



Service Repair Manual

Models

335F LCR Excavator

[Previous Screen](#)

Product: EXCAVATOR

Model: 335F LCR EXCAVATOR KNE

Configuration: 335F LCR Excavator KNE00001-UP (MACHINE) POWERED BY C7.1 Engine

Disassembly and Assembly

C7.1 Engines for Caterpillar Built Machines

Media Number -UENR4468-15

Publication Date -01/06/2015

Date Updated -30/10/2018

i06731945

Rocker Shaft and Pushrod - Install

SMCS - 1102-012; 1208-012

Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A ⁽¹⁾	9U-6198	Crankshaft Turning Tool	1
A ⁽²⁾	9U-7336	Housing	1
	5P-7305	Engine Turning Tool	1
B	367-8608	Engine Timing Pin	1
C	298-5564	T40 Torx Socket	1
D	227-4389	E10 Torx Socket	1
E	370-4657	Rocker Arm Spacer	6
F	322-4113	Retainers	24

⁽¹⁾ The Crankshaft Turning Tool is used on the front pulley.

⁽²⁾ 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.

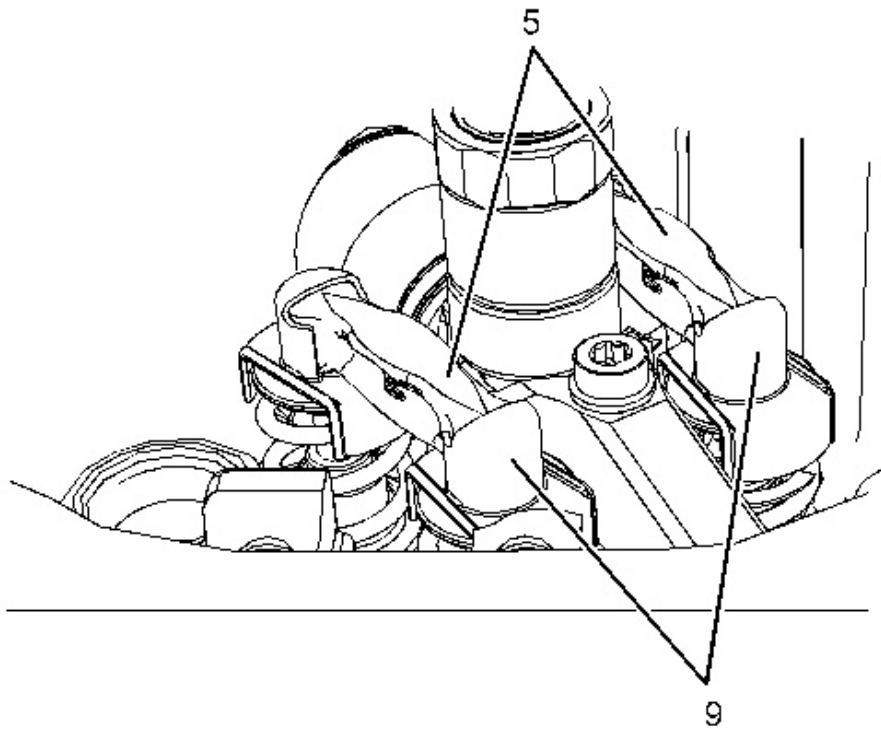


Illustration 1

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The correct location of valve bridges on valve stems is shown.

1. Engines that have valve bridge clips (9) originally installed on valve bridges (5). Remove the valve bridge clips from the valve bridges.
2. Clean valve bridges (5). Inspect the valve bridges for wear and damage. Replace any valve bridges that are worn or damaged.
3. Install Tooling (F) onto valve bridges (5).
4. Lubricate valve bridges (5) with clean engine oil.

NOTICE

Failure to ensure that ALL valve bridges are correctly seated onto the valve stems will cause interference between the pistons and the valves, resulting in damage to the engine.

5. Install valve bridges (5) to the valve stems. Ensure that valve bridge clips (9) are correctly located.

Note: Install used valve bridges in the original location and in the original orientation. Ensure that the valve bridges are correctly seated on the valves. New valve bridges may be installed in either orientation.

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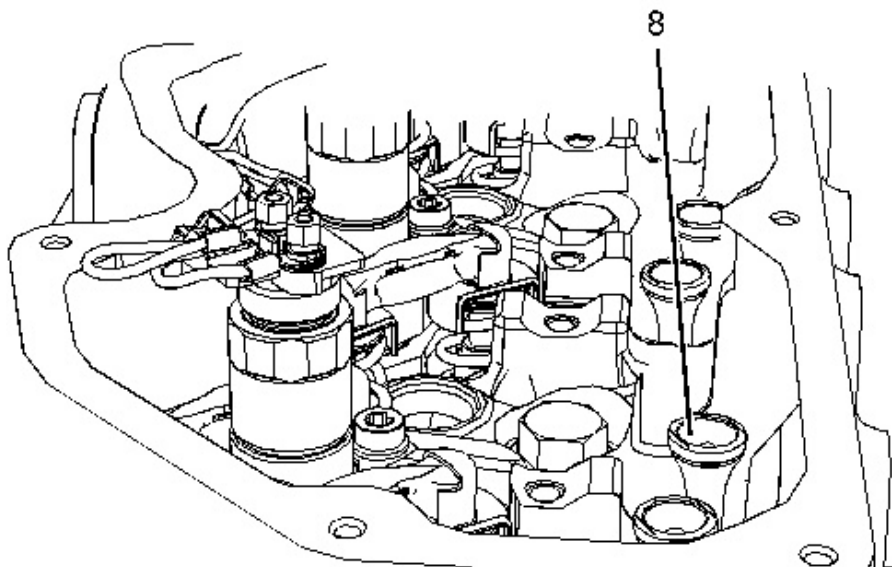


Illustration 2

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6. Clean the pushrods. Inspect the pushrods for wear and damage. Replace any pushrods that are worn or damaged.
7. Apply clean engine lubricating oil to both ends of pushrods (8). Install the pushrods to the engine with the cup upward. **Ensure that when the pushrods are installed into the hydraulic lift there should be a noticeable snap when the pushrods are correctly installed.**

Note: Ensure that the pushrods are installed in the original location.

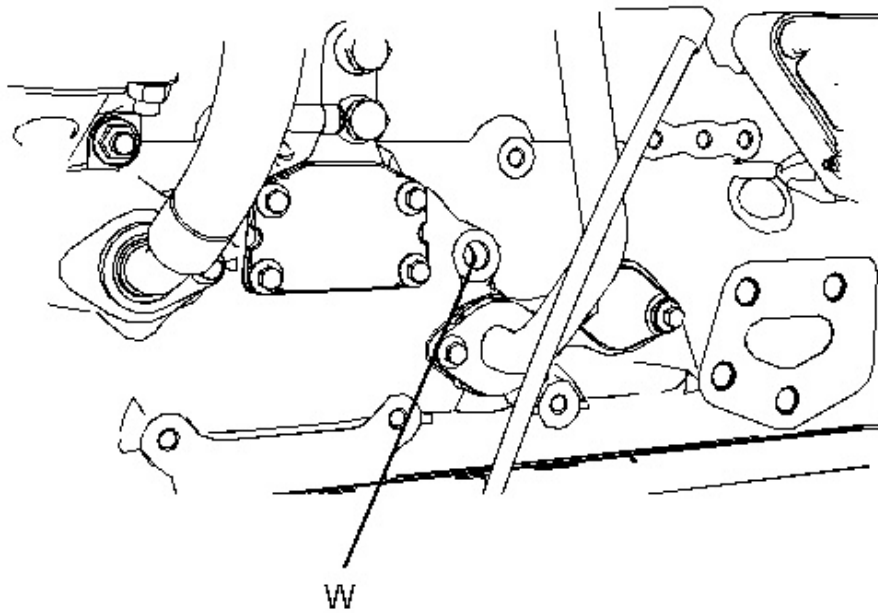


Illustration 3

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8. If necessary, use Tooling (A) to rotate the crankshaft so that number one piston is at top dead center on the compression stroke. Refer to System Operation, Testing and Adjusting, "Position the Valve Mechanism Before Maintenance Procedures" for the correct procedure. Install Tooling (B) through Hole (W) to lock the crankshaft.

