

Product: VIBRATORY COMPACTOR

Model: CS-54B VIBRATORY COMPACTOR L4H

Configuration: CS54B CP54B Vibratory Soil Compactor L4H00001-UP (MACHINE) POWERED BY C4.4 Engine

## Disassembly and Assembly

### C4.4 Engines for Caterpillar Built Machines

Media Number -UENR0602-11

Publication Date -01/08/2013

Date Updated -25/10/2017

i04048724

## Pistons and Connecting Rods - Install

SMCS - 1225-012

### Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A <sup>(1)</sup>	9U-6198	Crankshaft Turning Tool	1
A <sup>(2)</sup>	9U-7336	Housing	1
	5P-7305	Engine Turning Tool	1
B	1U-6684	Piston Ring Compressor	1
C	8T-3052	Degree Wheel	1

<sup>(1)</sup> The Crankshaft Turning Tool is used on the front pulley.

<sup>(2)</sup> 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.

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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

### Discard all used Connecting Rod fasteners.

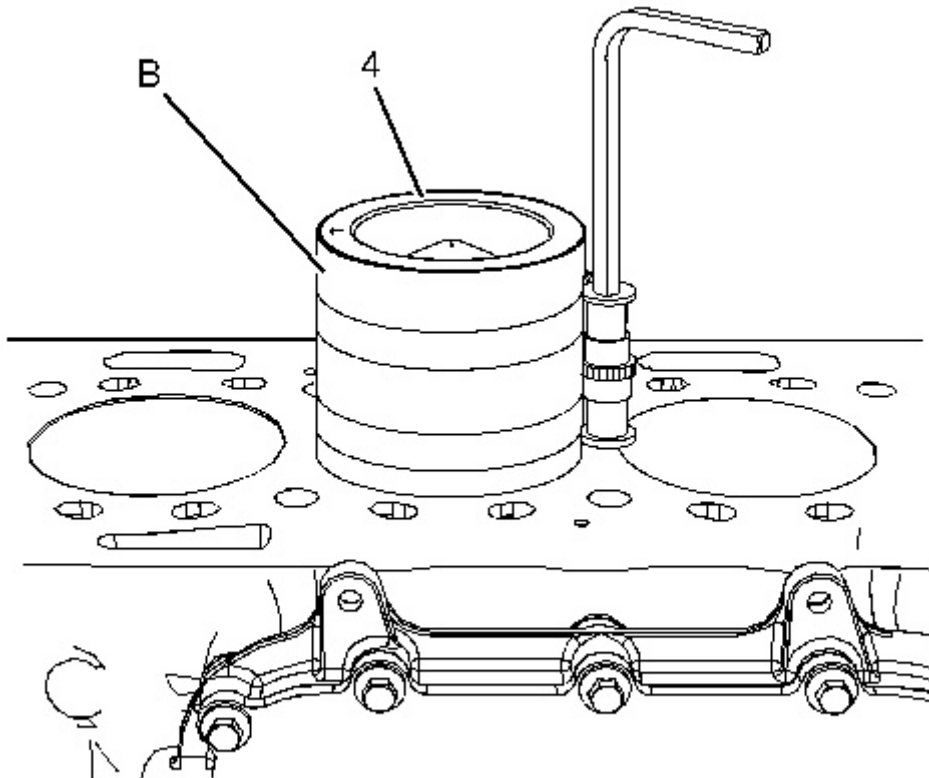
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1. If the connecting rod caps were temporarily installed, remove the connecting rod caps. If necessary, thoroughly clean all of the components.
2. Apply clean engine oil to the cylinder bore, to the piston rings, to the outer surface of the piston and to the bearing shells for the connecting rod.

**Note:** Install the bearing shells for the connecting rods dry when clearance checks are performed. Refer to Disassembly and Assembly, "Bearing Clearance - Check" for the correct procedure. Apply clean engine oil to the bearing shells for the connecting rods during final assembly.

