a new valve guide (2) and place the valve guide in position. Carefully tap the valve guide in order to start the installation. Use Tooling (A) to install the valve guide into the cylinder head.
3. Repeat Step 2 for the remaining valve guides.

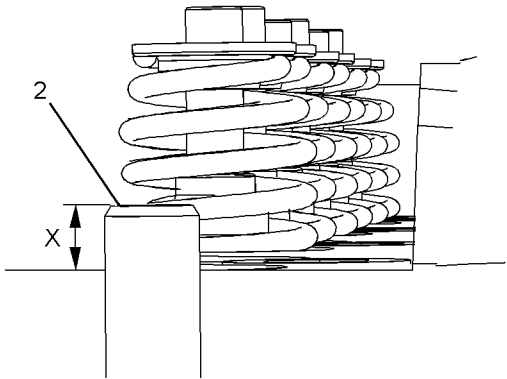


Illustration 148

g03005596

4. Check protrusion (X) of valve guides (2). The valve guides should protrude 8.5 ± 0.15 mm (0.33465 ± 0.00591 inch) above the valve spring recess. Refer to Specifications, "Cylinder Head Valves" for more information.
5. After installation of valve guides (2), the valve guides must be reamed to the finished diameter. Follow Steps 5.a through 5.c in order to ream the valve guides.
 - a. Lubricate the bores of valve guides (2) with clean engine oil.
 - b. Use Tooling (B) in order to ream the valve guides. Ensure that even pressure is applied to Tooling (B).
 - c. Ensure that the cylinder head is clean and free from machining debris.
6. Check the finished diameter of valve guides (2). Refer to Specifications, "Cylinder Head - Valves" for more information.
7. Check the depths of the valves below the face of the cylinder head. Refer to System Operation, Testing and Adjusting, "Valve Depth - Inspect" for more information.

End By:

a. Install the inlet valves and the exhaust valves.
Refer to Disassembly and Assembly, "Inlet
and Exhaust Valves - Remove and Install".

i05270770

Engine Oil Filter Base - Remove and Install

Removal Procedure

Table 26

Required Tools			
Tool	Part Number	Part Description	Qty
A	T400083	Filter Cartridge Tool	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

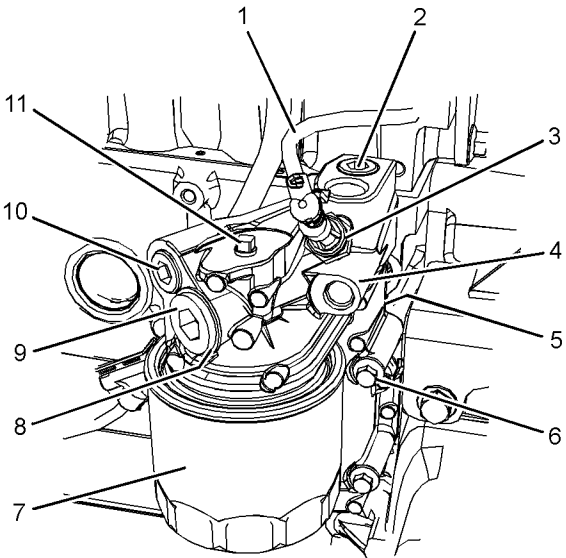


Illustration 149

g02675998

Typical example

1. Disconnect wiring harness assembly (1) from engine oil pressure switch (3).
 2. Place a suitable container below engine oil filter (7) in order to catch any oil that might be spilled.
 3. Use Tooling (A) in order to remove engine oil filter (7). Refer to Operation and Maintenance Manual, "Engine Oil and Filter - Change" for the correct procedure.
 4. Remove bolts (6) from oil filter base (1).
- Note:** Note the position of the different length bolts for installation purposes.
5. Remove engine oil filter base (4) from the cylinder block.
 6. Remove gasket (5) (not shown).
 7. If necessary, remove plug (2) from engine oil filter base (4).
 8. If necessary, remove plug (11) from engine oil filter base (4).
 9. If necessary, remove plug (10) from engine oil filter base (4).
 10. If necessary, remove plug (9) from engine oil filter base (1). Remove O-ring seal (8) (not shown) from plug (9).
 11. If necessary, remove the engine oil pressure switch. Refer to Disassembly and Assembly, "Engine Oil Pressure Switch - Remove and Install".