Note: Do not use excessive force to install Tooling (B). Do not use Tooling (B) to hold the crankshaft during repairs.

9. Remove Tooling (B).

NOTICE

Failure to ensure that the crankshaft is positioned at 60 degrees after top dead center will result in interference between the pistons and the valves. Failure to ensure that the crankshaft is positioned at 60 degrees after top dead center will result in damage to the engine.

10. Use Tooling (A) to rotate the crankshaft in a clockwise direction and position the crankshaft at 60 degrees after top dead center.
-

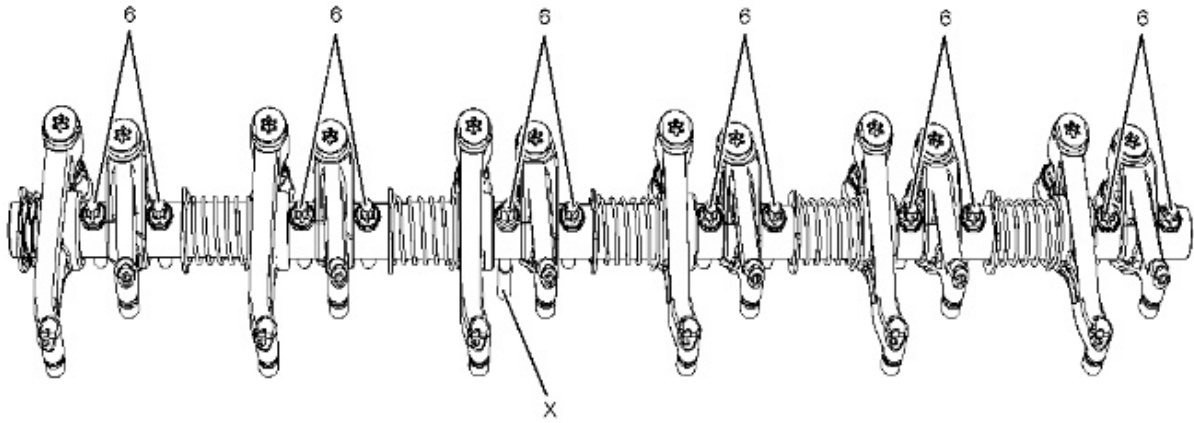


Illustration 4

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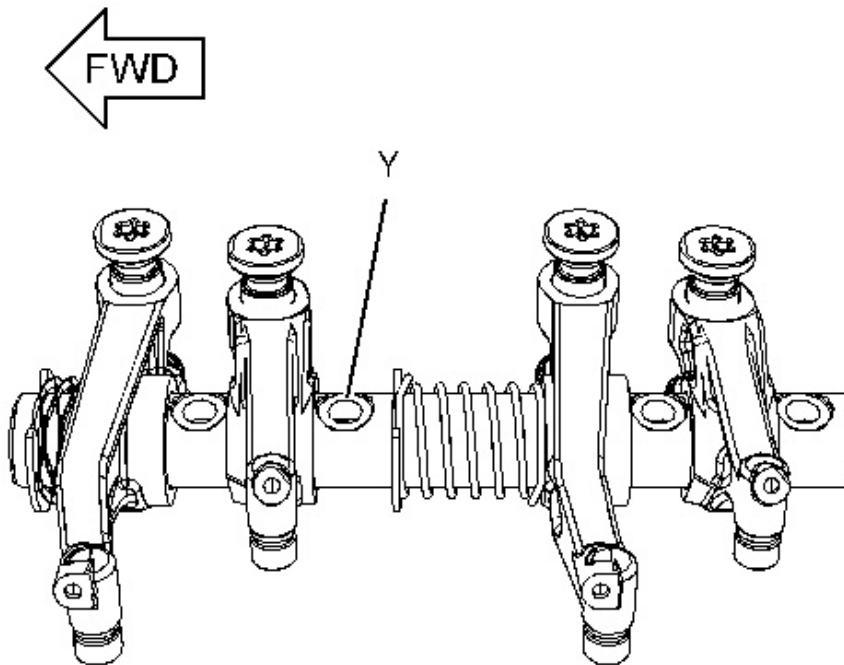


Illustration 5

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11. Ensure that the rocker shaft assembly is clean and free from wear and damage.
12. Position the rocker shaft assembly with Spotfaces (Y) for Torx screws (6) is in the up ward position.
13. Install Tooling (E) to rocker shaft assembly.
14. Install Torx screws (6) to the rocker shaft.

Note: Ensure that correct Torx screw (6) is installed to Position (X).

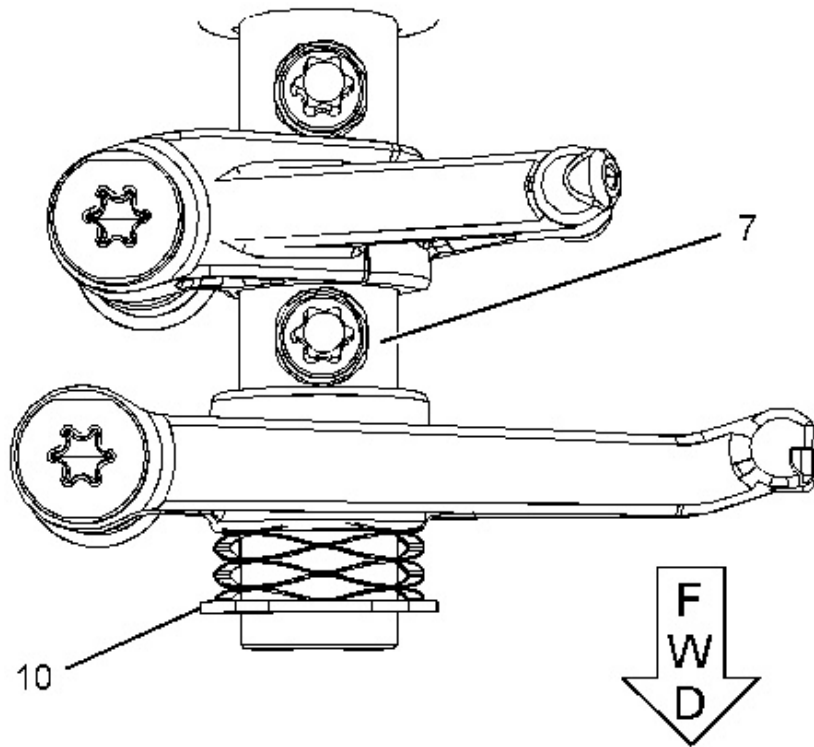


Illustration 6

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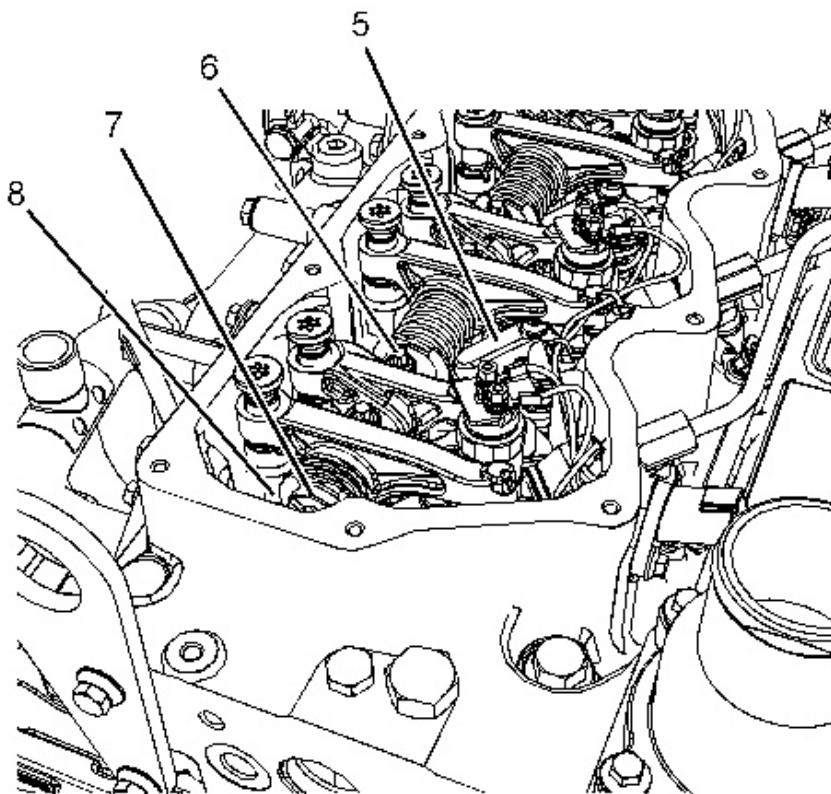


