



# Service Repair Manual

## **Models**

320D LRR Excavator

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Product: EXCAVATOR

Model: 320D LRR EXCAVATOR ZGB

Configuration: 320D LRR Excavator ZGB00001-UP (MACHINE) POWERED BY C6.4 Engine

## Disassembly and Assembly C6.4 Engine for Caterpillar Built Machines

Media Number -KENR8106-09

Publication Date -01/10/2017

Date Updated -18/10/2017

i02746415

# Valve Mechanism Cover Base - Remove and Install

SMCS - 1120-010

## Removal Procedure

### Start By:

- a. Remove the valve mechanism cover. Refer to Disassembly and Assembly, "Valve Mechanism Cover - Remove and Install".
- b. Remove the fuel injection lines. Refer to Disassembly and Assembly, "Fuel Injection Lines - Remove".

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### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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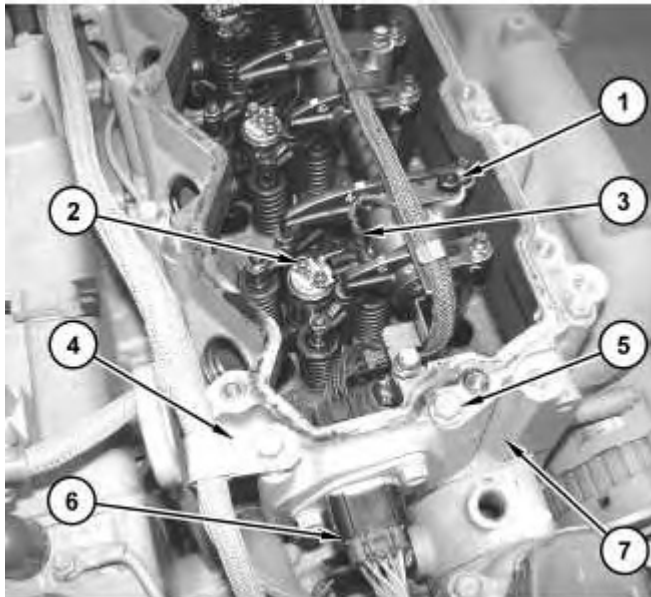


Illustration 1

g01375577

1. Remove clips (4).
2. Disconnect harness assembly (6).
3. Loosen nuts (2) and disconnect harness assembly (3).
4. Repeat Step 3 for the remaining electronic unit injectors.
5. Remove bolts (1).
6. Remove bolts (5). Remove valve mechanism cover base (7) and the gasket.

## Installation Procedure

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### NOTICE

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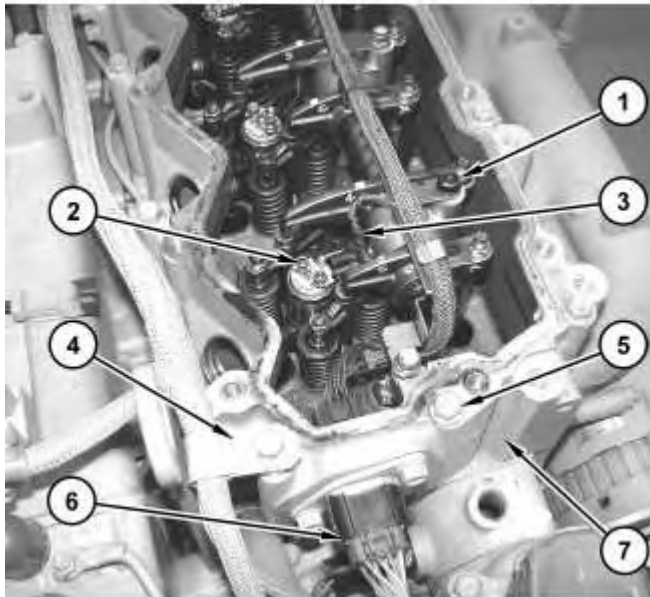


Illustration 2

g01375577

1. Install a new gasket and position valve mechanism cover base (7). Install bolts (5).
2. Install bolts (1). Tighten bolts (1) to a torque of  $18 \pm 2$  N·m ( $13 \pm 1$  lb ft).
3. Connect harness assembly (3) and tighten nuts (2).
4. Repeat Step 3 for the remaining electronic unit injectors.
5. Connect harness assembly (6).
6. Install clips (4).

**End By:**

- a. Install the fuel injection lines. Refer to Disassembly and Assembly, "Fuel Injection Lines - Install".
- b. Install the valve mechanism cover. Refer to Disassembly and Assembly, "Valve Mechanism Cover - Remove and Install".