**Note:** Ensure that the piston and the connecting rod assembly are installed in the correct cylinder.

3. Use Tooling (A) to rotate the crankshaft until the crankshaft pin is at the bottom center position. Lubricate the crankshaft pin with clean engine oil.
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Illustration 1

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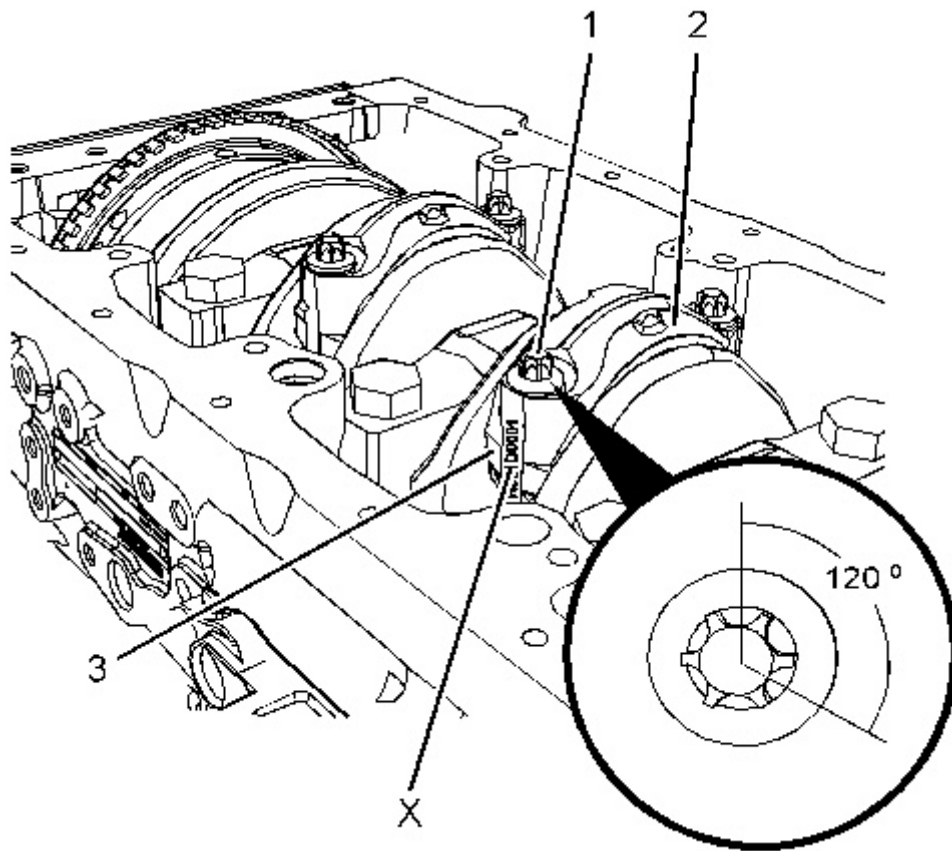
4. Install Tooling (B) onto piston (4).

**Note:** Ensure that Tooling (B) is installed correctly and that piston (4) can easily slide from the tool.

**Note:** The arrow on the top of the piston must be toward the front of the engine. The locating tab for the bearing shell of the connecting rod must be on the same side of the engine as the piston cooling jet.

5. Carefully push the piston and the connecting rod assembly into the cylinder bore and onto the crankshaft pin.

**Note:** Do not damage the finished surface of the crankshaft pin.



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Illustration 2

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6. Install connecting rod cap (2) onto connecting rod (1).

**Note:** Ensure that etched Number (X) on connecting rod cap (2) matches etched Number (X) on connecting rod (3). Ensure the correct orientation of connecting rod cap (2). The locating tab for the upper bearing shell and the lower bearing shell should be on the same side.