Illustration 7

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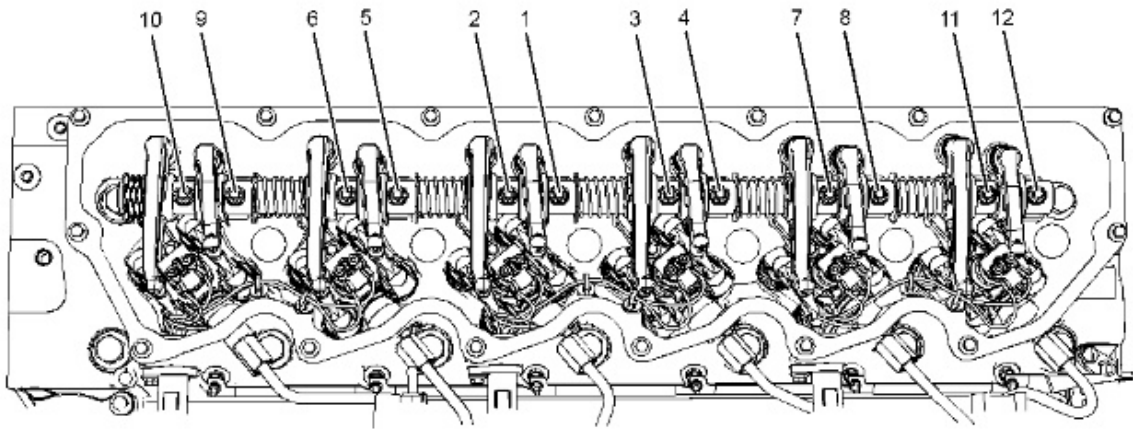


Illustration 8

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15. Ensure that ALL threaded inserts are fully unscrewed.

NOTICE

Damage to the engine will occur if all threaded inserts are not fully unscrewed.

16. Position rocker shaft assembly (7) onto the cylinder head. The retaining clip (10) should face the front of the engine.
Note: Ensure that the threaded inserts are correctly seated in ends of pushrods (8).
 17. Use Tooling (D) to tighten Torx screws (7) hand tight.
 18. Remove Tooling (E) from the rocker shaft. Install the remaining Torx screws (6) to the rocker shaft. Tighten the Torx screws hand tight.
 19. Tighten Torx screws (6) to a torque of 35 N·m (26 lb ft) in the numerical sequence that is shown in Illustration 8.
 20. Ensure that valve bridges (5) are correctly located on the valve stems. **Failure to ensure that ALL valve bridges are correctly seated onto the valve stems will result in interference between the pistons and the valves, resulting in damage to the engine.**
-

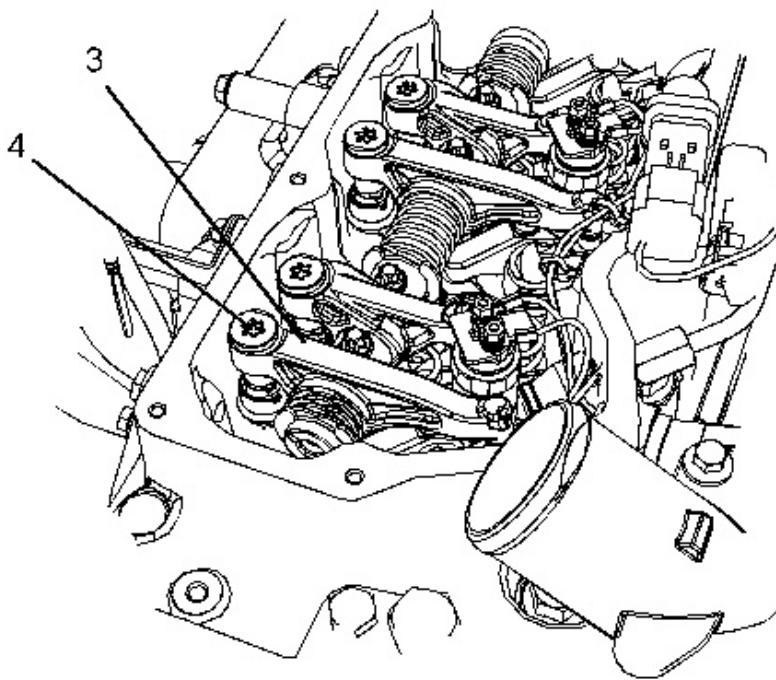


Illustration 9

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21. Use Tooling (C) to tighten threaded inserts (4) on all rocker arms (3). Tighten the threaded inserts to a torque of 30 N·m (265 lb in).

Note: When the threaded insert is tightened, the threaded insert must seat correctly into the cup for the pushrod.

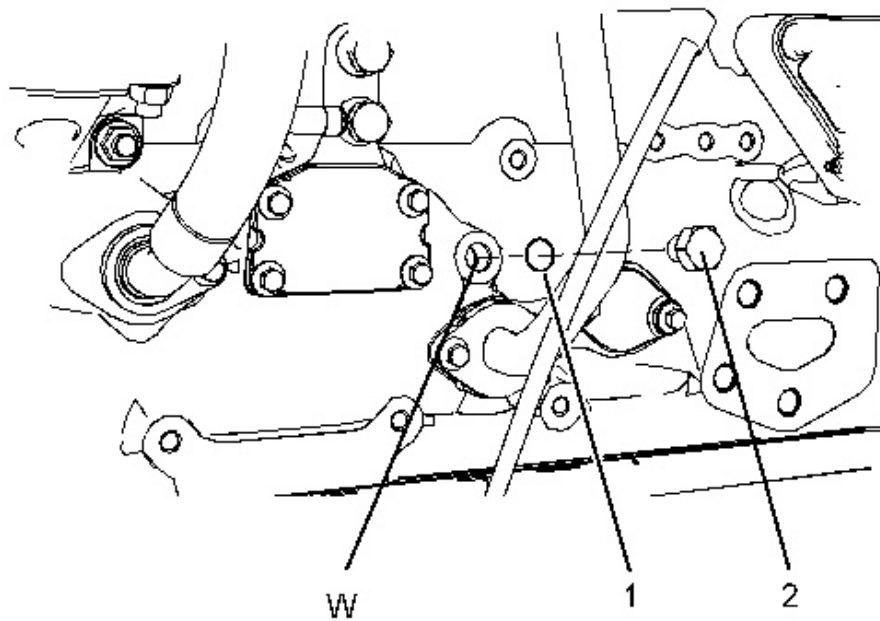


Illustration 10

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22. Install a new O-ring seal (1) to plug (2). Install the plug into Hole (W) in the cylinder block. Tighten plug (2) to a torque of 21 N·m (186 lb in).
23. The engine should not be operated for a period 30 minutes after the threaded inserts on all the rocker arms have been tightened. This period will allow the force of the valve springs to purge off excessive engine oil from the hydraulic lifters.