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## Disassembly and Assembly C6.4 Engine for Caterpillar Built Machines

Media Number -KENR8106-09

Publication Date -01/10/2017

Date Updated -18/10/2017

i02746912

# Rocker Shaft and Pushrod - Remove

SMCS - 1102-011; 1208-011

## Removal Procedure

### Start By:

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

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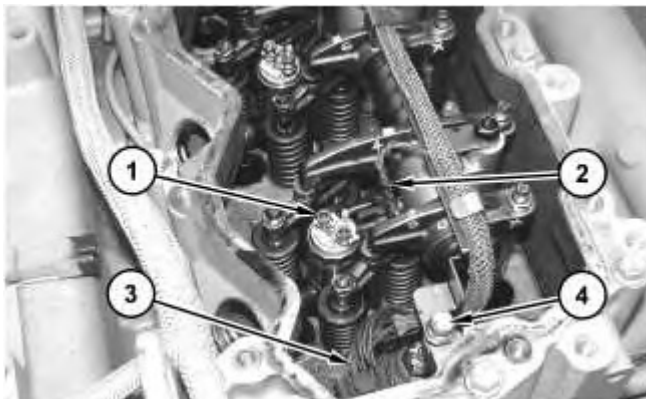
### NOTICE

**Keep all parts clean from contaminants.**

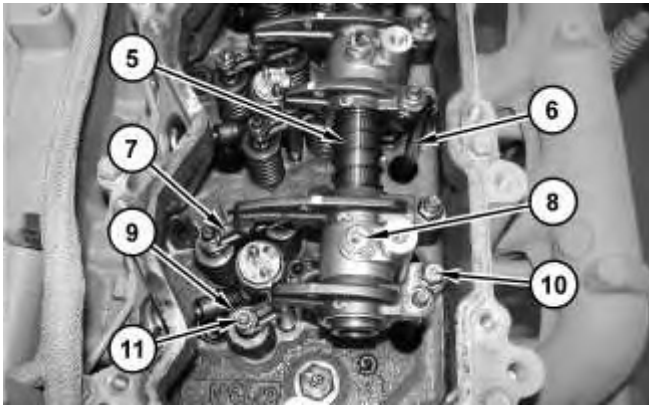
**Contaminants may cause rapid wear and shortened component life.**

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**Note:** The fuel injection lines do not need to be removed in order to remove the rocker shaft and pushrods.



1. Loosen nuts (1) and disconnect harness assembly (2).
2. Repeat Step 13 for the remaining electronic unit injectors.
3. Disconnect harness assembly (3).
4. Remove bolts (4) and remove harness assembly (3).



---

Illustration 2

5. Loosen nut (9). Loosen adjusting screw (11) by approximately one revolution.
6. Repeat Step 5 for the remaining rocker arms.
7. Loosen bolts (10). **Do not remove bolts (10) at this time.**
8. Loosen bolts (8). **Do not remove bolts (8) at this time.**
9. Remove bolts (10).
10. Remove bolts (8).
11. Remove rocker shaft assembly (5).
12. Remove pushrods (6).
13. Remove bridges (7) and the caps.

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Product: EXCAVATOR

Model: 320D LRR EXCAVATOR ZGB

Configuration: 320D LRR Excavator ZGB00001-UP (MACHINE) POWERED BY C6.4 Engine

## Disassembly and Assembly C6.4 Engine for Caterpillar Built Machines

Media Number -KENR8106-09

Publication Date -01/10/2017

Date Updated -18/10/2017

i02746773

## Rocker Shaft - Disassemble

SMCS - 1102-015

## Disassembly Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	1P-1859	Retaining Ring Pliers	1
B	1P-0510	Driver Gp	1

### Start By:

- Remove the rocker shaft and the pushrods. Refer to Disassembly and Assembly, "Rocker Shaft and Pushrods - Remove".

---

### NOTICE

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---

**Note:** Cleanliness is an important factor. Before you begin the disassembly procedure, the exterior of the components should be thoroughly cleaned. This will help to prevent dirt from entering the internal mechanism. Precision components can be damaged by contaminants or by dirt. Perform disassembly procedures on a clean work surface. Keep components covered and protected at all times.

