

Product: WHEEL LOADER

Model: 988B WHEEL LOADER 50W

Configuration: 988B WHEEL LOADER 50W00001-06040 (MACHINE) POWERED BY 3408 ENGINE

Disassembly and Assembly 3408E and 3412E Engines for Caterpillar Built Machines

Media Number -SEN1013-11

Publication Date -01/07/2015

Date Updated -22/08/2016

i02184090

Cylinder Head - Remove

SMCS - 1100-011

Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	138-7573	Link Bracket	2
B	5P-8700	Lifting Bracket	2

Start By:

- Remove the unit injector sleeves. Refer to Disassembly and Assembly, "Unit Injector Sleeve - Remove".
- Remove the exhaust manifold. Refer to Disassembly and Assembly, "Exhaust Manifold - Remove and Install".

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.

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.

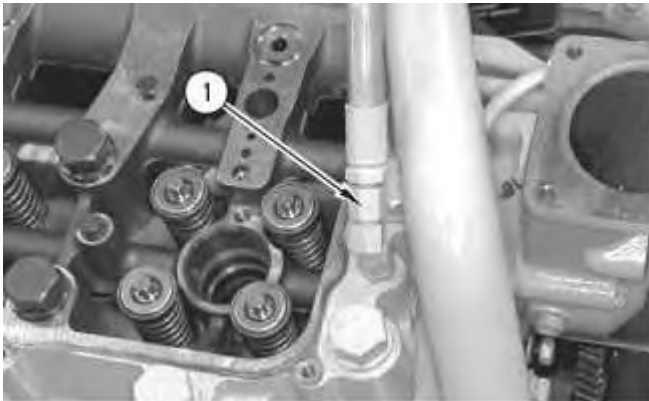


Illustration 1

g00570914

1. Remove hose assembly (1) from the front of the fuel manifold.

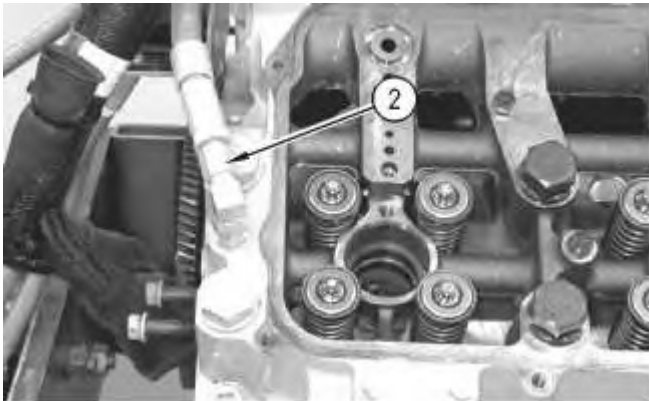


Illustration 2

g00570923

2. Remove hose assembly (2) from the rear of the fuel manifold.
-

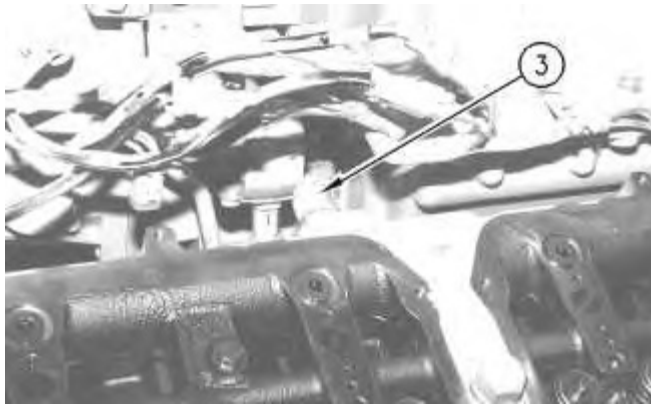


Illustration 3

g00582732

3. Remove tube assembly (3).

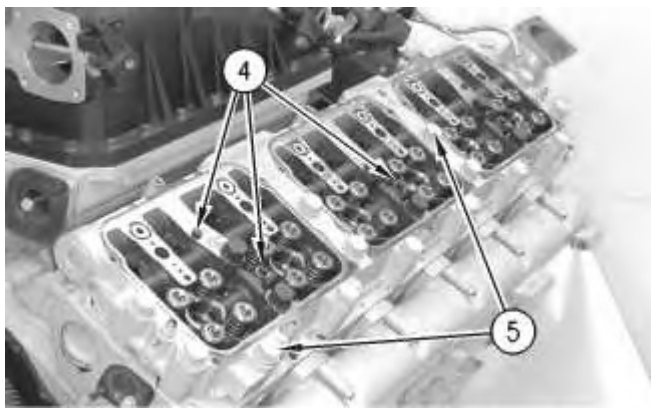


Illustration 4

g00570979

4. Remove cylinder head bolts (5). Remove bolts (4).

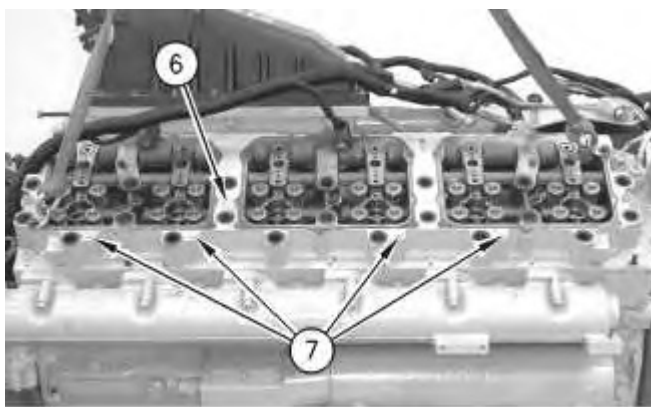


Illustration 5

g00570983

5. Attach Tooling (A) and a suitable lifting device to fuel manifold (6). The weight of the fuel manifold for the 3412E is approximately 60 kg (131 lb). The weight of the fuel manifold for the 3408E is approximately 39 kg (86 lb). Remove bolts (7). Remove fuel manifold (6).

