

Product: WHEEL TRACTOR

Model: 657B WHEEL TRACTOR 68K

Configuration: 657B TRACTOR 68K00893-UP (MACHINE) POWERED BY D346 ENGINE

Disassembly and Assembly C15 and C18 Engines for Caterpillar Built Machines

Media Number -REN8261-28

Publication Date -01/08/2015

Date Updated -28/08/2018

i02211115

Cylinder Head - Remove

SMCS - 1100-011

Removal Procedure

Start By:

- a. Remove the camshaft gear. Refer to Disassembly and Assembly, "Camshaft Gear - Remove and Install".
- b. Remove the electronic unit injectors. Refer to Disassembly and Assembly, "Electronic Unit Injector - Remove".
- c. Remove the valve mechanism cover base. Refer to Disassembly and Assembly, "Valve Mechanism Cover Base - Remove and Install".
- d. Remove the turbochargers. Refer to Disassembly and Assembly, "Turbocharger - Remove".

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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Do not turn the crankshaft or the camshaft while the camshaft gear is removed. If the front gear group is not correctly timed during installation, interference can occur between the pistons and the valves, resulting in damage to the engine.

1. Drain the cooling system. Refer to Operation and Maintenance Manual, "Cooling System Coolant - Change".
-

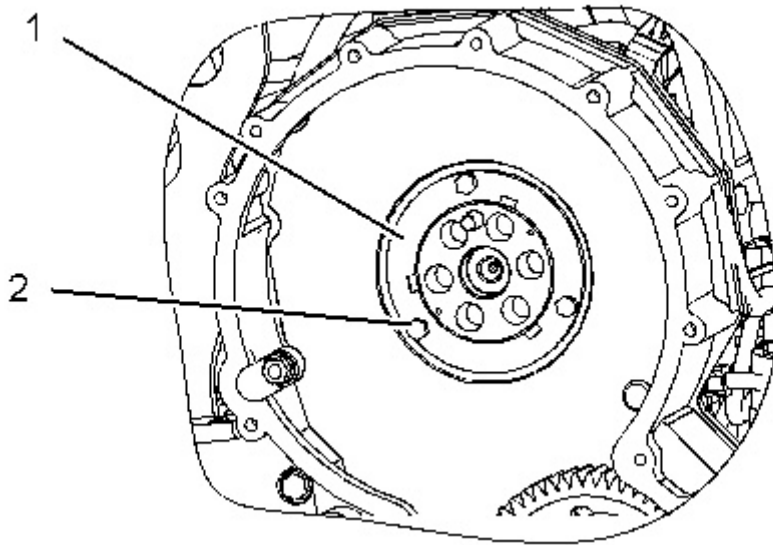


Illustration 1

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2. Remove bolts (2) and thrust plate (1).
-

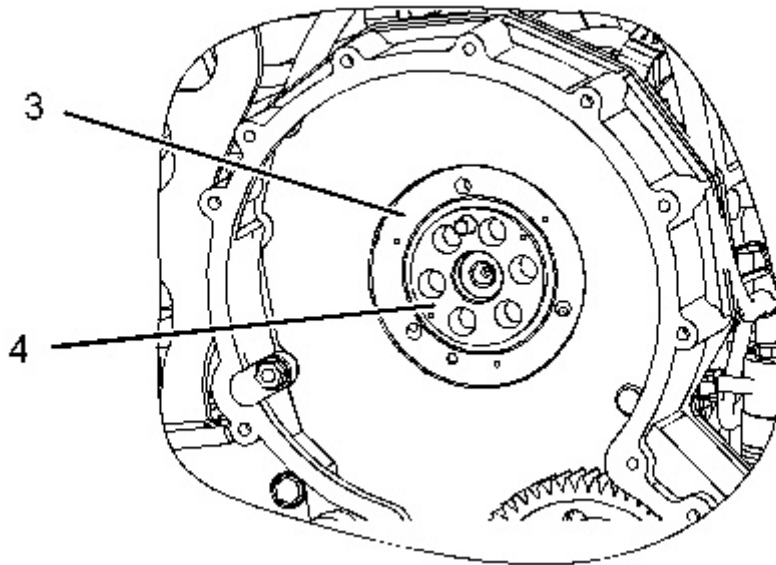


Illustration 2

g01116390

3. Remove sealing plate (3) and adapter assembly (4).
-

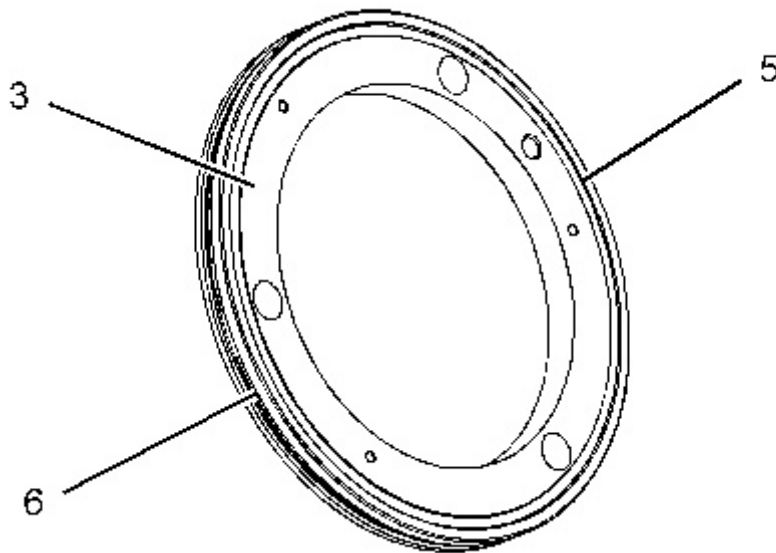


Illustration 3

g01056684

4. Remove O-ring seal (5) and O-ring seal (6) from sealing plate (3).
-

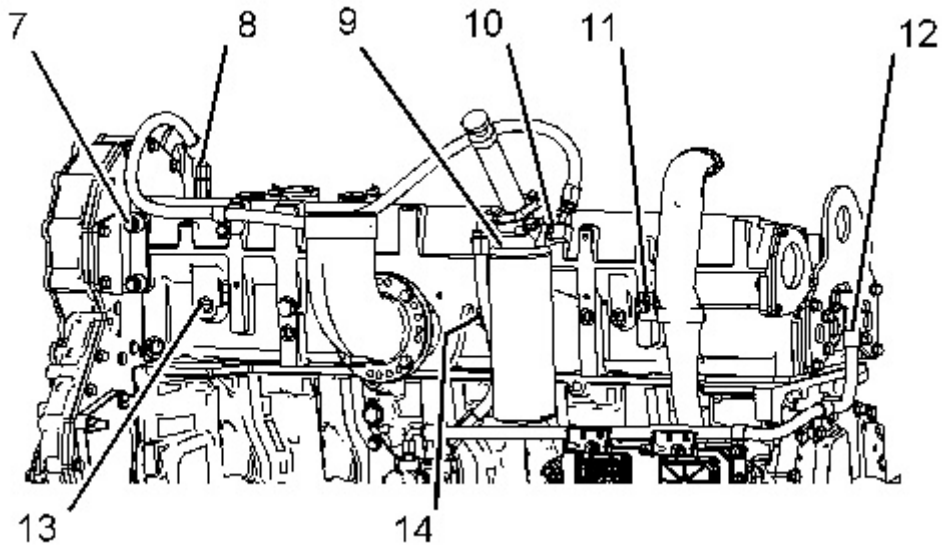


Illustration 4

g01117768

5. Disconnect hose assembly (8).
 6. Disconnect hose assembly (12).
 7. Remove bolts (10). Position fuel filter base (9) out of the way.
 8. Remove bolt (11) and the breather tube from the cylinder head.
 9. Remove bolts (7) and remove the bracket from the cylinder head.
 10. Disconnect boost pressure sensor (13).
 11. Disconnect inlet air temperature sensor (14).
-