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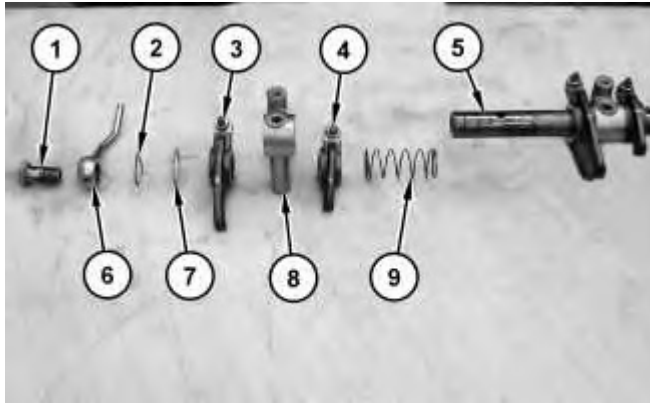


Illustration 1

g01375734

## **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.**

1. Remove bolt (1) from shaft assembly (5).
2. Remove pipe (6) from shaft assembly (5).
3. Use Tooling (A) in order to remove retaining ring (2) from shaft assembly (5).
4. Remove washer (7) from shaft assembly (5).
5. Remove arm assembly (3) from shaft assembly (5).
6. Remove bracket (8) from shaft assembly (5).
7. Remove arm assembly (4) from shaft assembly (5).
8. Remove spring (9) from shaft assembly (5).



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Illustration 2

g01375874

9. If necessary, use Tooling (B) in order to remove bushing (10) from arm assemblies (3) and (4).
10. Repeat Steps 3 through 9 for the remaining rocker shaft assembly.

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Product: EXCAVATOR

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Configuration: 320D LRR Excavator ZGB00001-UP (MACHINE) POWERED BY C6.4 Engine

## Disassembly and Assembly C6.4 Engine for Caterpillar Built Machines

Media Number -KENR8106-09

Publication Date -01/10/2017

Date Updated -18/10/2017

i02746816

# Rocker Shaft - Assemble

SMCS - 1102-016

## Assembly Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	1P-1859	Retaining Ring Pliers	1
B	1P-0510	Driver Gp	1

---

### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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**Note:** Cleanliness is an important factor. Before assembly, thoroughly clean all parts in cleaning fluid. Allow the parts to air dry. Do not use wiping cloths or rags to dry parts. Lint may be deposited on the parts which may cause trouble. Inspect all parts. If any parts are worn or damaged, use new parts for replacement. Dirt and other contaminants can damage the precision component. Perform assembly procedures on a clean work surface. Keep components covered and protected at all times.

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Illustration 1

g01375874

1. If necessary, Use Tooling (B) in order to install bushing (10) into arm assemblies (4) and (3).

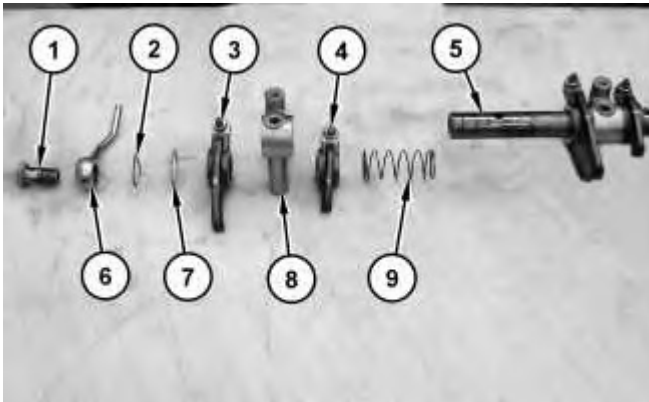


Illustration 2

g01375734

## **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.**

2. Install spring (9) onto shaft assembly (5).
3. Install arm assembly (4) onto shaft assembly (5).
4. Install bracket (8) onto shaft assembly (5).
5. Install arm assembly (3) onto shaft assembly (5).
6. Install washer (7) onto shaft assembly (5).

7. Use Tooling (A) in order to install retaining ring (2) onto shaft assembly (5).
8. Repeat Steps 1 through 7 for the remaining rocker shaft assembly.
9. Install pipe (6) onto shaft assembly (5).
10. Install bolt (1). Tighten bolts (1) to a torque of  $74 \pm 5 \text{ N}\cdot\text{m}$  ( $55 \pm 4 \text{ lb ft}$ ).