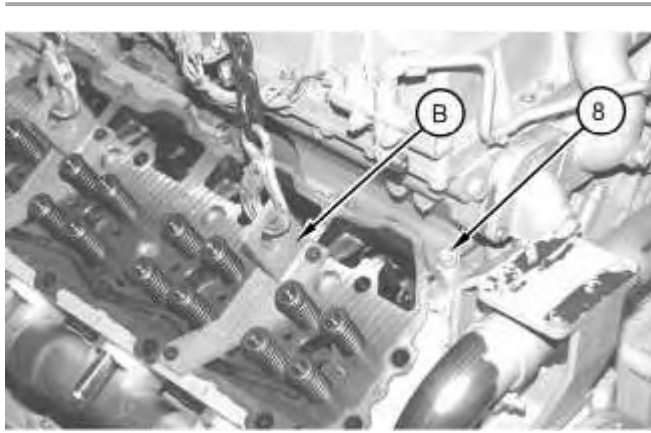


Illustration 6

g01105094

6. Attach Tooling (B) and a suitable lifting device to the cylinder head. The weight of the cylinder head for the 3412E is approximately 172 kg (380 lb). The weight of the cylinder head for the 3408E is approximately 90 kg (200 lb). Remove cylinder head nuts (8).

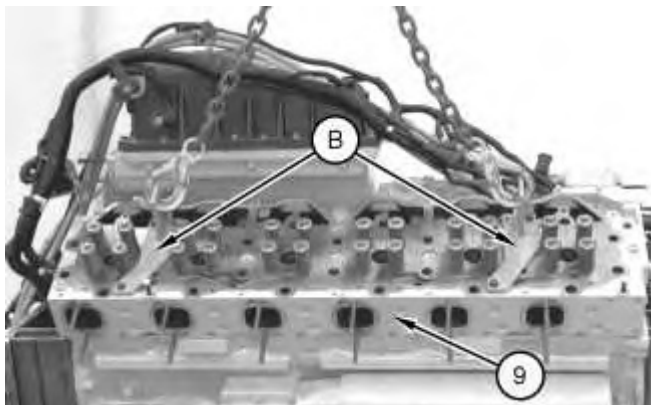


Illustration 7

g01105075

7. Remove cylinder head (9) and the gasket.

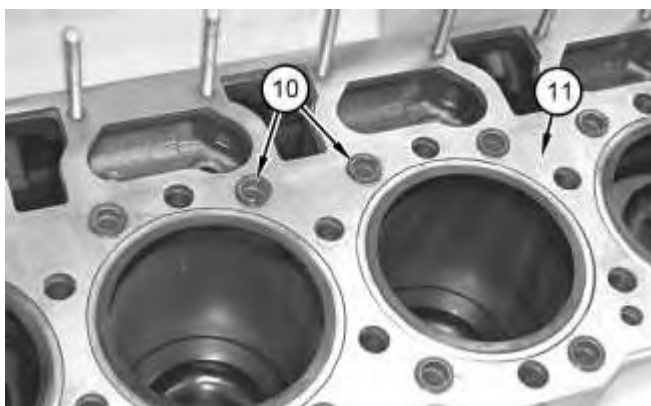


Illustration 8

g01105076

8. Remove seals (10).

9. Remove spacer plate (11).

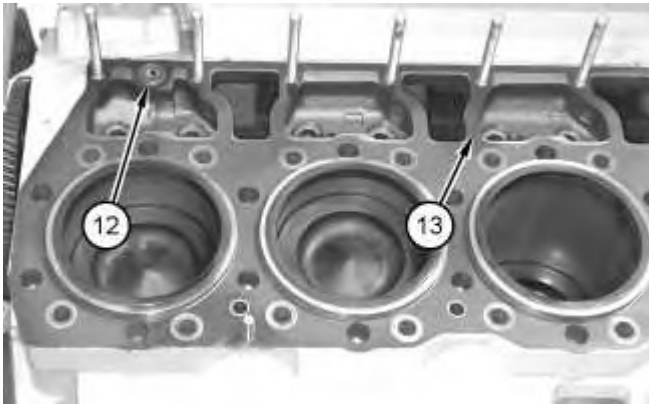


Illustration 9

g01105072

10. Remove O-ring seals (12) and gasket (13).

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i02184092

Cylinder Head - Install

SMCS - 1100-012

Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	138-7573	Link Bracket	2
B	5P-8700	Lifting Bracket	2
C	8C-8422	Sealant	2

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: Thoroughly clean the spacer plate and the bottom surface of the cylinder head. A new spacer plate gasket must be installed when the cylinder head is removed.

Note: Apply a thin film of clean engine oil on the seals and the O-ring seals prior to installation.