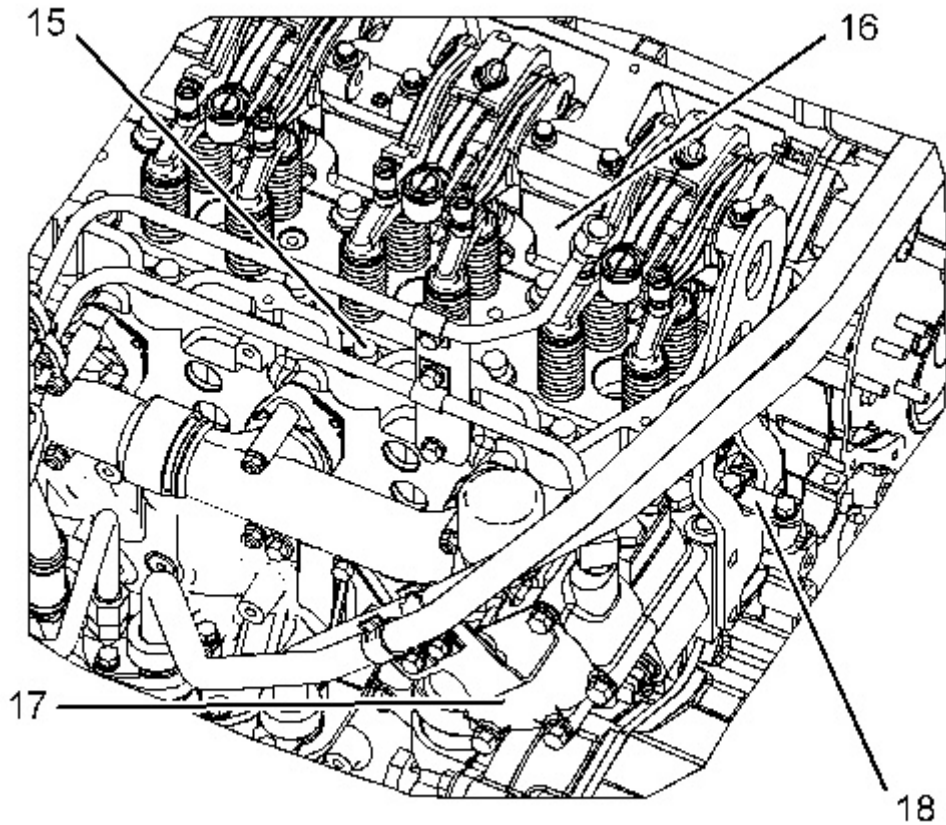


Illustration 5

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12. Remove water temperature regulator housing (17).
 13. Remove strap (18).
 14. Attach a suitable lifting device to cylinder head (16). The weight of the cylinder head is approximately 235 kg (518 lb).
 15. Remove cylinder head bolts (15).
 16. Carefully remove cylinder head (16).
-

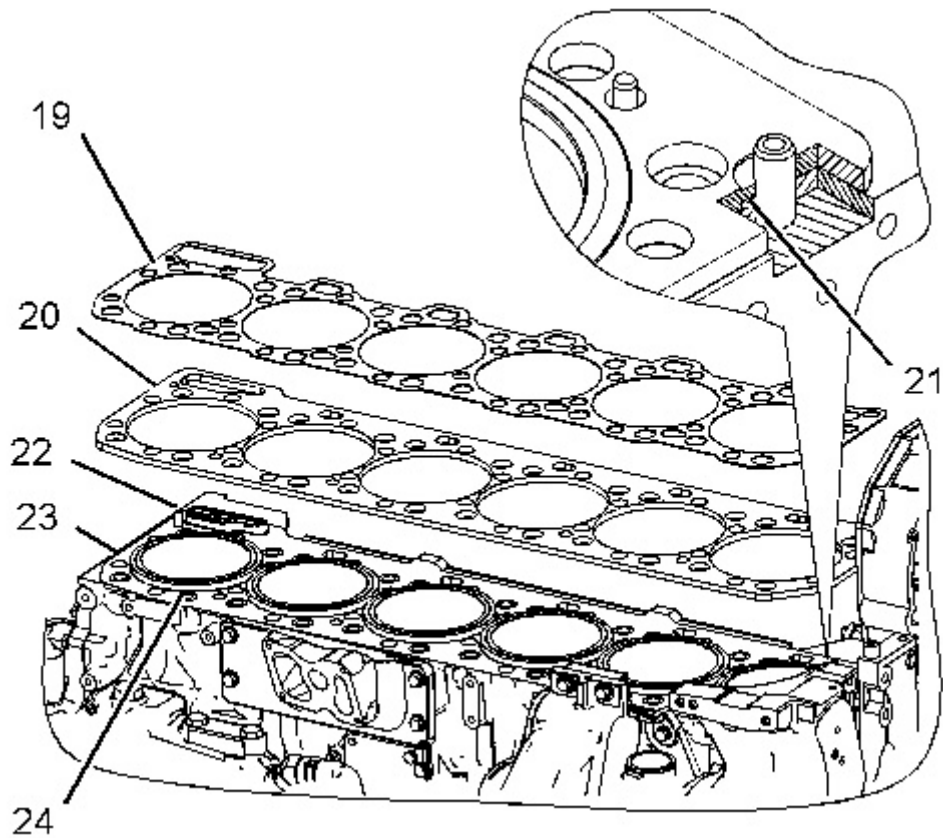


Illustration 6

g01117797

17. Remove cylinder head gasket (19).
 18. Remove spacer plate (20).
 19. Remove seals (24) and seal (22).
 20. Remove spacer plate gasket (23).
 21. Remove O-ring seal (21) from the dowel in the cylinder block.
-

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i04410295

Cylinder Head - Install

SMCS - 1100-012

Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	6V-4876	Lubricant	1
B	8T-2998	Lubricant	1
C	9S-3263	Thread Lock Compound	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

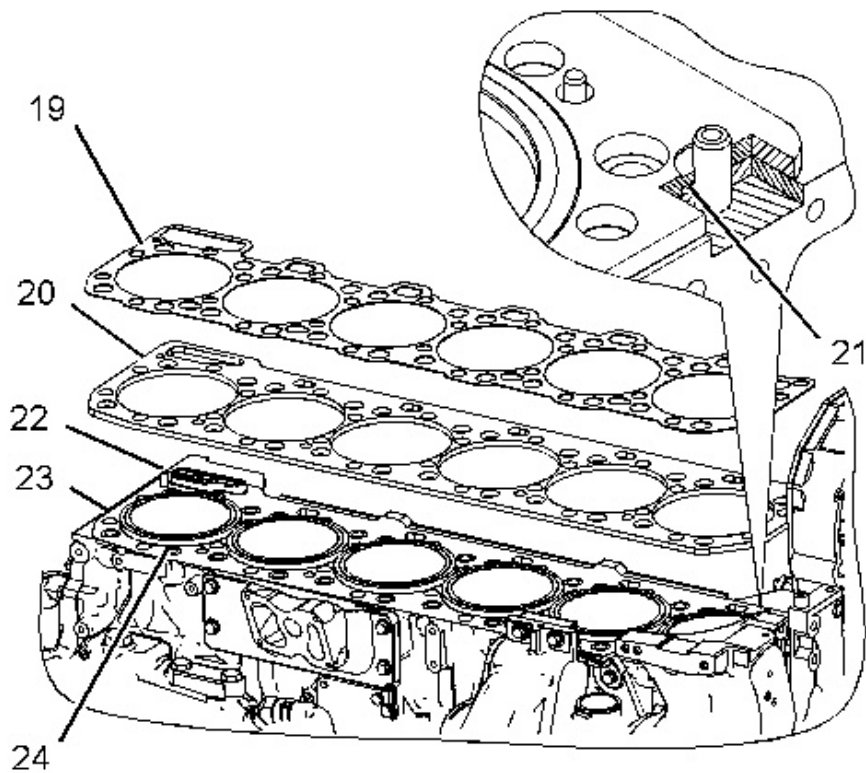


Illustration 1

g01117797

1. Install O-ring seal (21) on the dowel in the cylinder block.
 2. Install spacer plate gasket (23) on the cylinder block.
 3. Install seals (24) and seal (22) .
 4. Install spacer plate (20) .
 5. Install cylinder head gasket (19) on the spacer plate.
-