**End By:**

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

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Product: EXCAVATOR

Model: 320D LRR EXCAVATOR ZGB

Configuration: 320D LRR Excavator ZGB00001-UP (MACHINE) POWERED BY C6.4 Engine

## Disassembly and Assembly C6.4 Engine for Caterpillar Built Machines

Media Number -KENR8106-09

Publication Date -01/10/2017

Date Updated -18/10/2017

i02746971

# Rocker Shaft and Pushrod - Install

SMCS - 1102-012; 1208-012

## Installation Procedure

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### NOTICE

**Keep all parts clean from contaminants.**

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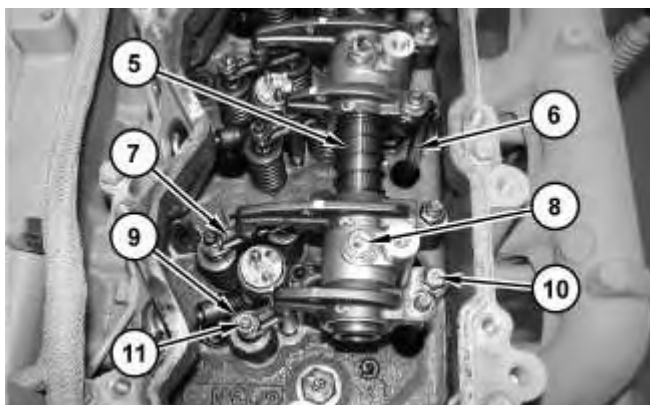


Illustration 1

g01375847

1. Install bridges (7) and the caps.
2. Install pushrods (6).
3. Position rocker shaft assembly (5).

4. Position bolts (8). **Do not tighten bolts (8) at this time.**
5. Position bolts (10). **Do not tighten bolts (10) at this time.**
6. Tighten bolts (8) to a torque of  $18 \pm 2 \text{ N}\cdot\text{m}$  ( $13 \pm 1 \text{ lb ft}$ ).
7. Tighten bolts (10) to a torque of  $18 \pm 2 \text{ N}\cdot\text{m}$  ( $13 \pm 1 \text{ lb ft}$ ).
8. Adjust adjusting screw (11) so that bridge (7) contacts both of the valve ends evenly. Tighten nut (9) to a torque of  $4 \pm 1 \text{ N}\cdot\text{m}$  ( $35 \pm 9 \text{ lb in}$ ).
9. Repeat Step 8 for the remaining rocker arms.

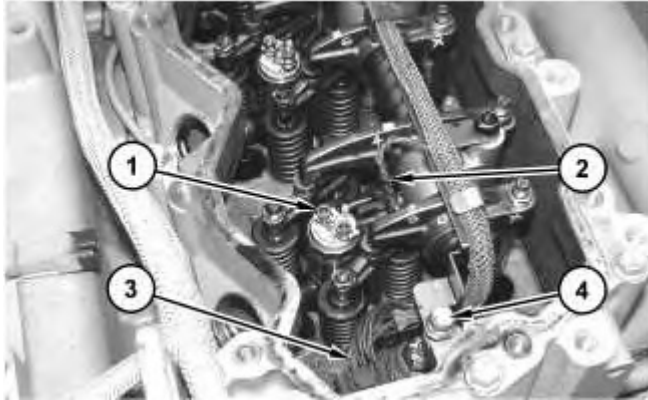


Illustration 2

g01375828

10. Position harness assembly (3) and install bolts (4).
11. Connect harness assembly (3).
12. Connect harness assembly (2) and tighten nuts (1).
13. Repeat Step 12 for the remaining electronic unit injectors.
14. Adjust the inlet valve lash to 0.250 mm (0.0098 inch). Adjust the exhaust valve lash to 0.400 mm (0.0157 inch). Refer to Testing and Adjusting, "Engine Valve Lash - Test/Adjust".

### **End By:**

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

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Product: EXCAVATOR

Model: 320D LRR EXCAVATOR ZGB

Configuration: 320D LRR Excavator ZGB00001-UP (MACHINE) POWERED BY C6.4 Engine

## Disassembly and Assembly

### C6.4 Engine for Caterpillar Built Machines

Media Number -KENR8106-09

Publication Date -01/10/2017

Date Updated -18/10/2017

i02746505

## Cylinder Head - Remove

SMCS - 1100-011

### Removal Procedure

#### Start By:

- a. Remove the valve mechanism cover base. Refer to Disassembly and Assembly, "Valve Mechanism Cover Base - Remove and Install".
- b. Remove the rocker shaft and pushrods. Refer to Disassembly and Assembly, "Rocker Shaft and Pushrods - Remove".
- c. Remove the electronic unit injectors. Refer to Disassembly and Assembly, "Electronic Unit Injector - Remove".
- d. If necessary, remove the exhaust manifold. Refer to Disassembly and Assembly, "Exhaust Manifold - Remove and Install".
- e. If necessary, remove the inlet manifold. Refer to Disassembly and Assembly, "Inlet Manifold - Remove and Install".
- f. If necessary, remove the water temperature regulator. Refer to Disassembly and Assembly, "Water Temperature Regulator - Remove and Install".