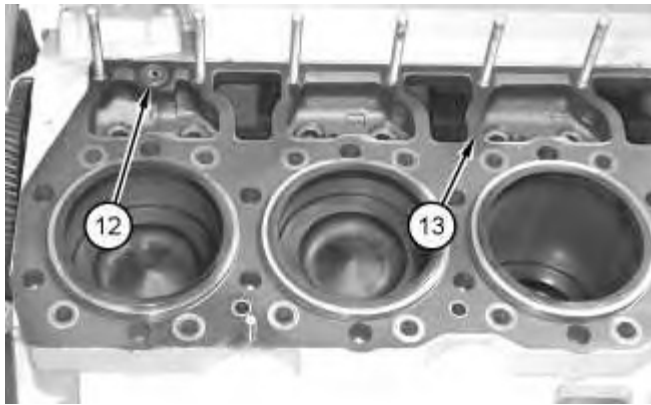


Illustration 1

g01105072

1. Install O-ring seals (12) and gasket (13).

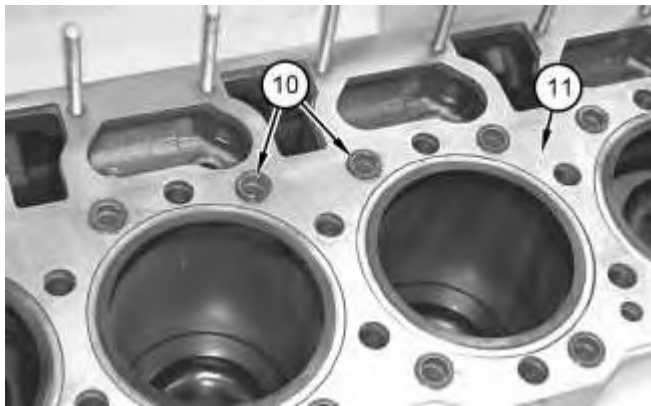


Illustration 2

g01105076

2. Install spacer plate (11).
3. Install seals (10).

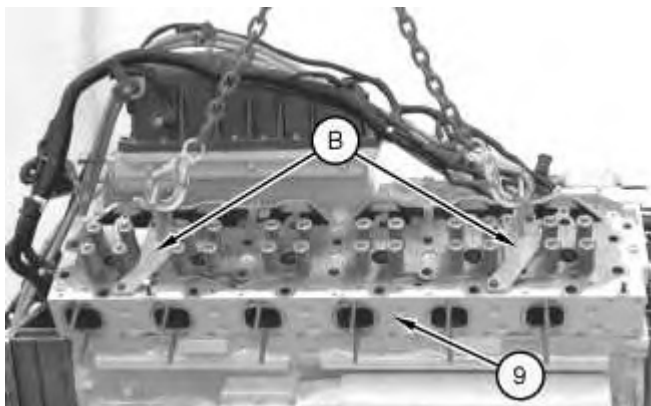


Illustration 3

g01105075

4. Position the gasket on the engine. Attach Tooling (B) and a suitable lifting device to the cylinder head. The weight of the cylinder head for the 3412E is approximately 172 kg

(380 lb). The weight of the cylinder head for the 3408E is approximately 90 kg (200 lb).
Install cylinder head (9).

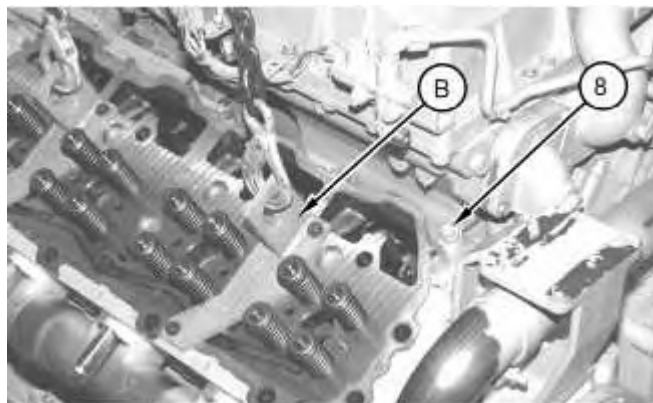


Illustration 4

g01105094

5. Install cylinder head nuts (8). Remove Tooling (B).

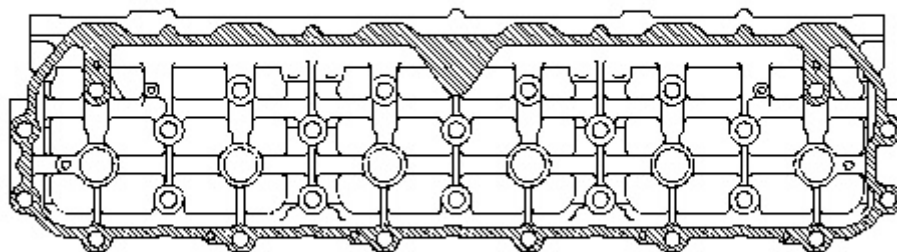


Illustration 5

g00570607

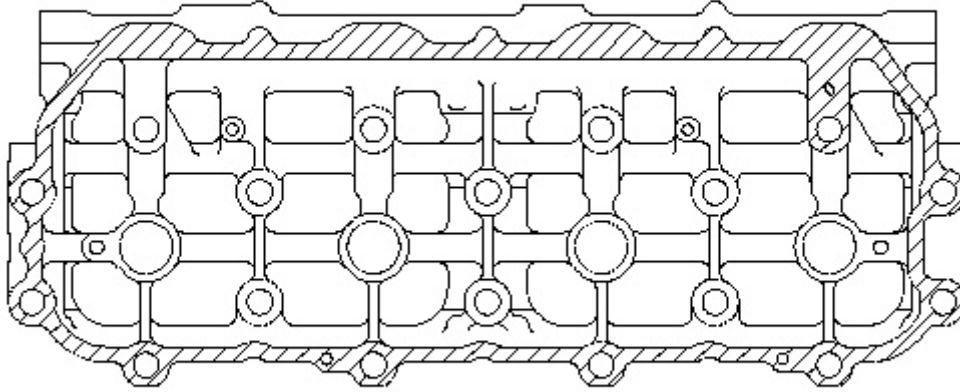


Illustration 6

g00582780

6. Apply Tooling (C) to the shaded area of the fuel manifold. Tooling (C) is applied to the bottom portion of the fuel manifold. Tooling (C) is permitted on the entire face of the fuel manifold.