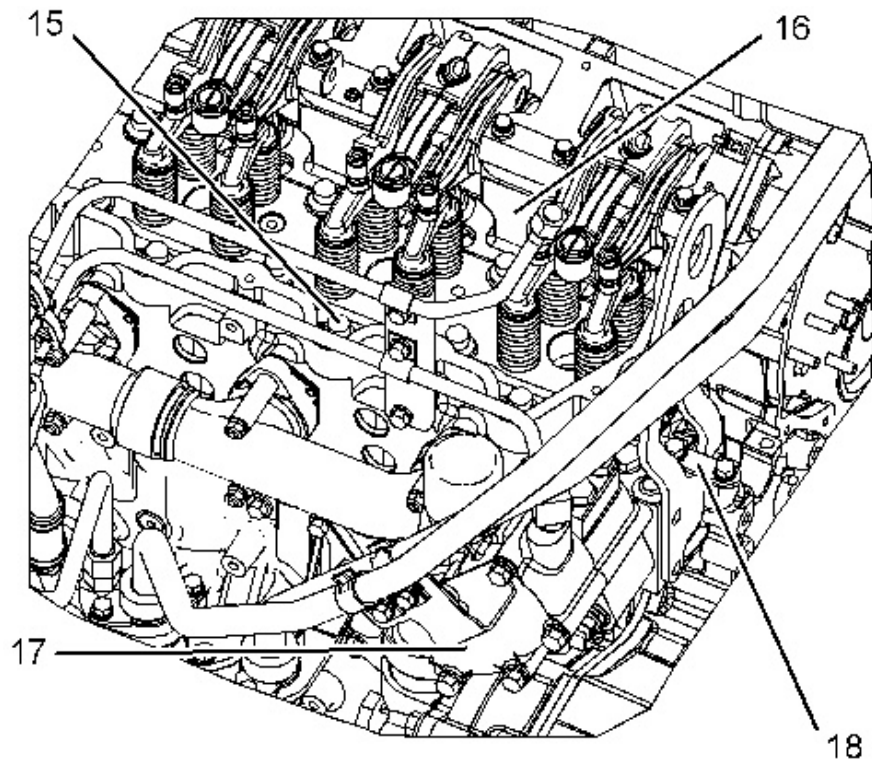
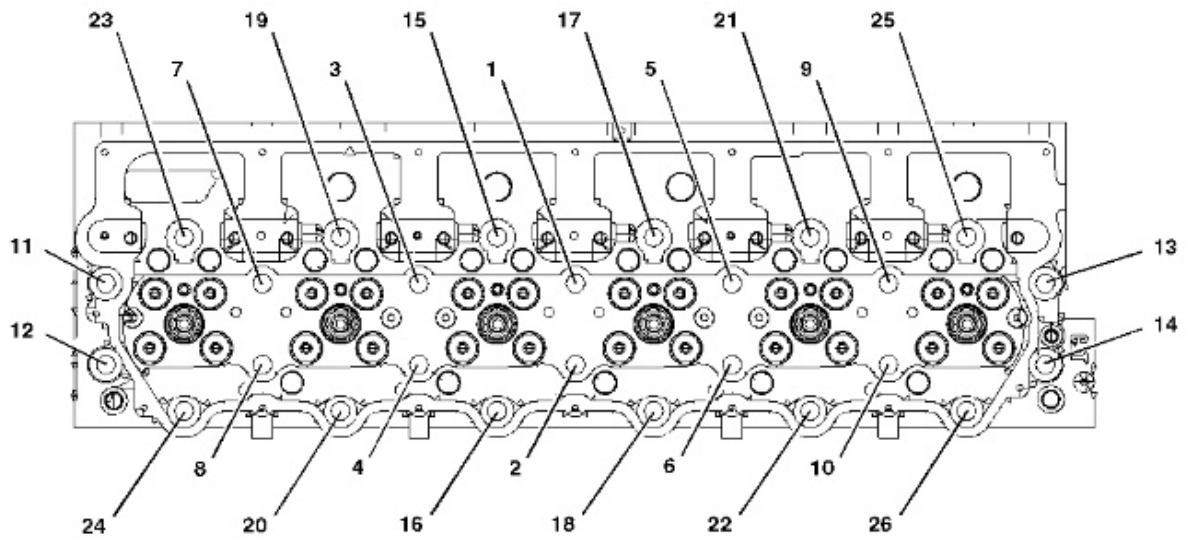


Illustration 2

g01116398

6. Attach a suitable lifting device to cylinder head (16) . The weight of the cylinder head is approximately 235 kg (518 lb).
7. Carefully install cylinder head (16) on the dowel pins on the cylinder block.



Note: The following bolts are 216 mm (8.5 inch) long: 11, 12, 13, 14, 16, 18, 20, 22, 24 and 26. The rest of the bolts are 194 mm (7.6 inch) long.

8. Apply Tooling (A) to the bolt threads and both sides of the washers for cylinder head bolts (15). Install and tighten the bolts using the following sequence:
 - a. In a numerical sequence, tighten bolts 1 through 26 to a torque of 270 ± 15 N·m (200 ± 11 lb ft).
 - b. In a numerical sequence, tighten bolts 1 through 26 to a torque of 450 ± 15 N·m (330 ± 11 lb ft).
 - c. In a numerical sequence, again tighten bolts 1 through 26 to a torque of 450 ± 15 N·m (330 ± 11 lb ft).
9. Install strap (18).
10. Install water temperature regulator housing (17).