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#### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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#### 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.

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Illustration 1

g01375619

1. Disconnect hose (1).

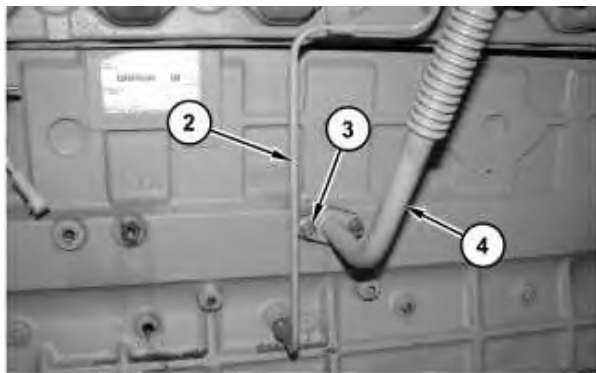


Illustration 2

g01375622

2. Disconnect tube assembly (2).
  3. Remove bolts (3). Disconnect tube assembly (4) and remove the gasket.
-

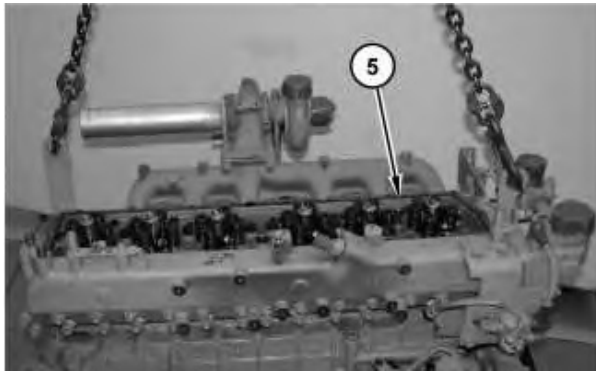


Illustration 3

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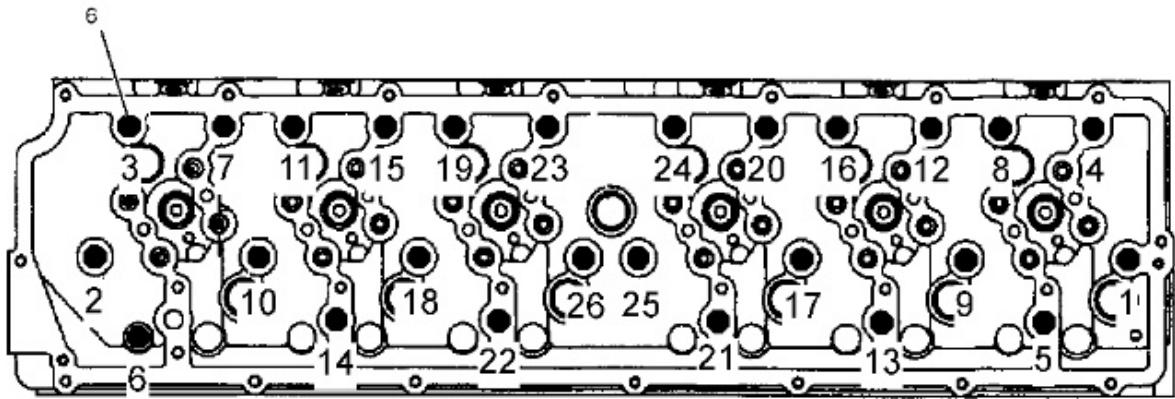


Illustration 4

g01375653

4. Attach a suitable lifting device to cylinder head (5). The weight of cylinder head (5) is approximately 113 kg (250 lb).
5. Loosen cylinder head bolts (6) in the sequence that is shown in Illustration 4.
6. Use the suitable lifting device in order to remove cylinder head (5) and the gasket.