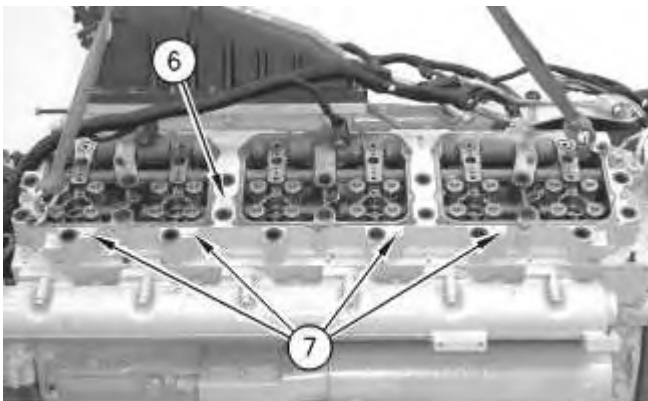


Illustration 7

g00570983

7. Attach Tooling (A) and a suitable lifting device to fuel manifold (6). The weight of the fuel manifold for the 3412E is approximately 60 kg (131 lb). The weight of the fuel manifold for the 3408E is approximately 39 kg (86 lb). Install fuel manifold (6). Install bolts (7).

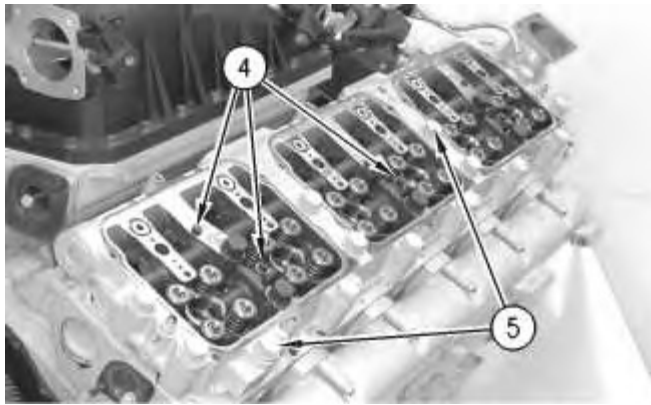


Illustration 8

g00570979

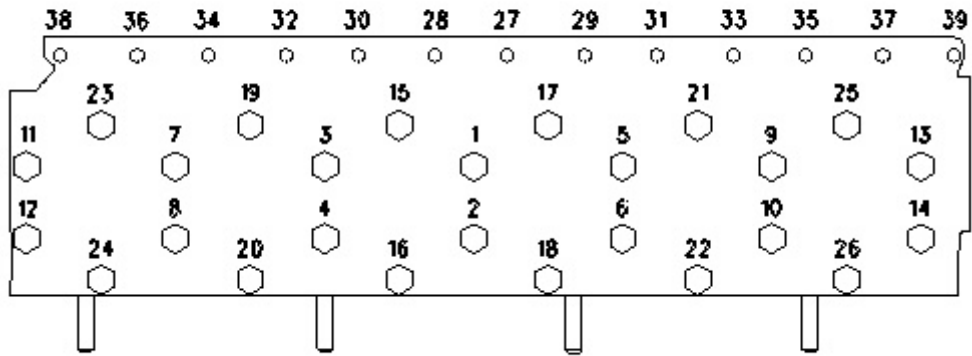
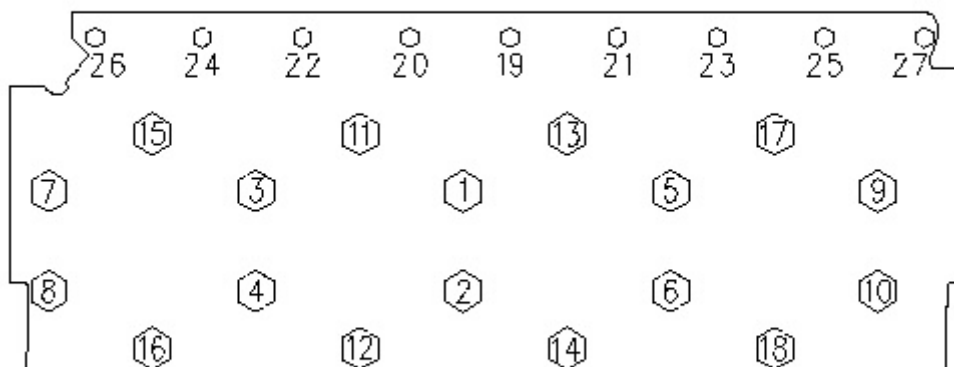


Illustration 9

g00570761



Note: Apply clean engine oil to the bolts for the cylinder head.

8. Install cylinder head bolts (5). Install bolts (4).
9. Tighten the bolts in the following sequence:

In a numerical sequence, tighten the bolts 1 through 26 for the 3412E.

In a numerical sequence, tighten the bolts 1 through 18 for the 3408E.

- a. In a numerical sequence, tighten the bolts to a torque of $270 \pm 15 \text{ N}\cdot\text{m}$ ($200 \pm 11 \text{ lb ft}$).
- b. In a numerical sequence, tighten the bolts to a torque of $450 \pm 15 \text{ N}\cdot\text{m}$ ($330 \pm 11 \text{ lb ft}$).
- c. In a numerical sequence, again tighten the bolts to a torque of $450 \pm 15 \text{ N}\cdot\text{m}$ ($330 \pm 11 \text{ lb ft}$).
- d. Tighten the upper row of nuts that are on the cylinder head in the following sequence:

In a numerical sequence, tighten nuts 27 through 39 for the 3412E to a torque of $45 \pm 7 \text{ N}\cdot\text{m}$ ($33 \pm 5 \text{ lb ft}$).