End By:

- a. Install the valve mechanism cover. Refer to Disassembly and Assembly, "Valve Mechanism Cover - Remove and Install" for the correct procedure.

Previous Screen

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Disassembly and Assembly
C7.1 Engines for Caterpillar Built Machines

Media Number -UENR4468-15

Publication Date -01/06/2015

Date Updated -30/10/2018

i05018674

Cylinder Head - Remove

SMCS - 1100-011

Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	370-8376	Capping Kit	1

Start By:

- a. If necessary, remove the secondary fuel filter and the fuel filter base. Refer to Disassembly and Assembly, "Fuel Filter Base - Remove and Install" for the correct procedure.
 - b. If necessary, remove the water separator and fuel filter (Primary). Refer to Disassembly and Assembly, "Water Separator and Fuel Filter (Primary) - Remove and Install" for the correct procedure.
 - c. Remove the exhaust manifold. Refer to Disassembly and Assembly, "Exhaust Manifold - Remove and Install" for the correct procedure.
 - d. Remove the crankcase breather canister and plastic tube assemblies. Refer to Disassembly and Assembly, "Crankcase Breather - Remove" for the correct procedure.
 - e. Remove the fuel manifold. Refer to Disassembly and Assembly, "Fuel Manifold (Rail) - Remove and Install" for the correct procedure.
 - f. Remove the electronic unit injectors. Refer to Disassembly and Assembly, "Electronic Unit Injector - Remove" for the correct procedure.
 - g. Remove the mounting bracket for the electronic control module. Refer to Disassembly and Assembly, "ECM Mounting Bracket - Remove and Install" for the correct procedure.
 - h. Remove the glow plugs. Refer to Disassembly and Assembly, "Glow Plugs - Remove and Install" 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.

1. Drain the coolant from the cooling system into a suitable container for storage or for disposal. Refer to Operation and Maintenance Manual, "Cooling System Coolant - Change" for the correct draining procedure.
-

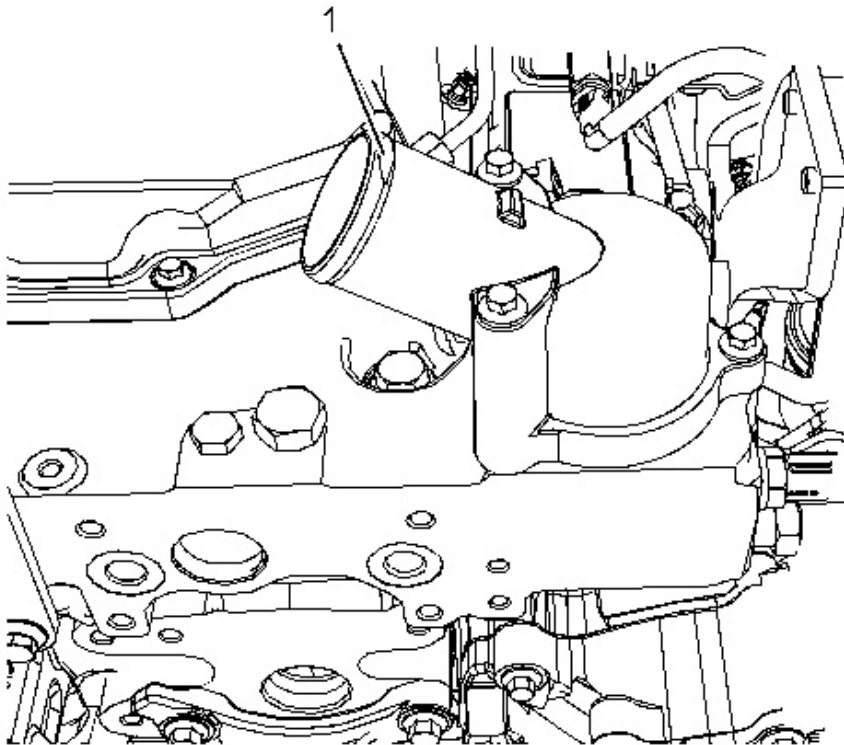


Illustration 1

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2. Disconnect the upper radiator hose from water temperature regulator housing (1) on the cylinder head.
-

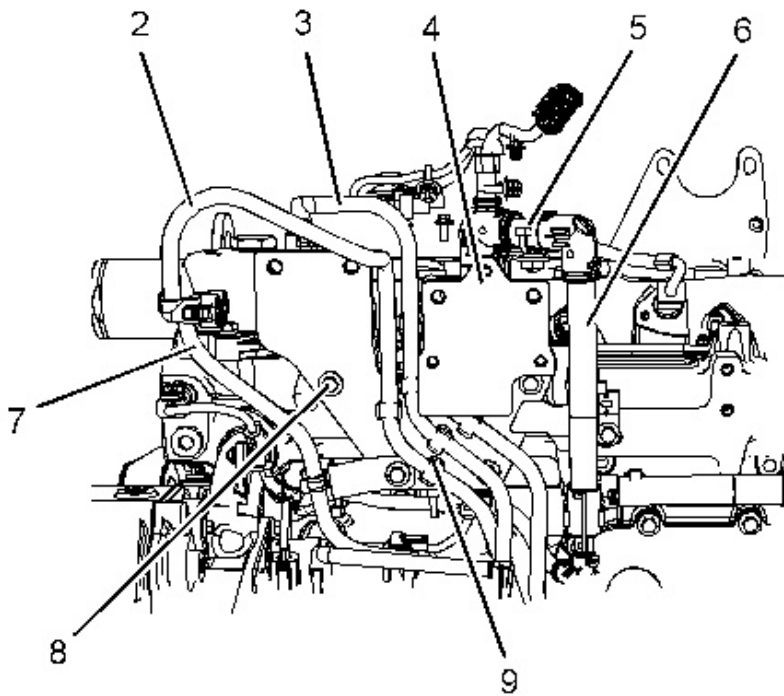


Illustration 2

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3. Remove plastic tube assembly (2), plastic tube assembly (3), and plastic tube assembly (7) from clips (9).
4. Cut all cable straps (5) from engine wiring harness assembly (6). Position engine wiring harness assembly away from the engine.

Note: Ensure that all cable straps are removed from the engine wiring harness.