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Product: EXCAVATOR

Model: 320D LRR EXCAVATOR ZGB

Configuration: 320D LRR Excavator ZGB00001-UP (MACHINE) POWERED BY C6.4 Engine

## Disassembly and Assembly C6.4 Engine for Caterpillar Built Machines

Media Number -KENR8106-09

Publication Date -01/10/2017

Date Updated -18/10/2017

i02746742

# Cylinder Head - Install

SMCS - 1100-012

## Installation Procedure

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### NOTICE

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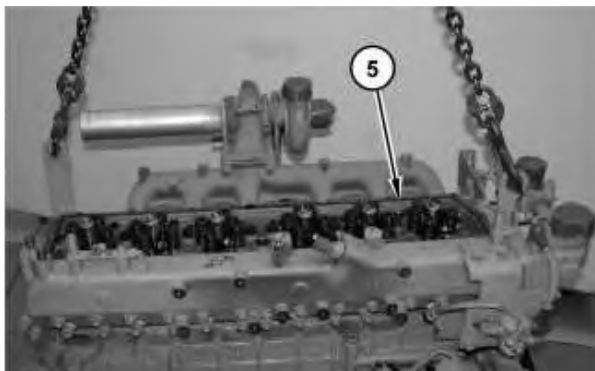


Illustration 1

g01375641

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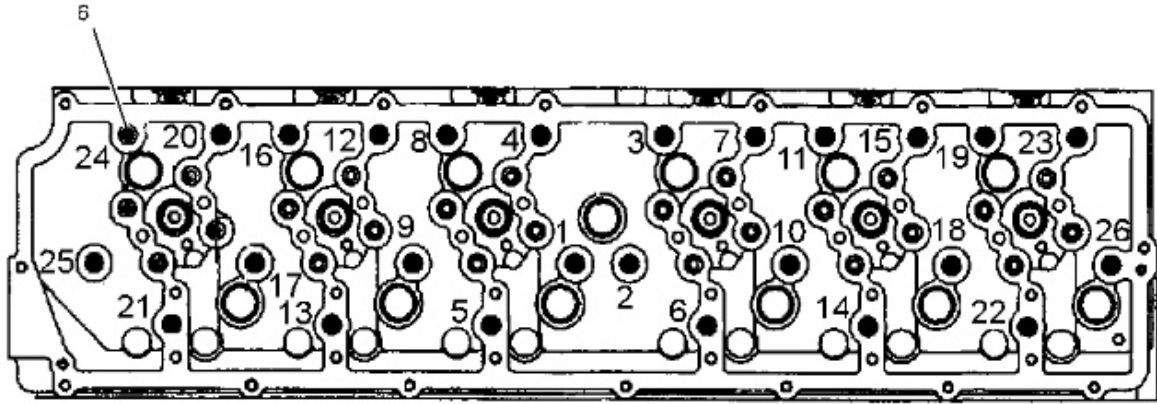


Illustration 2

g01375708

1. Install a new gasket. Attach a suitable lifting device to cylinder head (5). The weight of cylinder head (5) is approximately 113 kg (250 lb). Use the suitable lifting device in order to position cylinder head (5) on the engine block.
2. Tighten bolts (6) in the sequence that is shown in Illustration 2 to a torque of  $137 \pm 5 \text{ N}\cdot\text{m}$  ( $101 \pm 4 \text{ lb ft}$ ).

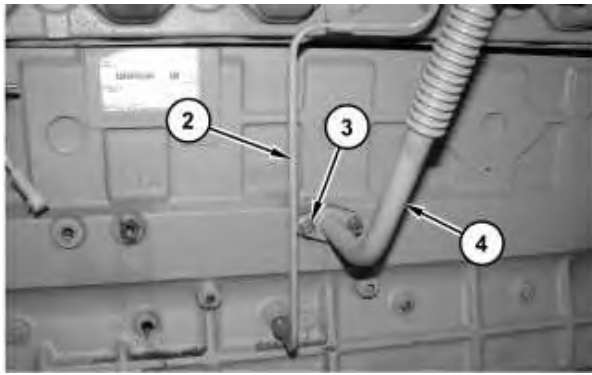


Illustration 3

g01375622

3. Install a new gasket and connect tube assembly (4). Install bolts (3).
4. Connect tube assembly (2).



5. Connect hose (1).

**End By:**

- a. If necessary, install the water temperature regulator. Refer to Disassembly and Assembly, "Water Temperature Regulator - Remove and Install".
- b. If necessary, install the inlet manifold. Refer to Disassembly and Assembly, "Inlet Manifold - Remove and Install".
- c. If necessary, install the exhaust manifold. Refer to Disassembly and Assembly, "Exhaust Manifold - Remove and Install".
- d. Install the electronic unit injectors. Refer to Disassembly and Assembly, "Electronic Unit Injector - Install".
- e. Install the rocker shaft and pushrods. Refer to Disassembly and Assembly, "Rocker Shaft and Pushrods - Install".
- f. Install the valve mechanism cover base. Refer to Disassembly and Assembly, "Valve Mechanism Cover Base - Remove and Install".