In a numerical sequence, tighten nuts 19 through 27 for the 3408E to a torque of $45 \pm 7 \text{ N}\cdot\text{m}$ ($33 \pm 5 \text{ lb ft}$).



Illustration 11

g00582732

10. Install tube assembly (3).
-

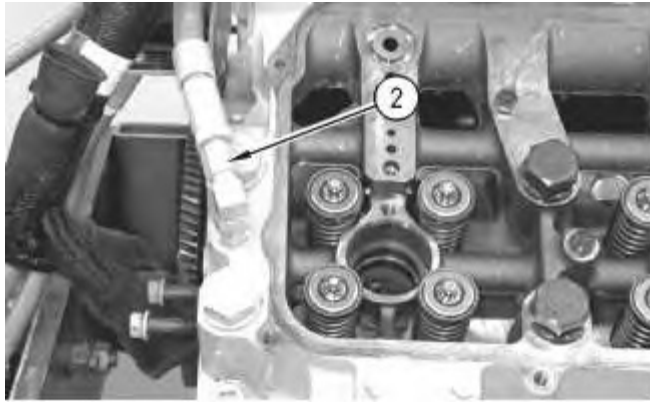


Illustration 12

g00570923

11. Install hose assembly (2) on the rear of the fuel manifold.

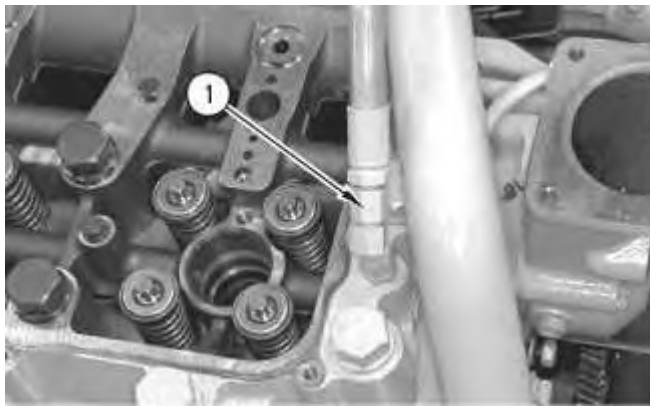


Illustration 13

g00570914

12. Install hose assembly (1) on the front of the fuel manifold.

End By:

- a. Install the exhaust manifold. Refer to Disassembly and Assembly, "Exhaust Manifold - Remove and Install".
 - b. Install the unit injector sleeves. Refer to Disassembly and Assembly, "Unit Injector Sleeve - Install".
-

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Media Number -SEN1013-11

Publication Date -01/07/2015

Date Updated -22/08/2016

i05933135

Lifter Group - Remove and Install

SMCS - 1209-010

Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	5P-7433	Valve Lifter Tool Group	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.

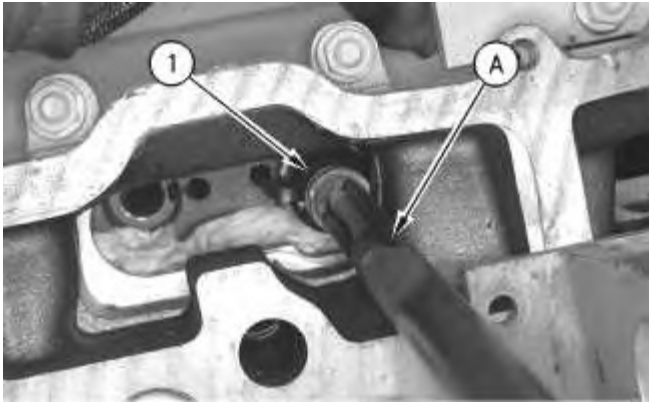


Illustration 1

g00571490

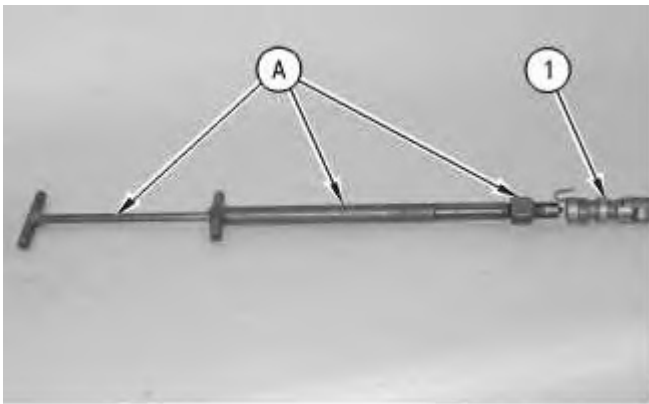


Illustration 2

g00571491

1. Install Tooling (A) in lifter assembly (1) .
2. Remove lifter assembly (1) from the lifter bore.

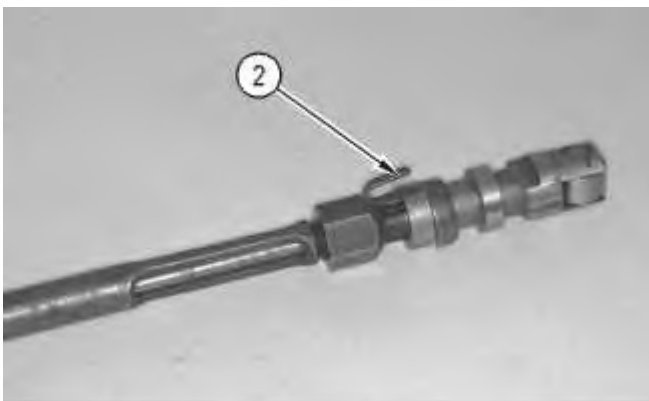


Illustration 3

g00571492

3. Remove lifter guide spring (2) from the lifter assembly.

Installation Procedure

Table 2

Required Tools			
Tool	Part Number	Part Description	Qty
A	5P-7433	Valve Lifter Tool Group	1

Note: Install new valve lifter guide springs on the valve lifter when the valve lifters are removed from the engine.