5. Remove bolts (8) and remove bracket (4) from the cylinder head.
-

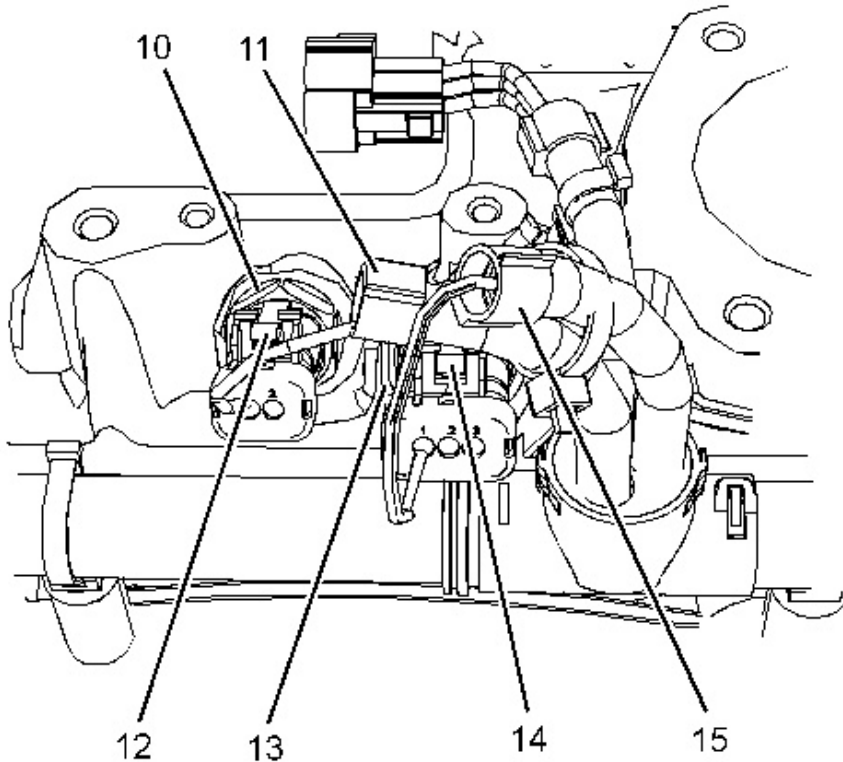


Illustration 3

g02206194

6. Follow Step 6.a through Step 6.b in order to disconnect harness assembly (15) from boost pressure sensor (13).
 - a. Slide locking tab (14) into the unlocked position.
 - b. Disconnect harness assembly (15) from boost pressure sensor (13).
 7. Follow Step 7.a through Step 7.b in order to disconnect harness assembly (11) from inlet air temperature sensor (10).
 - a. Slide locking tab (12) into the unlocked position.
 - b. Disconnect harness assembly (11) from inlet air temperature sensor (10).
 8. Remove all cable straps that secure the harness assembly to the cylinder head. The harness assembly should be positioned away from the cylinder head in order to avoid causing an obstruction during the removal of the cylinder head.
 9. On some application there is an engine wiring harness support bracket on the rear of the cylinder head. If necessary, cut the cable straps and remove the engine wiring harness from the support bracket. Remove the support bracket from the cylinder head before removal of the cylinder head assembly.
-

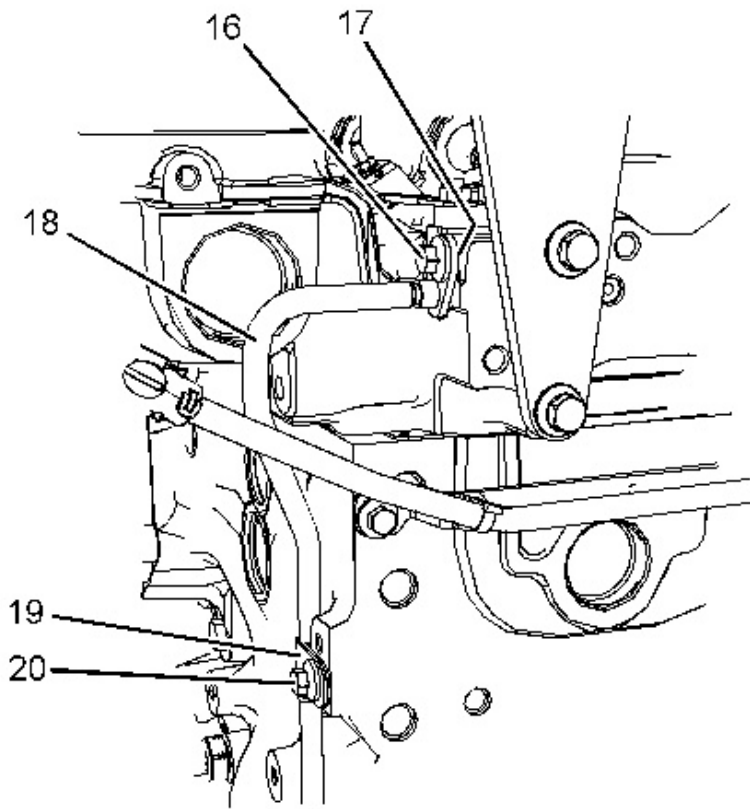


Illustration 4

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10. Remove bolt (16) from tube assembly (18). Remove bolt (20) from tube clip (19).
 11. Remove tube assembly (18) from the cylinder head. Remove O-ring seal (17) (not shown) from the tube assembly. Plug the port in the cylinder head with a new plug. Cap the tube assembly with new cap.
-

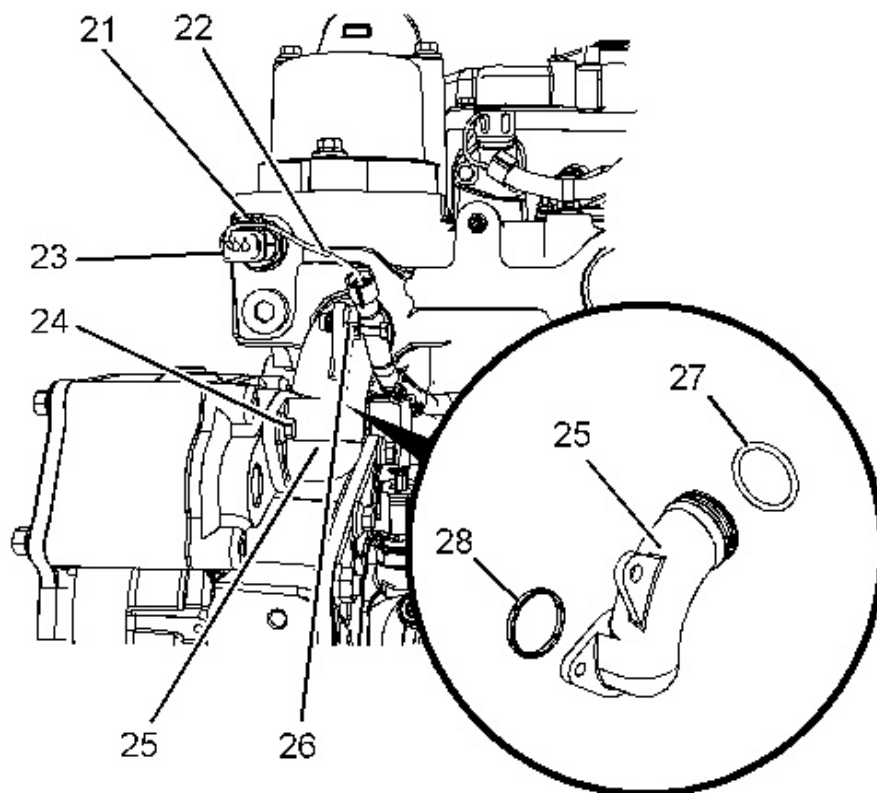


Illustration 5

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12. Follow Step 12.a through Step 12.c in order to disconnect harness assembly (22) from coolant temperature sensor (23).
 - a. Slide locking tab (21) into the unlocked position.
 - b. Disconnect harness assembly (22) from coolant temperature sensor (23).
 - c. Cut cable strap (26) and remove harness assembly (22) from bypass tube (25).
 13. Remove bolts (24).
 14. Remove bypass tube (25) from the cylinder head. Remove O-ring seal (27) and O-ring seal (28) from bypass tube (25).
-