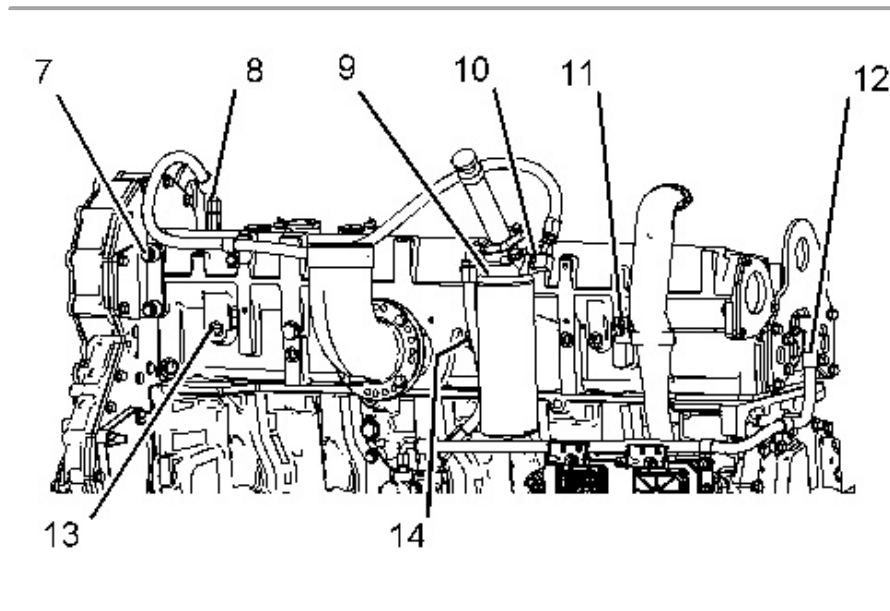


Illustration 4

g01117768

11. Connect inlet air temperature sensor (14).
12. Connect boost pressure sensor (13).
13. Position the bracket on the cylinder head and install bolts (7).
14. Position the breather tube on the cylinder head and install bolt (11). Tighten the bolt to a torque of 10 ± 3 N·m (89 ± 27 lb in).
15. Position fuel filter base (9) on the cylinder head and install bolts (10).
16. Connect hose assembly (12).
17. Connect hose assembly (8).

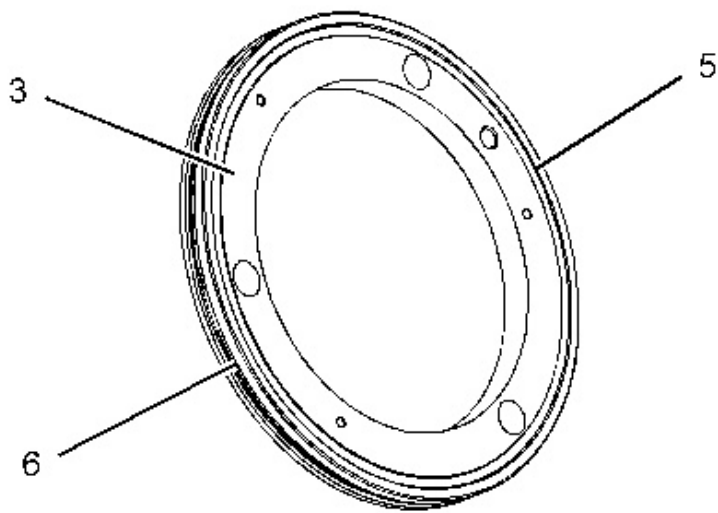


Illustration 5

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18. Install O-ring seal (5) and O-ring seal (6) on sealing plate (3) . Lubricate O-ring seal (6) with a 50/50 mixture of Tooling (B) and clean engine oil.

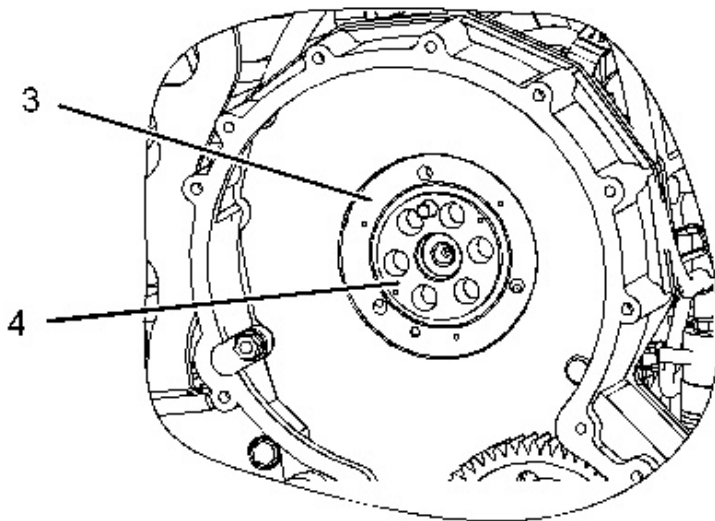


Illustration 6

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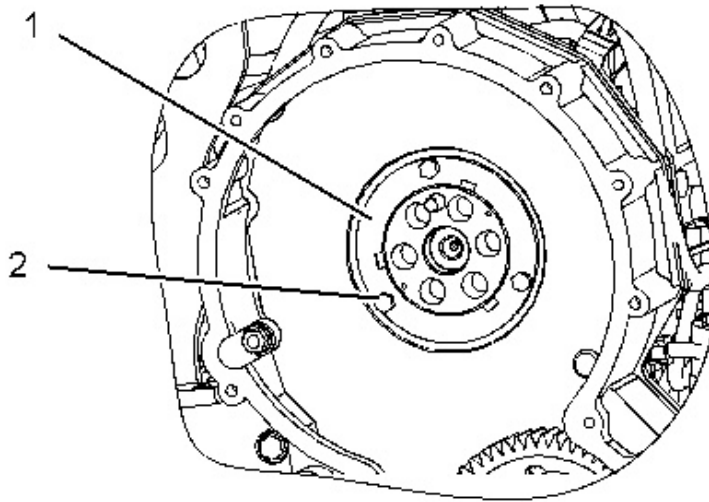


Illustration 7

g01056681

19. Install adapter assembly (4) and sealing plate (3) . Ensure that the dowel in adapter assembly (4) engages the hole in the camshaft.
20. Install thrust plate (1) . Apply Tooling (C) to bolts (2) . Hold the thrust plate in position and install bolts (2) . Evenly tighten bolts (2) until sealing plate (3) and the O-ring seal are seated against the cylinder head.

Note: Ensure that the O-ring seal stays in the groove in sealing plate (3) .

21. Fill the cooling system. Refer to Operation and Maintenance Manual, "Cooling System Coolant - Change".

End By:

- a. Install the turbochargers. Refer to Disassembly and Assembly, "Turbocharger - Install".
 - b. Install the valve mechanism cover base. Refer to Disassembly and Assembly, "Valve Mechanism Cover Base - Remove and Install".
 - c. Install the electronic unit injectors. Refer to Disassembly and Assembly, "Electronic Unit Injector - Install".
 - d. Install the camshaft gear. Refer to Disassembly and Assembly, "Camshaft Gear - Remove and Install".
-

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i02211219

Camshaft - Remove

SMCS - 1210-011

Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	9U-7257	Cradle	1
B	9U-7256	Guide	1
C	9U-7225	Camshaft Pilot	2
D	9U-7240	Camshaft Hook	2

Start By:

- a. Remove the camshaft gear. Refer to Disassembly and Assembly, "Camshaft Gear - Remove and Install".
- b. Remove the rocker arms and the rocker shafts. Refer to Disassembly and Assembly, "Rocker Arm and Shaft - Remove".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Do not turn the crankshaft or the camshaft while the camshaft gear is removed. If the front gear group is not correctly timed during installation, interference can occur between the pistons and the valves, resulting in damage to the engine.