Note: Apply clean engine oil to the ball socket for the pushrod and the bore for the valve lifter assembly.



Illustration 4

g00571513

1. Make an alignment of the new lifter guide spring (2) in Tooling (A) .

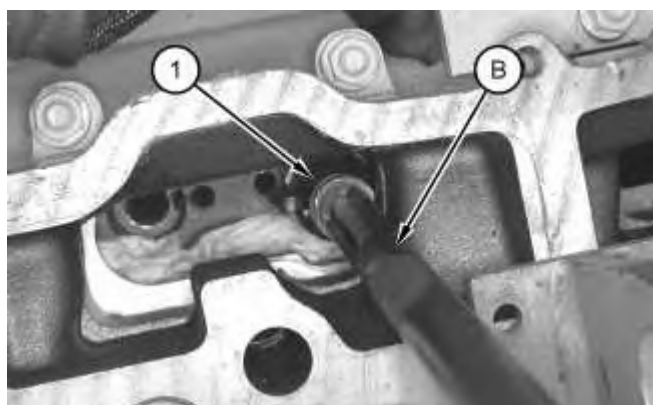


Illustration 5

g01104989

2. Install lifter assembly (1) in the cylinder block with Tooling (A) .

End By: Install the cylinder head. Refer to Disassembly and Assembly, "Cylinder Head - Install".

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Date Updated -22/08/2016

i06177964

Camshaft - Remove and Install

SMCS - 1210-010

Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	1P-0510	Driver Group	1

Start By:

- Remove the front housing. Refer to Disassembly and Assembly, "Housing (Front) - Remove".
- Remove the lifter group. Refer to Disassembly and Assembly, "Lifter Group - Remove and Install".
- Remove the flywheel housing. Refer to Disassembly and Assembly, "Flywheel Housing - Remove and Install".

NOTICE

Keep all parts clean from contaminants.

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NOTICE

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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.