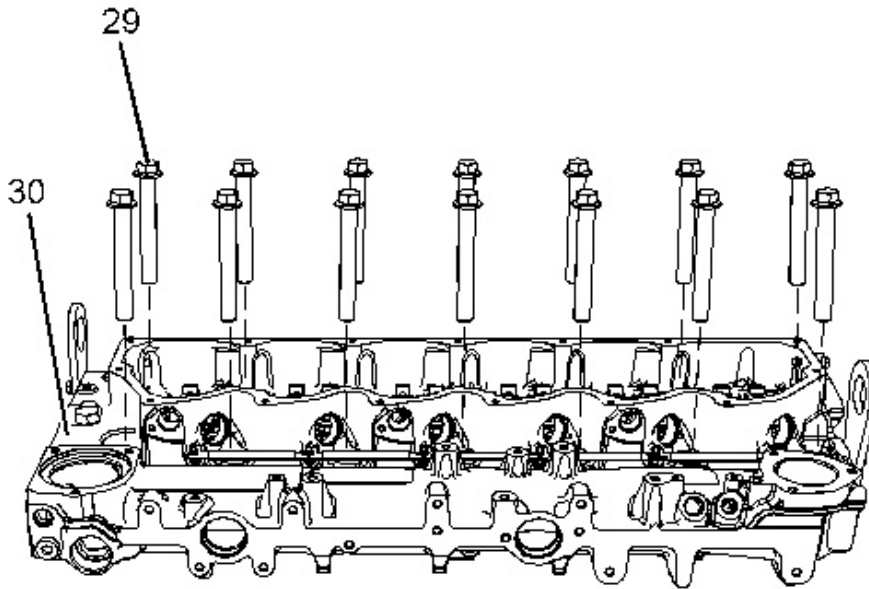


Illustration 6

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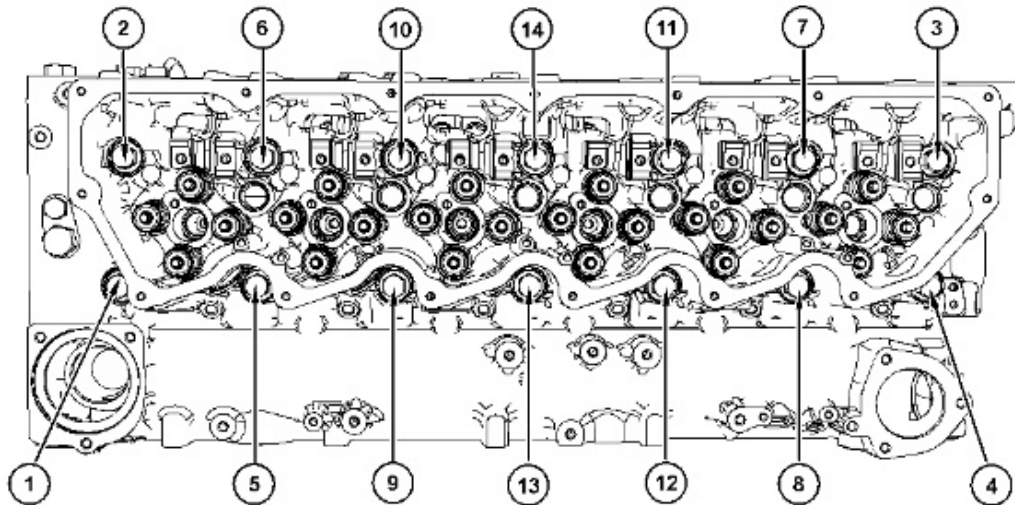


Illustration 7

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Sequence for tightening the bolts for the cylinder head

15. Gradually loosen bolts (29) in the reverse numerical order to the tightening sequence. Refer to the Illustration 7.

Note: Follow the correct sequence in order to help prevent distortion of the cylinder head.

16. Remove bolts (29) from cylinder head (30).
17. Attach a suitable lifting device to cylinder head (30). Support the weight of the cylinder head. The weight of the cylinder head is approximately 96 kg (212 lb).

Note: A spreader bar must be used in order to distribute the weight of the cylinder head during the lifting operation.

18. Use the suitable lifting device to lift cylinder head (30) off the cylinder block.

Note: Do not use a lever to separate the cylinder head from the cylinder block. Take care not to damage the machined surfaces of the cylinder head during the removal procedure.

NOTICE

Place the cylinder head on a surface that will not scratch the face of the cylinder head.

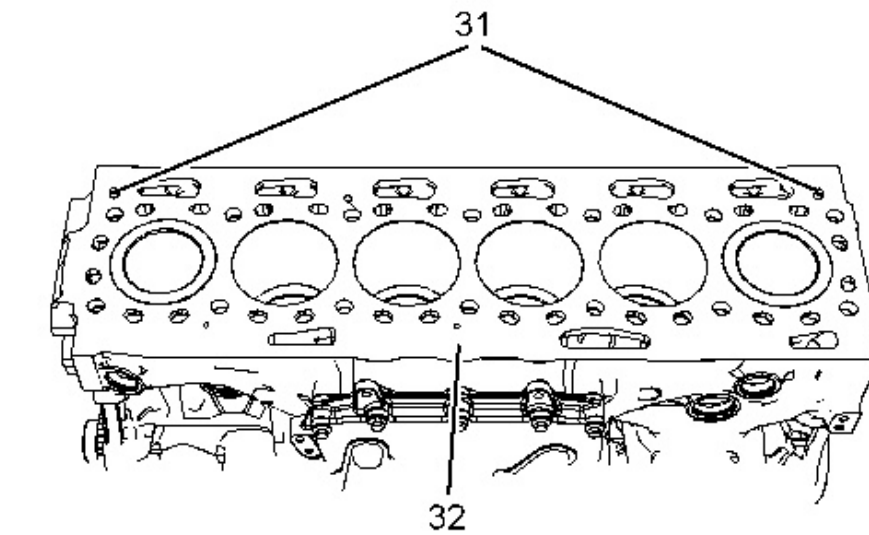


Illustration 8

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19. Remove cylinder head gasket (32).
20. Note the position of dowels (31) in the cylinder block.
21. If necessary, remove the water temperature regulator from the cylinder head. Refer to Disassembly and Assembly, "Water Temperature Regulator - Remove and Install" for the correct procedure.

[Previous Screen](#)

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Disassembly and Assembly

C7.1 Engines for Caterpillar Built Machines

Media Number -UENR4468-15

Publication Date -01/06/2015

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i05018675

Cylinder Head - Install

SMCS - 1100-012

Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
B	-	Guide Studs M16 by 115mm	2
C	8T-3052	Degree Wheel	1
D	1U-6396	O-Ring Assembly Compound	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Ensure that wiring harness are correctly routed and the cable straps are not over tightened. Over tightening of the cable straps will damage the wiring harness convoluting.

1. Thoroughly clean the gasket surfaces of the cylinder head and the cylinder block. Do not damage the gasket surfaces of the cylinder head or the cylinder block. Ensure that no debris enters the cylinder bores, the coolant passages, or the lubricant passages.

2. Inspect the gasket surface of the cylinder head for distortion. Refer to Specifications, "Cylinder Head" for more information. If the gasket surface of the cylinder head is distorted beyond maximum permitted limits, replace the cylinder head.
-