**Note:** Do not reuse the old connecting rod bolts in order to secure the connecting rod cap.

7. Install new bolts (1) to connecting rod (3). Tighten the bolts evenly to a torque of 40 N·m (30 lb ft).

8. Turn the bolts for an additional 120 degrees in a clockwise direction. Use Tooling (C) to achieve the correct final torque.
9. Ensure that the installed connecting rod assembly has tactile side play. Rotate the crankshaft in order to ensure that there is no binding.
10. Repeat Step 2 through Step 9 in order to install the remaining pistons and connecting rods.

**End By:**

- a. Install the piston cooling jets. Refer to Disassembly and Assembly, "Piston Cooling Jets - Remove and Install" for the correct procedure.
  - b. Install the cylinder head. Refer to Disassembly and Assembly, "Cylinder Head - Install" for the correct procedure.
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## Disassembly and Assembly C4.4 Engines for Caterpillar Built Machines

Media Number -UENR0602-11

Publication Date -01/08/2013

Date Updated -25/10/2017

i04047739

# Connecting Rod Bearings - Remove - Connecting Rods in Position

SMCS - 1219-011

## Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A <sup>(1)</sup>	9U-6198	Crankshaft Turning Tool	1
A <sup>(2)</sup>	9U-7336	Housing	1
	5P-7305	Engine Turning Tool	1

<sup>(1)</sup> The Crankshaft Turning Tool is used on the front pulley.

<sup>(2)</sup> This Tool is used in the aperture for the electric starting motor.

### Start By:

- If the engine is equipped with a balancer, remove the balancer. Refer to Disassembly and Assembly, "Balancer - Remove" for the correct procedure.
- If the engine is not equipped with a balancer, remove the engine oil pump. Refer to Disassembly and Assembly, "Engine Oil Pump - Remove" for the correct procedure.

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

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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**