Installation Procedure

Table 27

Required Tools			
Tool	Part Number	Part Description	Qty
A	T400083	Filter Cartridge Tool	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

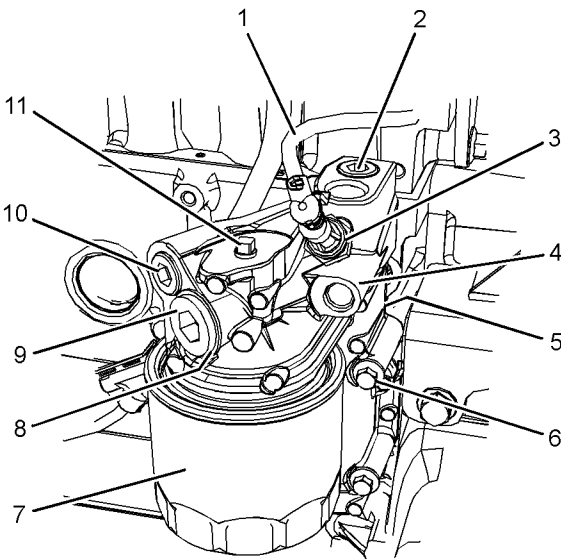


Illustration 150

g02675998

Typical example

1. Clean the gasket surface of the engine oil filter base (4). Clean the gasket surface of the cylinder block.
2. If necessary, install new O-ring seal (8) (not shown) to plug (9). Install plug (9) to engine oil filter base (1). Tighten the plug to a torque of 30 N·m (266 lb in).
3. If necessary, install new plug (10) to engine oil filter base (4). Tighten the plug to a torque of 30 N·m (266 lb in).
4. If necessary, install new plug (11) to engine oil filter base (4). Tighten the plug to a torque of 10 N·m (89 lb in).
5. If necessary, install new plug (2) to engine oil filter base (4). Tighten the plug to a torque of 30 N·m (266 lb in).

6. Position new gasket (5) (not shown) onto engine oil filter base (4). Install bolts (6) to engine oil filter base (4).

Note: Ensure that the different length bolts are installed in the correct position.

7. Install the assembly of the engine oil filter base to the cylinder block. Tighten bolts (6) to a torque of 25 N·m (221 lb in).
8. If necessary, install the engine oil pressure switch. Refer to Disassembly and Assembly, "Engine Oil Pressure Switch - Remove and Install" for the correct procedure.
9. Connect wiring harness assembly (1) to engine oil pressure switch (3).
10. Use Tooling (A) in order to install new engine oil filter (7). Refer to Operation and Maintenance Manual, "Engine Oil and Filter - Change" for the correct procedure.
11. Check the level of the engine oil. Refer to Operation and Maintenance Manual, "Engine Oil Level - Check" for the correct procedure.

i05270773

Engine Oil Cooler - Remove

Removal Procedure

Start By:

- a. Remove the alternator and mounting bracket. Refer to Disassembly and Assembly, "Alternator - Remove" for the correct procedure.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

Disassembly and Assembly Section

1. Drain the coolant from the cooling system into a suitable container. Refer to Operation and Maintenance Manual, "Cooling System Coolant - Change" for the correct procedure.
2. If the engine oil has become contaminated with coolant, the engine oil and filter must be replaced. Refer to Operation and Maintenance Manual, "Engine Oil and Filter - Change" for the correct procedure.