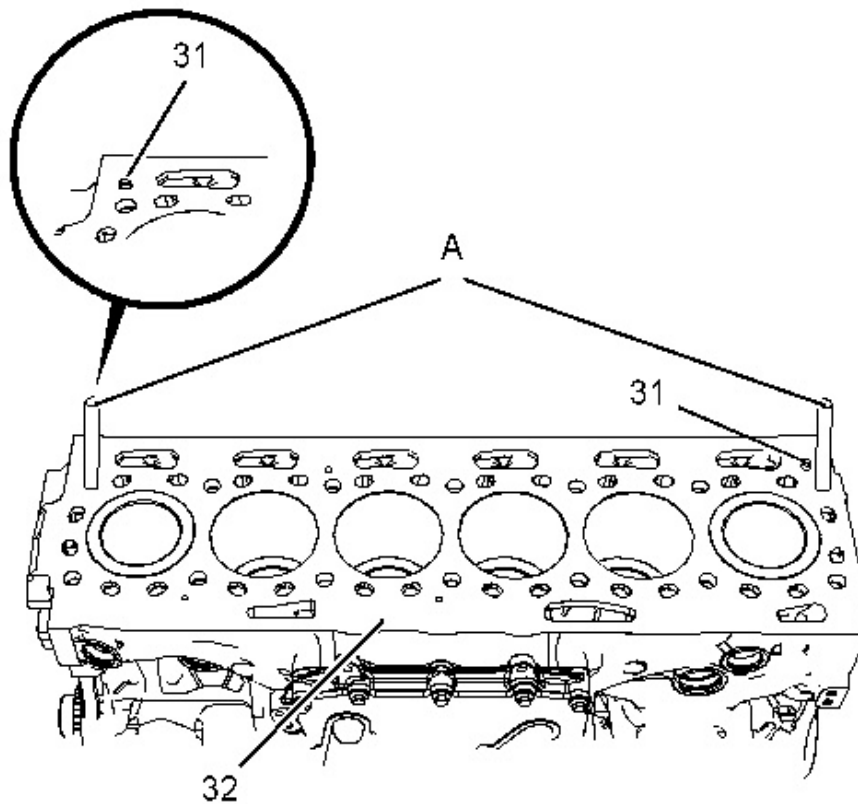


Illustration 1

g02216033

3. Inspect dowels (31) for damage. If necessary, replace the dowels in the cylinder block.
 4. Align a new cylinder head gasket (32) with dowels (31). Install the new cylinder head gasket (32) onto the cylinder block.
 5. Install Tooling (B) to the cylinder block.
 6. Use a suitable lifting device to lift cylinder head. The weight of the cylinder head is approximately 96 kg (212 lb).
Note: A spreader bar must be used in order to distribute the weight of the cylinder head during the lifting operation.
 7. Use Tooling (B) to align the cylinder head with the cylinder block. Install the cylinder head to the cylinder block.
Note: Ensure that the cylinder head is correctly positioned on dowels (31).
 8. Remove Tooling (B).
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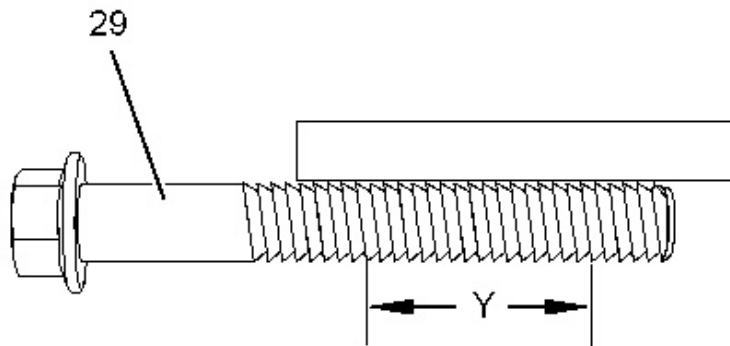


Illustration 2

g02216034

9. Clean bolts (29). Follow Step 9.a for the procedure to inspect the bolts.
 - a. Use a straight edge to check the threads of the bolts. Refer to Illustration 2. Replace any bolts that show visual reduction in the diameter of the thread over Length (Y).
10. Lubricate the threads and the shoulder of bolts (29) with clean engine oil.

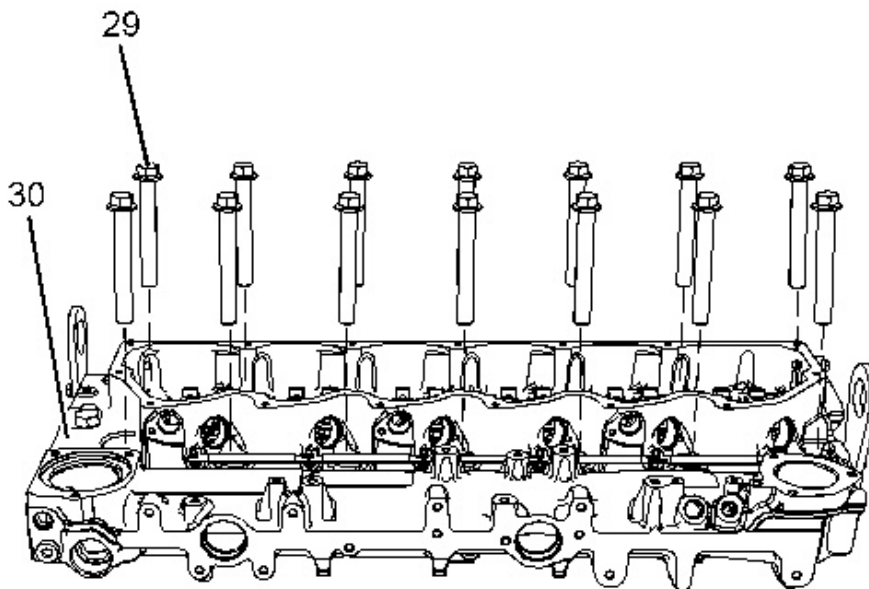


Illustration 3

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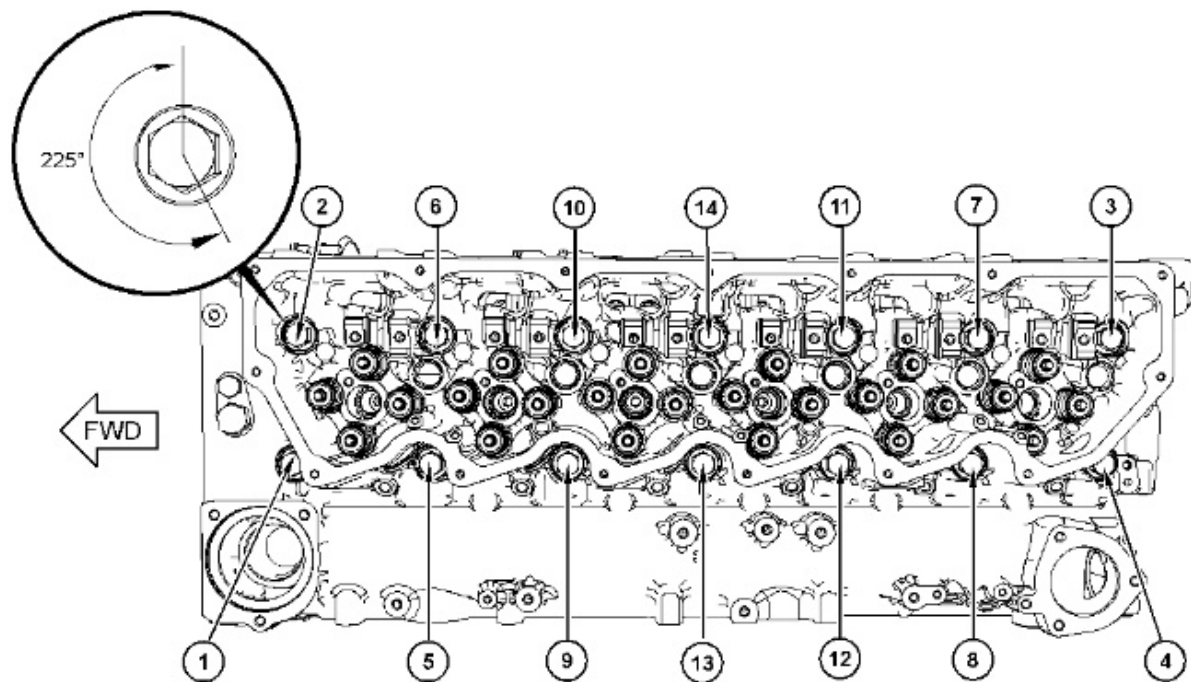


Illustration 4

g03417152

11. Install bolts (29) to cylinder head (30).
12. Tighten the bolts to a torque of 50 N·m (37 lb ft) in the numerical sequence that is shown in Illustration 4.
13. Tighten the bolts to a torque of 100 N·m (74 lb ft) in the numerical sequence that is shown in Illustration 4.
14. Use Tooling (C) in order to turn the bolts through an additional 225 degrees in the numerical sequence that is shown in Illustration 4.