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Product: EXCAVATOR

Model: 320D LRR EXCAVATOR ZGB

Configuration: 320D LRR Excavator ZGB00001-UP (MACHINE) POWERED BY C6.4 Engine

## Disassembly and Assembly C6.4 Engine for Caterpillar Built Machines

Media Number -KENR8106-09

Publication Date -01/10/2017

Date Updated -18/10/2017

i02751804

# Lifter Group - Remove and Install

SMCS - 1209-010

## Removal Procedure

### Start By:

- a. Remove the camshaft. Refer to Disassembly and Assembly, "Camshaft - Remove".

---

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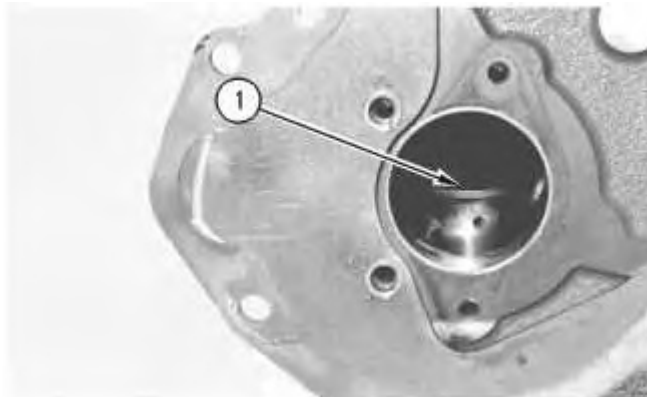


Illustration 1

g00610824

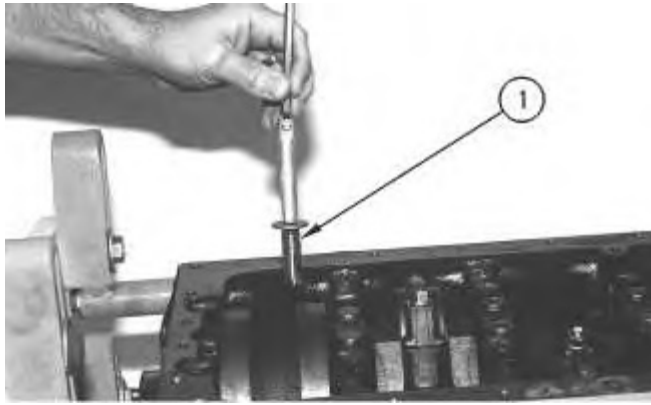


Illustration 2

g00532061

1. Use a magnet in order to remove valve lifter (1) from the engine cylinder block, as shown. Put identification marks on valve lifters (1) for installation purposes.
2. Repeat Step 1 for the remainder of valve lifters (1).

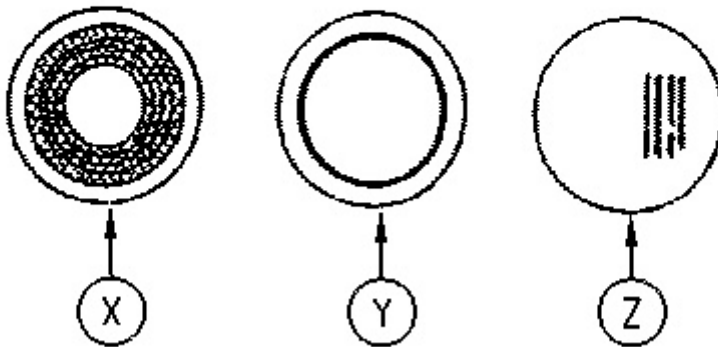


Illustration 3

g00613675

View (X) shows a good contact pattern. Views (Y) and (Z) show bad contact patterns.