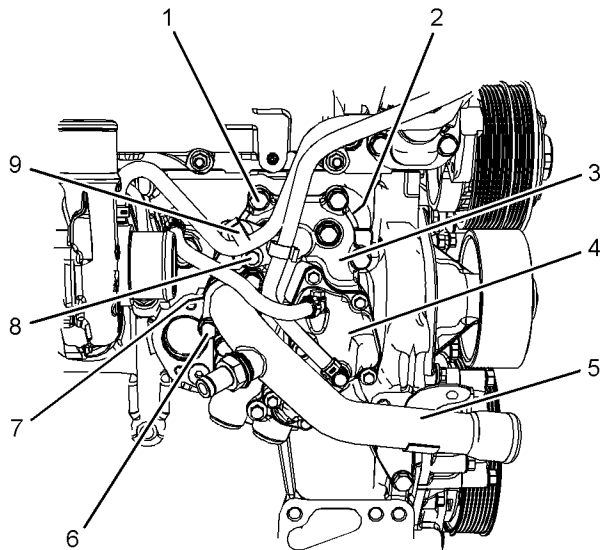


Illustration 151

g02706998

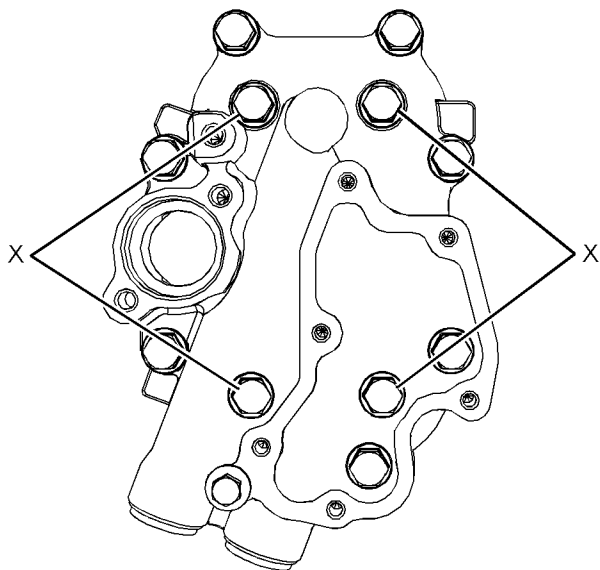


Illustration 152

g02871078

3. Disconnect the coolant hoses from tube assembly (5).

4. Remove bolts (6) from tube assembly (5). Remove tube assembly (5) from engine oil cooler assembly (3).
5. Remove O-ring seal (7) (not shown) from tube assembly (5).
6. Remove bolt (8) and bracket (9) from the engine oil cooler assembly.
7. Remove boost pressure chamber cover (4). Refer to Disassembly and Assembly, "Turbocharger - Remove" for the correct procedure.
8. Remove bolts (1) from the engine oil cooler. Do not remove the bolts in Position (X). Remove the engine oil cooler assembly from the cylinder block.

Note: The bolts are different lengths. Note the position of the different lengths bolts.

9. Remove gasket (2) (not shown).

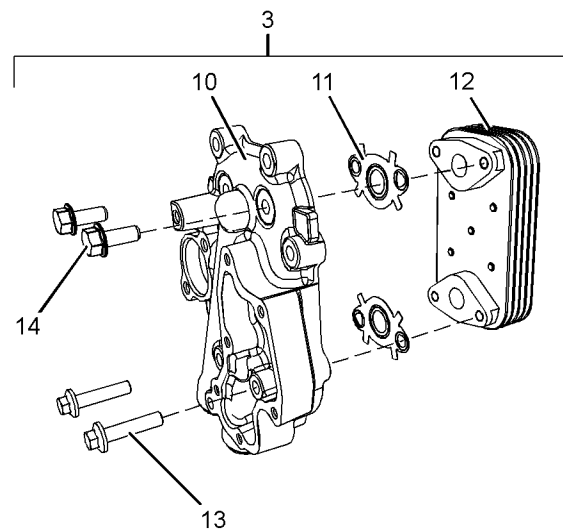


Illustration 153

g02707318

10. If necessary, follow Step 10.a through Step 10.c in order to disassemble the engine oil cooler.
 - a. Remove bolts (13) and bolts (14) from the engine oil cooler assembly (3).
 - b. Remove cooler matrix (12) from housing (10).

c. Remove gaskets (11).