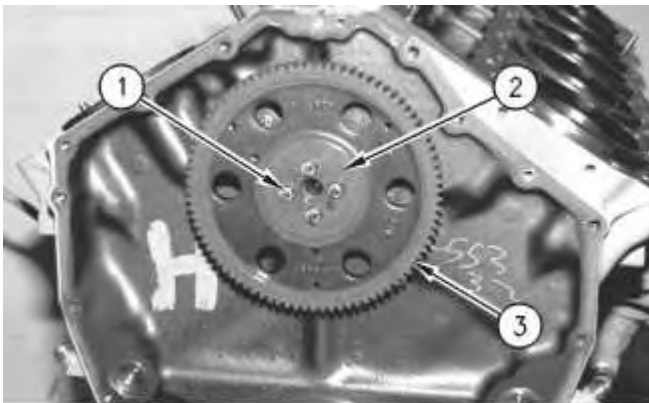


Illustration 1

g00572086

1. Remove four bolts (1) and plate (2) from the rear of the camshaft. Remove gear (3) from the camshaft.

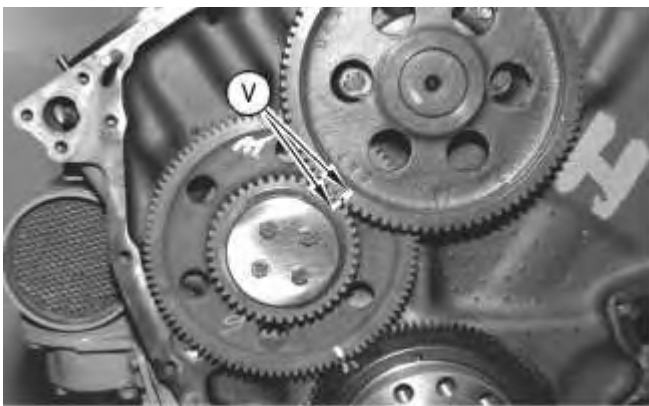


Illustration 2

g00572090

2. Rotate the engine until the "V" marks on the front of the timing gears are in alignment.
-

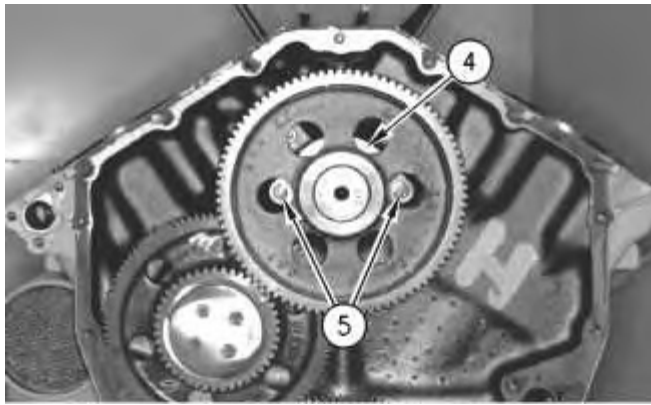


Illustration 3

g00572095

3. Remove two bolts (5) and plate (4) from the camshaft.

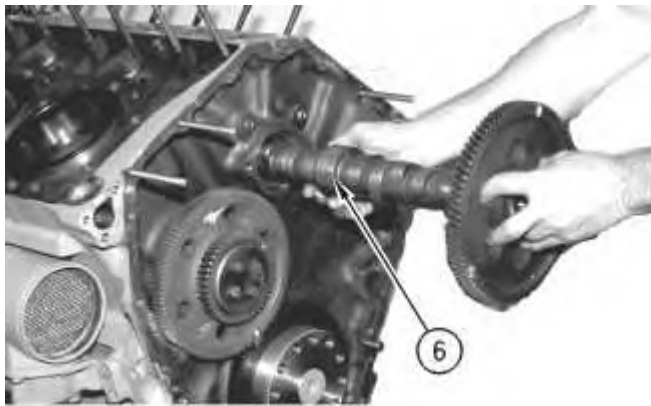


Illustration 4

g00572105

4. Remove camshaft (6) from the cylinder block.

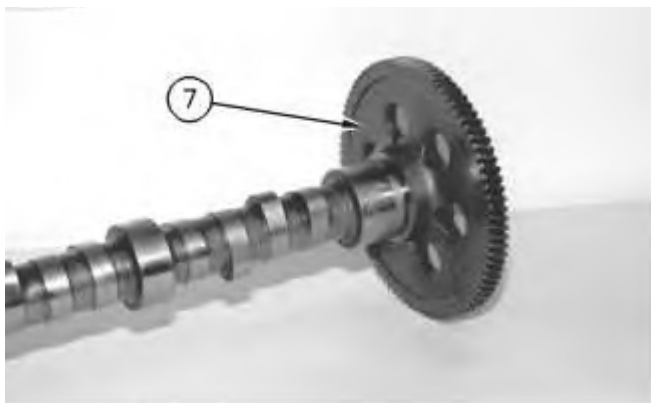


Illustration 5

g00572214

5. If necessary, remove camshaft gear (7) with Tool (A) and press.

Installation Procedure

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

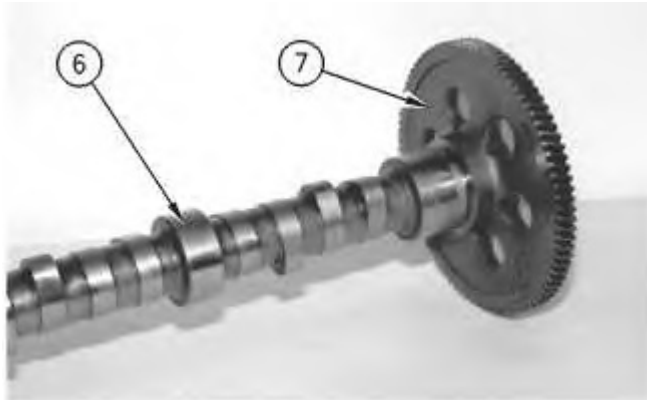
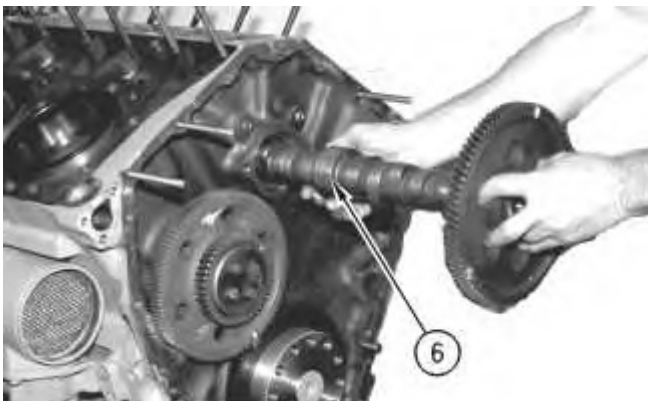


Illustration 6

g00572220

Note: The key for gear (7) must be in position on the camshaft (6) before gear (7) is installed.

1. Do not use a torch to heat camshaft gear (7). Raise the temperature of camshaft gear (7) by one of the following methods.
 - Use a suitable oven to raise the temperature of camshaft gear (7). Do not exceed 150° C (302° F) for more than four hours.
 - Use a suitable induction heater to raise the temperature of the hub of camshaft gear (7). Do not exceed 150° C (302° F) at bottom of gear teeth root radius.
2. Install camshaft gear (7) to camshaft (6).
3. Put **8T-2998** Lubricant on the camshaft lobes and the rollers for the valve lifter. Put clean engine oil on the bearing journals of the camshaft.



4. Install camshaft (6) until the rear of the camshaft is even with the rear of the cylinder block.

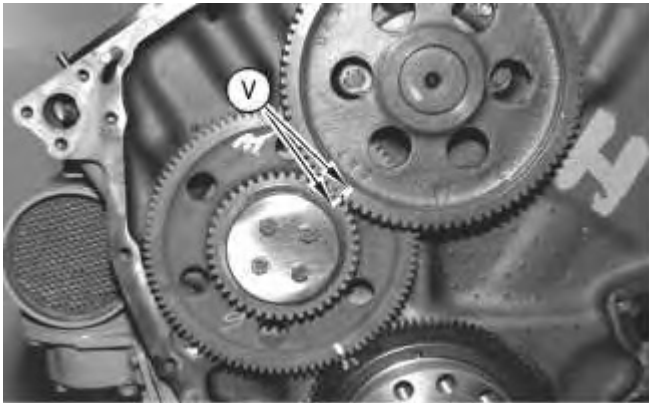


Illustration 8

5. Make an alignment of the “V” marks on the camshaft gear and the idler gear.



Illustration 9

6. Install plate (4) on the cylinder block.

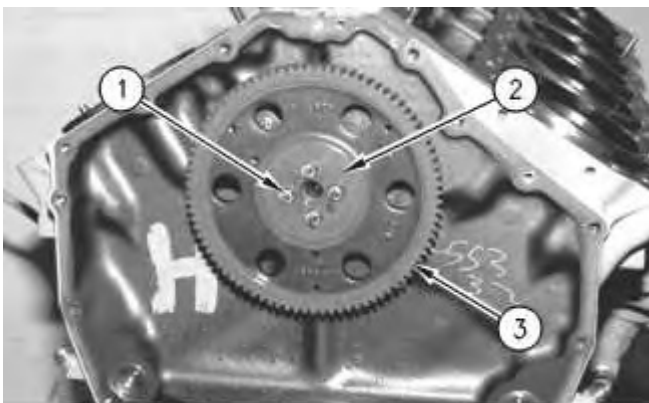


Illustration 10

7. Install gear (3) and plate (2) on the rear of the camshaft.

End By:

- a. Install the flywheel housing. Refer to Disassembly and Assembly, "Flywheel Housing - Remove and Install".
 - b. Install the lifter group. Refer to Disassembly and Assembly, "Lifter Group - Remove and Install".
 - c. Install the front housing. Refer to Disassembly and Assembly, "Housing (Front) - Install".
-

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Media Number -SEN1013-11

Publication Date -01/07/2015

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i01519738

Camshaft Bearings - Remove and Install

SMCS - 1211-010

Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	8S-2241	Camshaft Bearing Tool Group	1
	8S-8293	Extension	1
	5P-1667	Tube	1

Start By:

- A. Remove the flywheel housing. Refer to Disassembly and Assembly, "Flywheel Housing - Remove and Install".
- B. Remove the camshaft. Refer to Disassembly and Assembly, "Camshaft - Remove and Install".
- C. Remove the pistons and connecting rods. Refer to Disassembly and Assembly, "Pistons and Connecting Rods - Remove".

NOTICE

Keep all parts clean from contaminants.

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NOTICE

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Dispose of all fluids according to local regulations and mandates.

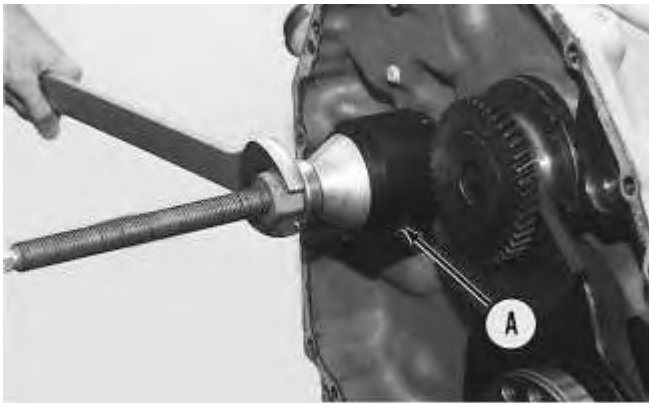


Illustration 1

g00569925

1. Remove the rear camshaft bearing with Tool (A) .
2. Remove the remainder of the camshaft bearings with Tool (A) through the rear of the engine block. Start from the rear of the cylinder block and move toward the front.

Installation Procedure

Table 2

Required Tools			
Tool	Part Number	Part Description	Qty
A	8S-2241	Camshaft Bearing Tool Group	1
	8S-8293	Extension	1
	5P-1667	Tube	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: Ensure that the inside of the cylinder block is clean. Inspect the camshaft bore for metal burrs. Put a thin film of clean engine oil on the inside of the camshaft bearing bores and on each camshaft bearing prior to installation.

Note: Two different camshaft bearings are used. Install the wider camshaft bearings in the front and rear camshaft bores. Install the narrow camshaft bearings in the inner bores.

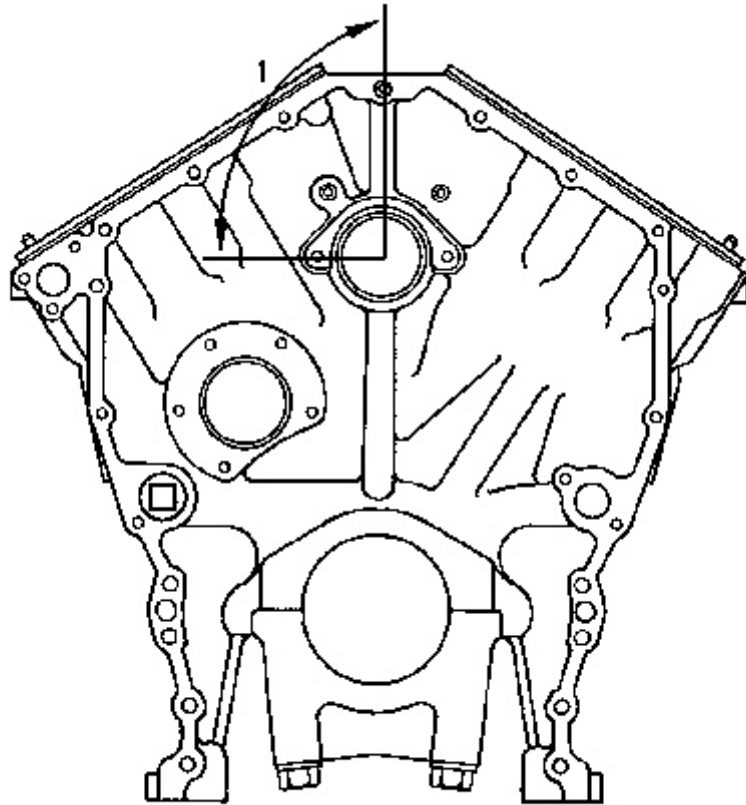


Illustration 2

g00570127

1. Install all the camshaft bearings with Tool (A) so that the oil hole in the camshaft bearing is in a horizontal position. Installation angle (1) is $90 \pm 15^\circ$.
2. Install the camshaft bearings with Tool (A) on the front side of the engine. Start the bearing that is being installed from the rear of each bore. Pull the bearing into the bore with Tool (A). Use the following procedure for achieving the proper installation depth for the bearings.

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