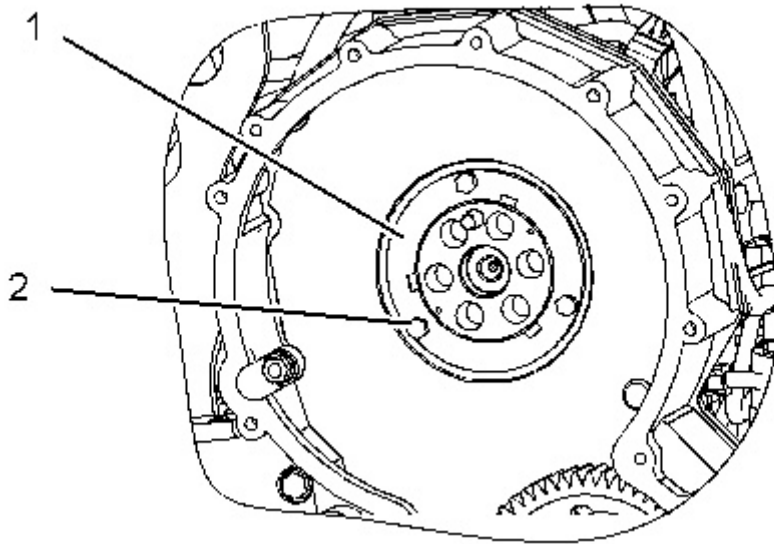


Illustration 1

g01056681

1. Remove bolts (2) and thrust plate (1).
-

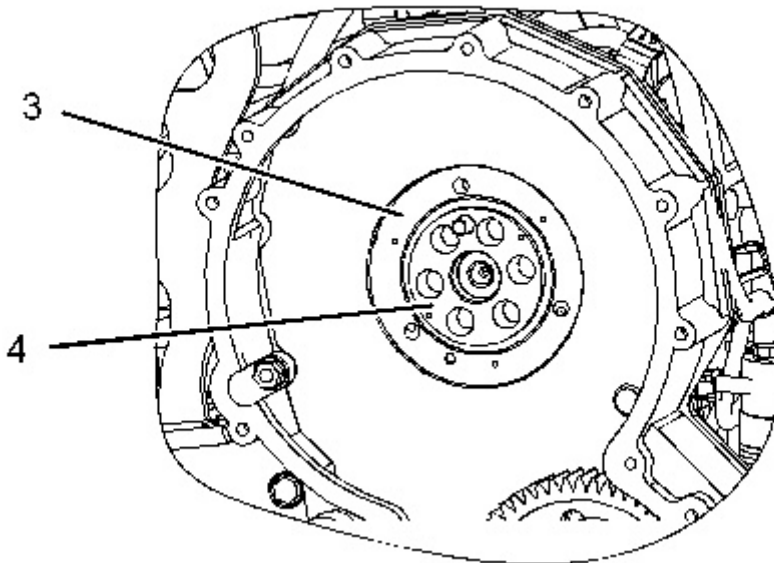


Illustration 2

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2. Remove sealing plate (3) from the front housing. Remove adapter assembly (4) from the crankshaft.
-

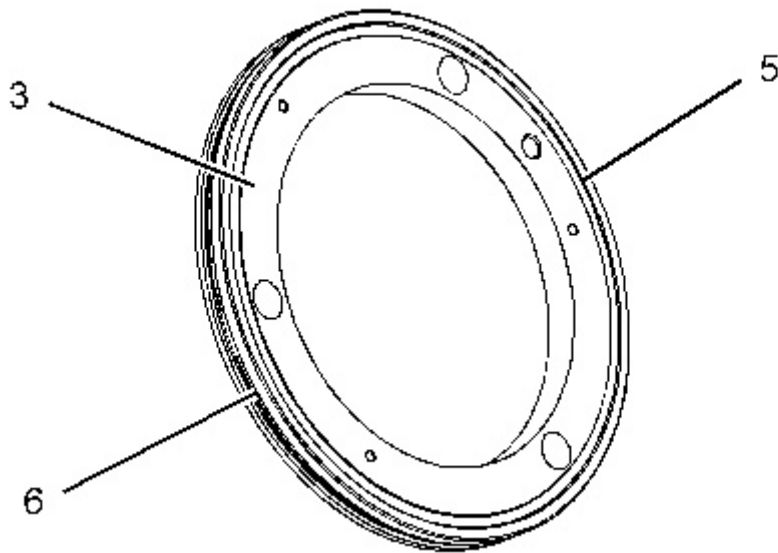


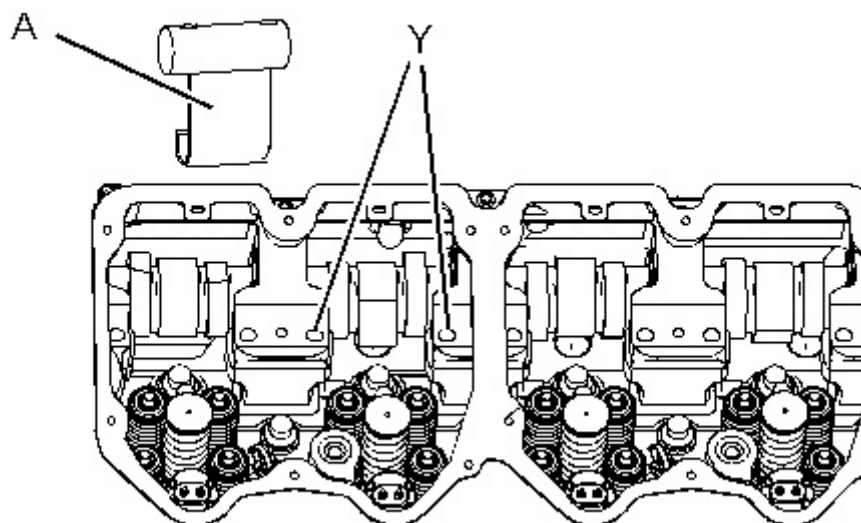
Illustration 3

g01056684

3. Remove O-ring seal (5) and O-ring seal (6) from sealing plate (3).
-

NOTICE

Care must be used when removing or installing the camshaft. Do not damage the finished surfaces of the camshaft or the camshaft bearings.



4. Use the bolts for the rocker arm shaft assembly to install Tooling (A) at Location (Y).
-

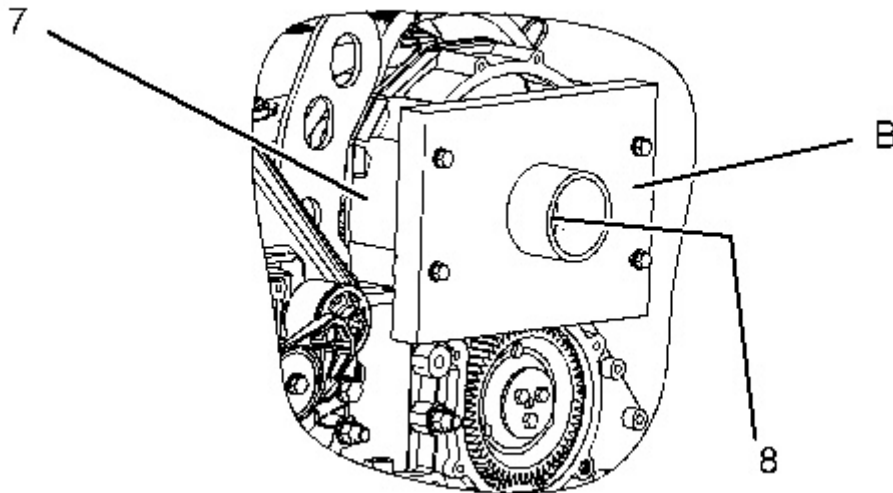


Illustration 5

5. Install Tooling (B) on front housing (7). Tooling (B) is used to support camshaft (8). Do not tighten the bolts for Tooling (B) at this time.
-