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Engine Oil Cooler - Install

Installation Procedure

1. Ensure that all components are free from wear and damaged. If necessary, replace any components that are worn or damaged.

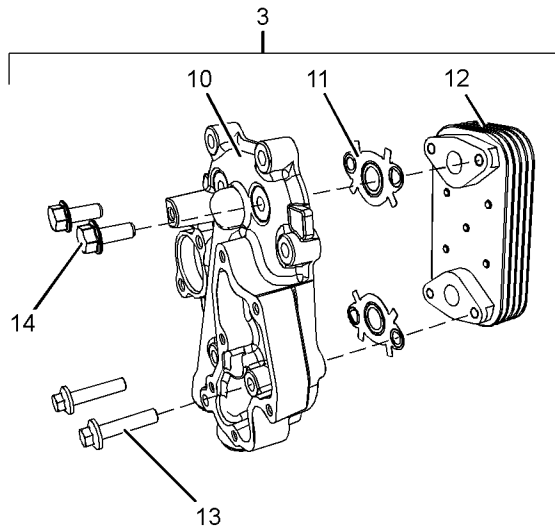


Illustration 154

g02707318

2. If necessary, follow Step 2.a through Step 2.d in order to assembly the engine oil cooler.
 - a. Ensure that engine oil cooler matrix (12) is clean, free from damage and restriction. Replace engine oil cooler matrix (12) if damaged or restricted.
 - b. Ensure that housing (10) is clean and free from damage. Replace housing (10) if damaged.
 - c. Position new gaskets (11) onto engine oil cooler matrix (12). Install engine oil cooler matrix (12) to housing (10).
 - d. Install bolts (13) and bolts (14) to the assembly of oil cooler (3). Tighten bolts (13) and bolts (14) to a torque of 25 N·m (221 lb in).

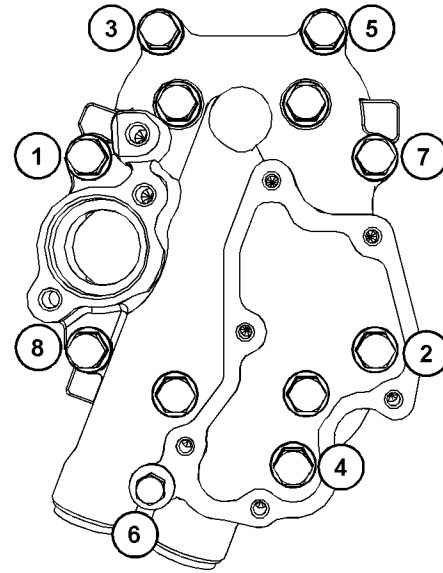


Illustration 155

g02871598

Tightening sequence for the engine oil cooler.