**Note:** Check the valve lifters for wear.

## Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	8T-2998	Lubricant	1

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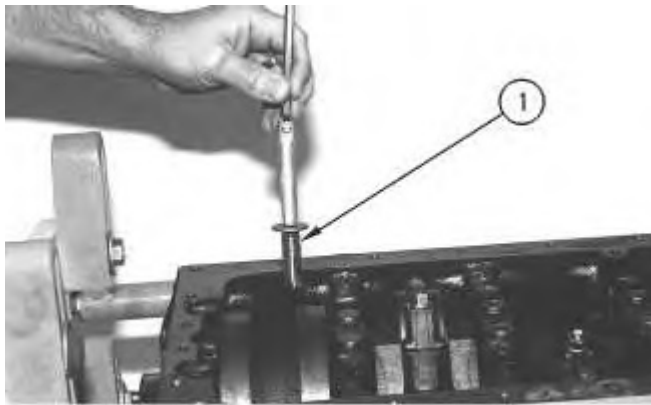


Illustration 4

g00532061

1. Apply Tooling (A) to valve lifter (1) prior to installation. Install valve lifter (1) in the original location in the engine cylinder block.
2. Repeat Step 1 for the remainder of the valve lifters.

### **End By:**

- a. Install the camshaft. Refer to Disassembly and Assembly, "Camshaft - Install".

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## Disassembly and Assembly C6.4 Engine for Caterpillar Built Machines

Media Number -KENR8106-09

Publication Date -01/10/2017

Date Updated -18/10/2017

i02751903

# Camshaft - Remove and Install

SMCS - 1210-010

## Removal Procedure

### Start By:

- a. Remove the front housing. Refer to Disassembly and Assembly, "Housing (Front) - Remove".
- b. Remove the rocker shaft assembly and the pushrods. Refer to Disassembly and Assembly, "Rocker Shaft and Pushrod - Remove".
- c. Remove the oil pan. Refer to Disassembly and Assembly, "Engine Oil Pan - Remove and Install".

**Note:** In this removal procedure, the engine needs to be placed in the upside-down position. This will allow the lifters to remain in position after the camshaft is removed.

---

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before opening any compartment or disassembling any component containing fluids.

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Dispose of all fluids according to local regulations and mandates.

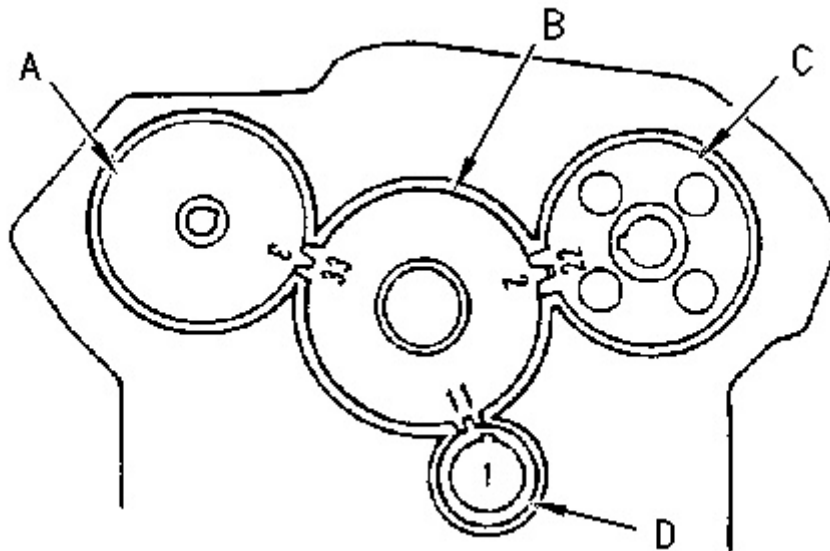
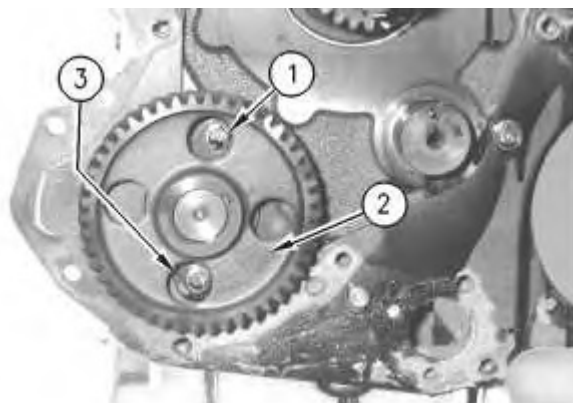


Illustration 1

g00569371

**Note:** Ensure that the marks on the timing gears are in alignment. Align the "3" mark on fuel injection drive gear (A) with the "33" mark on idler gear (B). Make an alignment of the "22" mark on camshaft gear (C) with the "2" mark on idler gear (B). Align the "1" mark on crankshaft gear (D) with the "11" mark on idler gear (B). The No. 1 cylinder is at the top center position when these marks are in alignment.

1. Rotate the engine at 180 degrees in order to place the engine in the upside-down position. This will ease the removal of the camshaft.



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