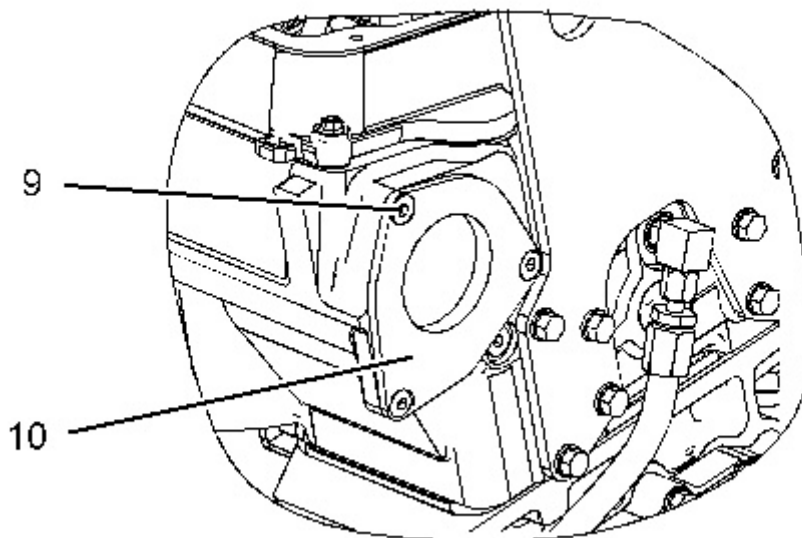


Illustration 6

6. Remove flat head screws (9) and cover (10). Remove the O-ring seal from the cover.
-

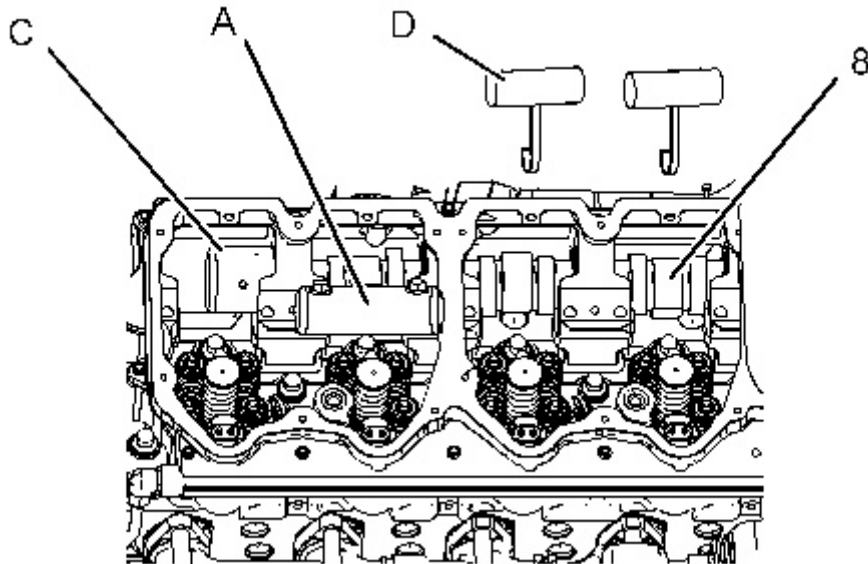


Illustration 7

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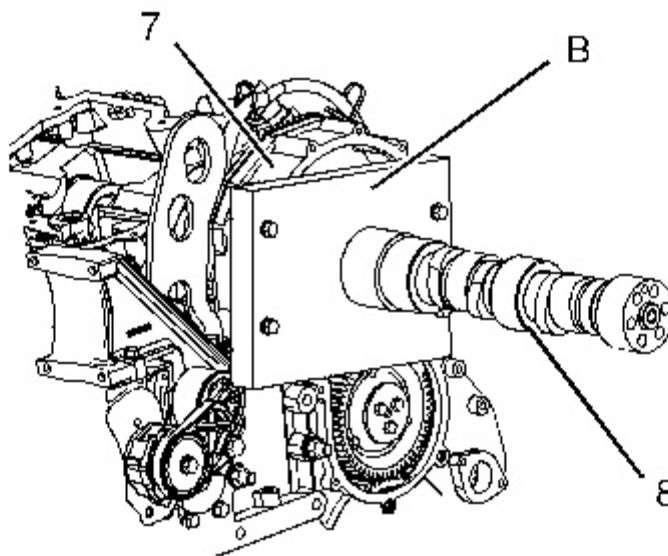


Illustration 8

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Note: It is necessary to install Tooling (C) on the camshaft. Tooling (C) will support the rear of the camshaft as the camshaft is moved out of the cylinder head and into Tooling (B). Align camshaft (8) with the bore of Tooling (B). Tighten the bolts that hold Tooling (B) to front housing (7).

7. Move camshaft (8) forward and install one Tooling (C) in the end of the camshaft. Again, move the camshaft forward and install remaining Tooling (C) into the back of first Tooling (C).

Note: Avoid lifting the camshaft with Tooling (D). The camshaft should rest on Tooling (A). Lifting of the camshaft can cause misalignment as the camshaft is removed, resulting in damage to the camshaft bearings.

8. Use Tooling (D) to move camshaft (8) toward the front of the engine. Reposition Tooling (D), as needed.
9. Carefully slide the camshaft to the front of the engine for removal. Use two technicians to remove the camshaft. Keep the camshaft level while the camshaft is being removed from the cylinder head. The weight of the camshaft is approximately 39 kg (86 lb).

Note: Rotate the camshaft during removal. This will prevent the camshaft from binding in the camshaft bearings.

Alternative Removal Procedure

Table 2

Required Tools			
Tool	Part Number	Part Description	Qty
E ⁽¹⁾	177-8001	Sleeve	1
F	177-8002	Adapter	1
G	6L-4697	Bolts	3

⁽¹⁾ Part of 177-8003 Engine Tool Group

Start By:

- a. Remove the camshaft gear. Refer to Disassembly and Assembly, "Camshaft Gear - Remove and Install".
- b. Remove the rocker arms and the rocker shafts. Refer to Disassembly and Assembly, "Rocker Arm and Shaft - Remove".

Note: This is an optional procedure to remove the camshaft. The preceding tool list shows the required tooling for removing the camshaft from the front of the engine or the rear of the engine.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Do not turn the crankshaft or the camshaft while the camshaft gear is removed. If the front gear group is not correctly timed during installation, interference can occur between the pistons and the valves, resulting in damage to the engine.