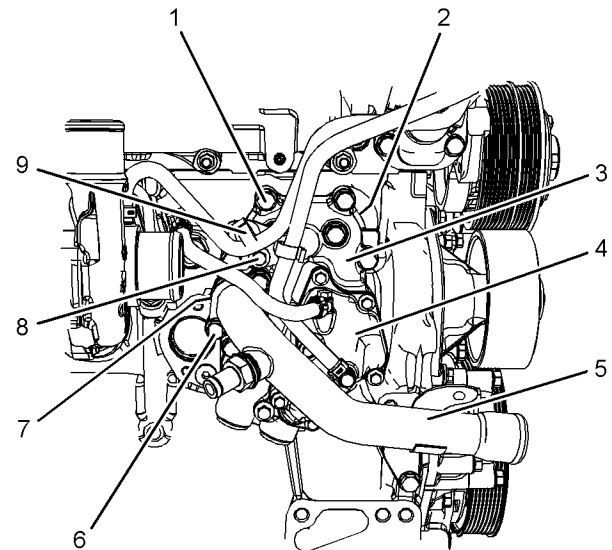


Illustration 156

g02706998

3. Clean the gasket surfaces of the cylinder block.
4. Position a new gasket (4) onto the engine oil cooler.
5. Install assembly of engine oil cooler (5) to the cylinder block. Install bolts (1) to the assembly of oil cooler (3).

Note: Ensure that the bolts of different lengths are installed in the correct position.

6. Tighten bolts (3) to a torque of 25 N·m (221 lb in) in sequence that is shown in Illustration 155 .
7. Position bracket (9) onto engine oil cooler (3). Install bolt (8) to bracket (9). Tighten the bolt to a torque of 15 N·m (133 lb in).
8. Install boost pressure chamber cover (4). Refer to Disassembly and Assembly, "Turbocharger - Install" for the correct procedure.
9. If necessary, install the turbo charger oil drain tube assembly. Refer to Disassembly and Assembly, "Turbocharger - Install" for the correct procedure.
10. Install a new O-ring seal (7) (not shown) to tube assembly (5).
11. Install tube assembly (5) to engine oil cooler (3).
12. Install bolts (6) to tube assembly (5). Tighten the bolts to a torque of 25 N·m (221 lb in).
13. Connect the coolant hoses to tube assembly (5).
14. Install the Alternator. Refer to Disassembly and Assembly, "Alternator - Install" for the correct procedure.
15. Fill the cooling system to the correct level. Refer to Operation and Maintenance Manual, "Cooling System Coolant - Change" for the correct procedure.
16. If the engine oil was drained during the engine oil cooler removal procedure, refill the lubrication system. Refer to Operation and Maintenance Manual, "Engine Oil and Filter - Change" for the correct procedure.

17. Check the level of the engine lubricating oil. Refer to Operation and Maintenance Manual, "Engine Oil Level - Check" for the correct procedure.

i05270776

Engine Oil Relief Valve - Remove and Install

Removal Procedure

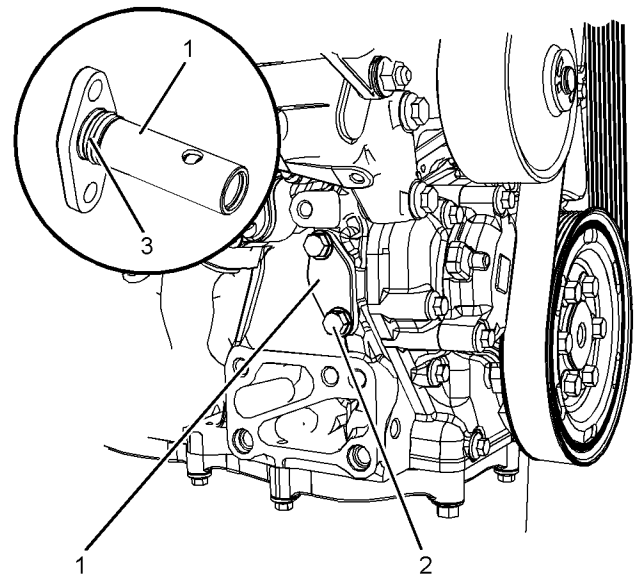


Illustration 157

g02953956

1. Remove bolts (2) from engine oil relief valve (1).
2. Remove engine oil relief valve (1) from the cylinder block.
3. Remove O-ring seal (3) from engine oil relief valve (1).

Installation Procedure

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Check all components for wear and damage. If necessary, replace any components that are worn or damaged.

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