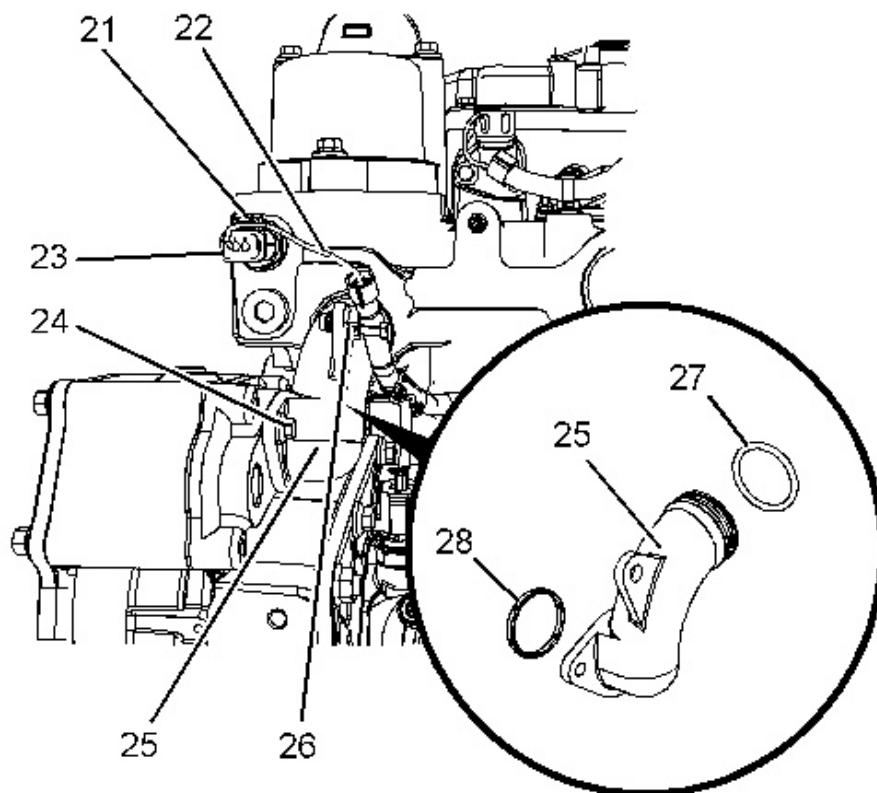


Illustration 5

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15. Use Tooling (D) in order to lubricate the O-ring seals. Install new O-ring seal (27) and O-ring seal (28) to bypass tube (25). Install the bypass tube in the cylinder head. Install bolts (24). Tighten the bolts to a torque of 9 N·m (80 lb in).
16. Follow Step 16.a through Step 16.c in order to connect harness assembly (22) to coolant temperature sensor (23).
 - a. Connect harness assembly (22) to coolant temperature sensor (23).
 - b. Slide locking tab (21) into the locked position.
 - c. Position harness assembly (22) onto the bypass tube and install a new cable strap (26).

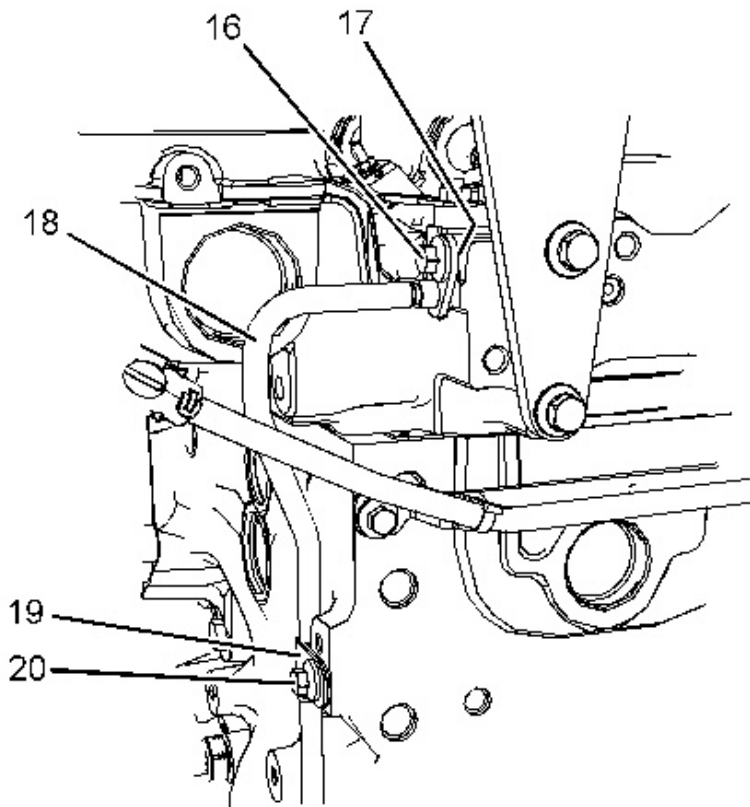


Illustration 6

g02206213

17. Remove the plugs and caps from the ports and tube assembly.
 18. Use Tooling (C) in order to lubricate new O-ring seals (17) (not shown). Install the O-ring seal to tube assembly (18) for the fuel return from the cylinder head.
 19. Install tube assembly (18) to the cylinder head.
 20. Install bolt (16) finger tight.
 21. Install bolt (20) to tube clip (19) finger tight.
 22. Tighten bolt (16) and bolt (20) to a torque of 22 N·m (195 lb in).
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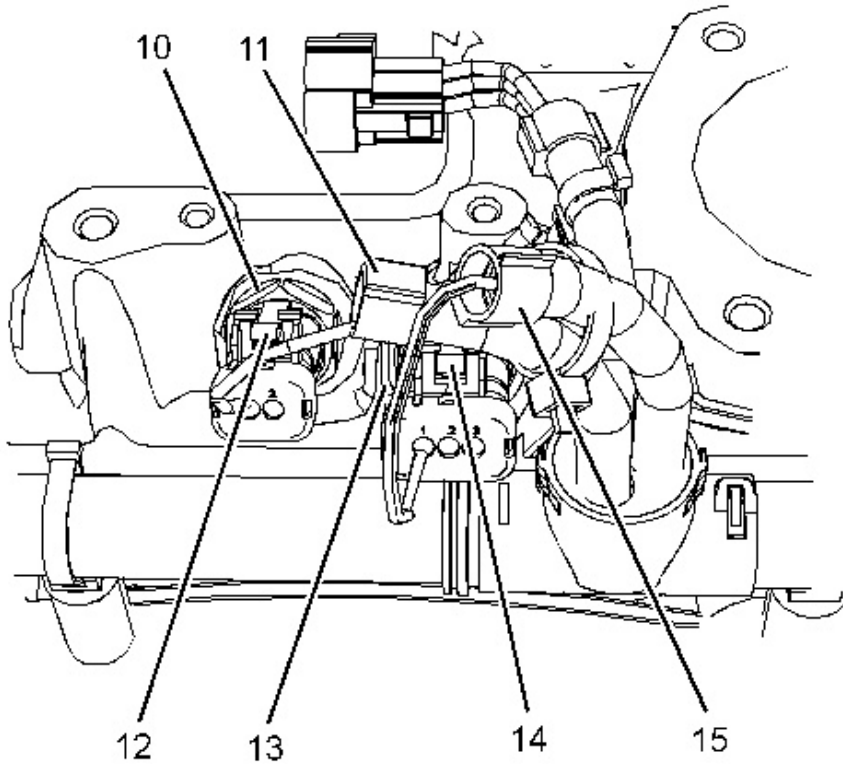


Illustration 7

g02206194

23. Follow Step 23.a through Step 23.b in order to connect harness assembly (11) to inlet air temperature sensor (10).
 - a. Connect harness assembly (11) to inlet air temperature sensor (10).
 - b. Slide locking tab (12) into the locked position.
 24. Follow Step 24.a through Step 24.b in order to connect harness assembly (15) to boost pressure sensor (13).
 - a. Connect harness assembly (15) to boost pressure sensor (13).
 - b. Slide locking tab (14) into the locked position.
 25. Position the harness assembly onto the cylinder head. Use new cable straps in order to secure the harness assembly to the cylinder head. Ensure that the harness assembly is not strained.

Note: Ensure that the harness assembly is clear of other engine components.
 26. On some applications there is an engine wiring harness support bracket on the rear of the cylinder head. If necessary, install the support bracket for the engine wiring harness to the cylinder head assembly. Use new cable straps in order to secure the engine harness assembly to the support bracket.
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