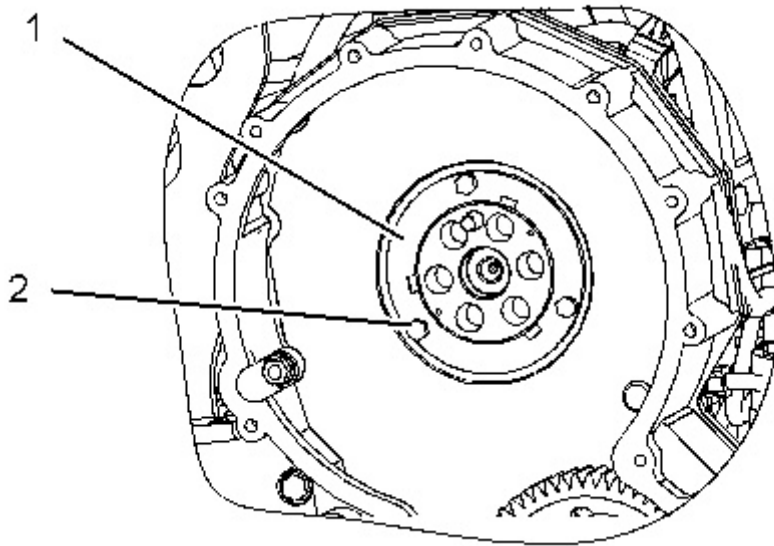


Illustration 9

g01056681

1. Remove bolts (2) and thrust plate (1).

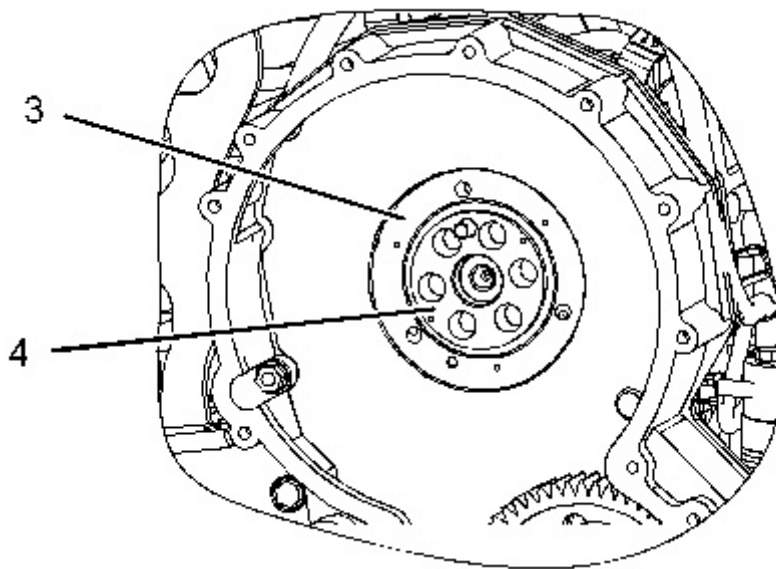


Illustration 10

g01071487

2. Remove sealing plate (3) from the front housing. Remove adapter assembly (4) from the crankshaft.
-

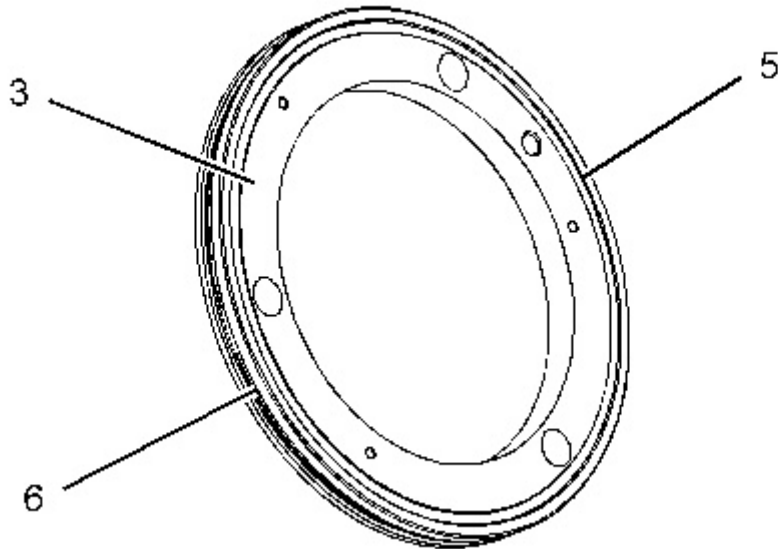


Illustration 11

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3. Remove O-ring seal (5) and O-ring seal (6) from sealing plate (3).
-

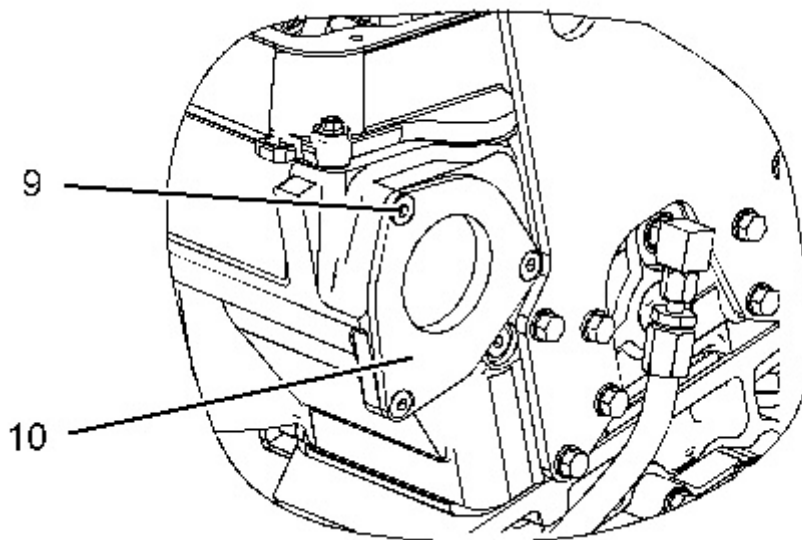


Illustration 12

g01056675

4. Remove flat head screws (9) and cover (10). Remove the O-ring seal from the cover.
-

NOTICE

Care must be used when removing or installing the camshaft. Do not damage the finished surfaces of the camshaft or the camshaft bearings.

5. To remove the camshaft from the rear of the engine, go to Step 6 through Step 8. To remove the camshaft from the front of the engine, go to Step 9 through Step 11.
-

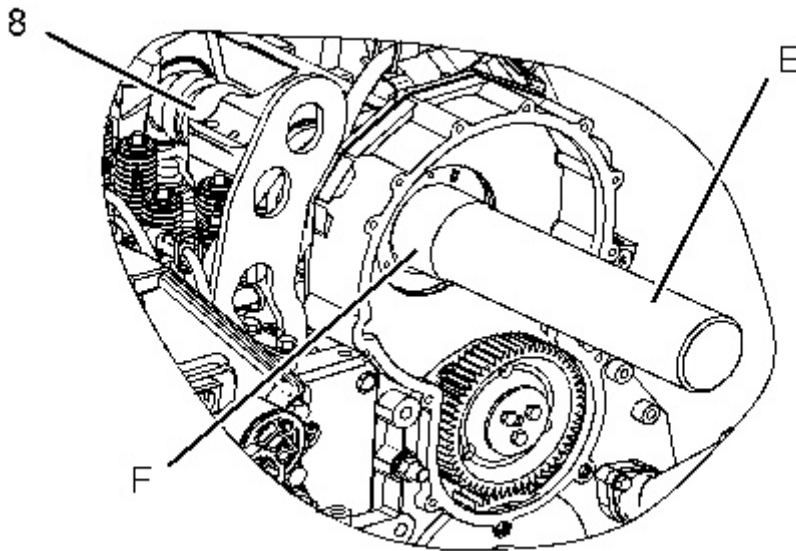


Illustration 13

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Removal of the camshaft from the rear of the engine

6. To remove the camshaft from the rear of the engine, install Tooling (F) on the front of camshaft (8) with Tooling (G).

Note: Carefully align Tooling (F) with the end of camshaft (8). If the adapter and the camshaft are not aligned, the camshaft may not be removed. The adapter and camshaft bearing will interfere.

7. Install Tooling (E) on Tooling (F).
8. Carefully slide camshaft (8) to the rear of the engine for removal. Use two technicians to remove the camshaft. Keep the camshaft level while the camshaft is being removed from the cylinder head. The weight of the camshaft is approximately 39 kg (86 lb).

Note: Rotate the camshaft during removal. This will prevent the camshaft from binding in the camshaft bearings.

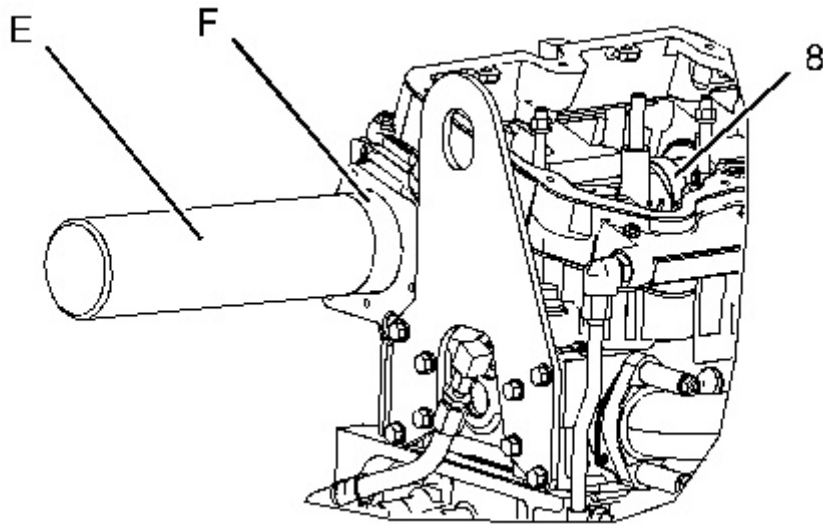


Illustration 14

g01056717

Remove the camshaft from the front of the engine.

9. To remove the camshaft from the front of the engine, install Tooling (F) on the rear of camshaft (8) with Tooling (G).

Note: Carefully align Tooling (F) with the end of camshaft (8). If the adapter and the camshaft are not aligned, the camshaft may not be removed. The adapter and camshaft bearing will interfere.

10. Install Tooling (E) on Tooling (F).
 11. Carefully slide the camshaft to the front of the engine for removal. Use two technicians to remove the camshaft. Keep the camshaft level while the camshaft is being removed from the cylinder head. The weight of the camshaft is approximately 39 kg (86 lb).
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i02211291

Camshaft - Install

SMCS - 1210-012

Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	9U-7257	Cradle	1
B	9U-7256	Guide	1
C	9U-7225	Camshaft Pilot	2
D	9U-7240	Camshaft Hook	2
H	9U-7243	Alignment Sleeve	1
J	8T-2998	Lubricant	1
K	9S-3263	Thread Lock Compound	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Do not turn the crankshaft or the camshaft while the camshaft gear is removed. If the front gear group is not correctly timed during installation, interference can occur between the pistons and the valves, resulting in damage to the engine.

NOTICE

Care must be used when removing or installing the camshaft. Do not damage the finished surfaces of the camshaft or the camshaft bearings.

1. Ensure that the camshaft and camshaft bearings are thoroughly clean. Lubricate the camshaft lobes with a 50/50 mixture of Tooling (J) and clean engine oil. Apply a thin coat of clean engine oil on the camshaft bearings.
-

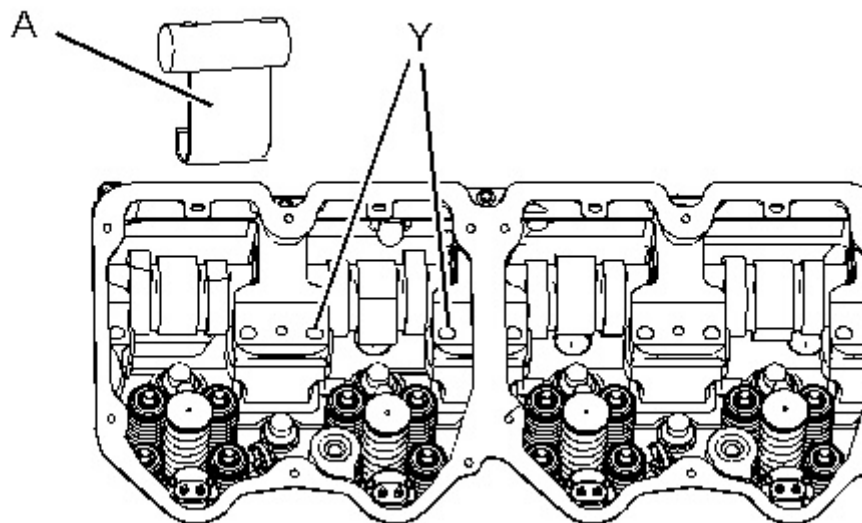


Illustration 1

g01056704

2. Install Tooling (A) on the cylinder head at Location (Y).
-

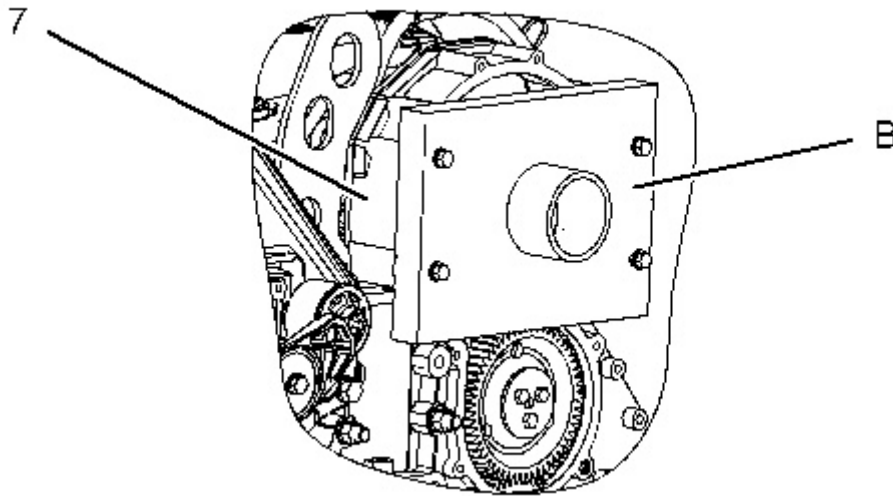


Illustration 2

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3. Install Tooling (B) on front housing (7). Do not tighten the bolts that hold Tooling (B) to front housing (7) at this time.
4. Use Tooling (H) to align Tooling (B) with the camshaft bearings. Tighten the bolts that hold Tooling (B) to front housing (7). Remove Tooling (H).

Note: Tooling (H) should move freely from the bore of Tooling (B).

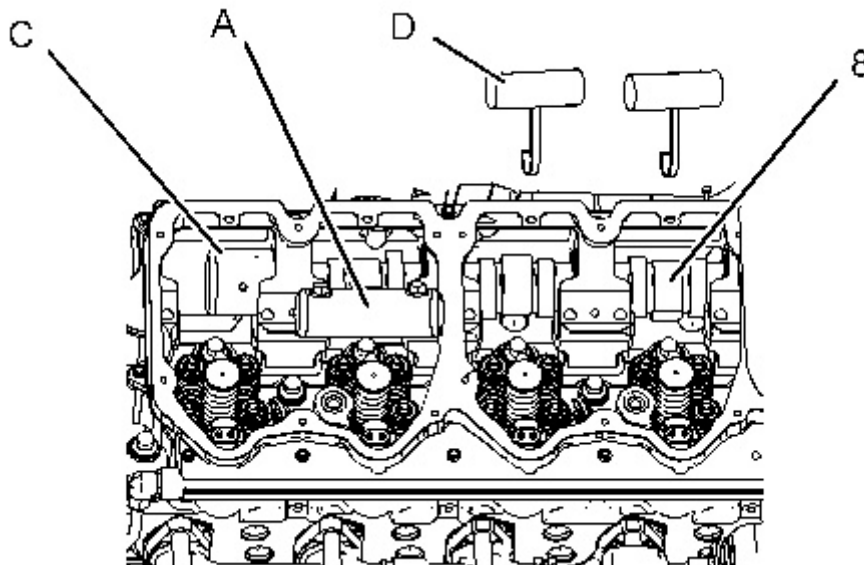


Illustration 3

g01047961

5. Install Tooling (C) on the rear of the camshaft.
6. Use two technicians to install the camshaft. Use Tooling (D) to assist in aligning camshaft (8) with the camshaft bearings. Carefully slide the camshaft into the cylinder head from the

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