**Discard all used Connecting Rod fasteners.**

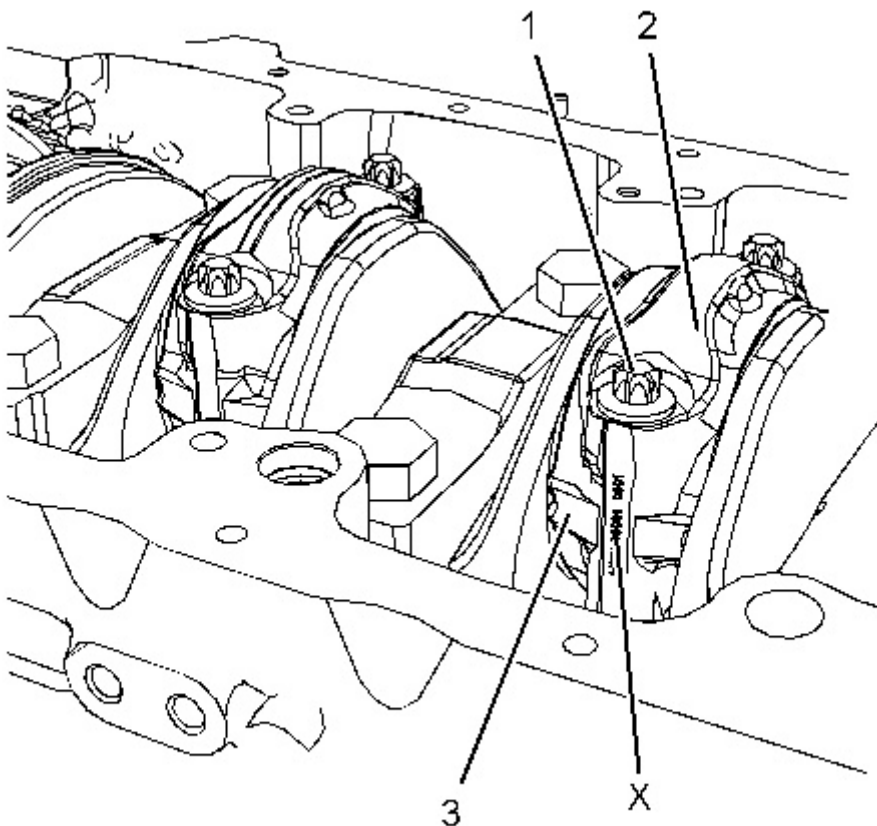
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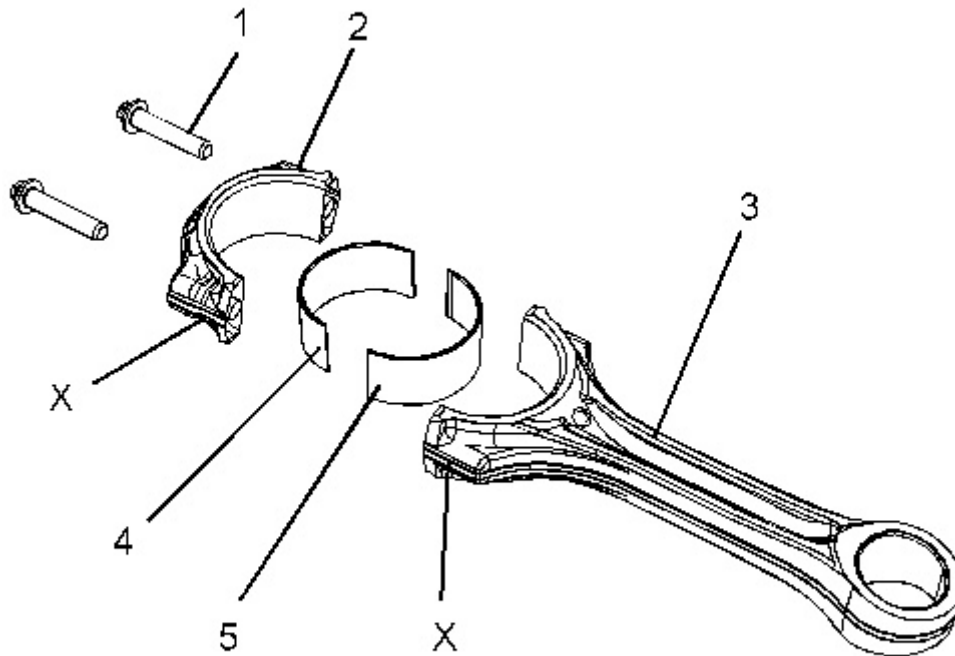
**Note:** If all connecting rod bearings require replacement, the procedure can be carried out on two cylinders at the same time. The procedure can be carried out on the following pairs of cylinders. 1 with 4 and 2 with 3. **Ensure that both pairs of the connecting rod bearings are installed before changing from one pair of cylinders to another pair of cylinders.** Refer to Disassembly and Assembly, "Connecting Rod Bearings - Install" for the correct procedure.

1. Use Tooling (A) to rotate the crankshaft until the crank pin is at the bottom center position.

If necessary, remove the glow plugs. Ref to Disassembly and Assembly, "Glow Plugs - Remove and Install" for the correct procedure.

**Note:** Removal of glow plug aids removal of the connecting rod bearing. It is not essential.





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Illustration 2

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2. The connecting rod and the connecting rod cap should have an etched Number (X) on the side. The number on the connecting rod and the connecting rod cap must match. If necessary, make a temporary mark on connecting rod (3) and connecting rod cap (2) in order to identify the cylinder number.

**Note:** Do not punch identification marks onto fracture split connecting rods. Do not stamp identification marks onto fracture split connecting rods.

3. Remove bolts (1) and connecting rod cap (2) from connecting rod (3). Discard bolts (1).
4. Remove lower bearing shell (4) from connecting rod cap (2). Keep the bearing shell and the connecting rod cap together.
5. Carefully push connecting rod (3) into the cylinder bore until connecting rod (3) is clear of the crankshaft. Remove upper bearing shell (5) from the connecting rod. Keep the bearing shells together.

**Note:** Do not push on the fracture split surfaces of the connecting rod as damage may result. Do not allow the connecting rod to contact the piston cooling jet.

6. Repeat Step 1 through Step 5 for the remaining bearing shells.

**Note:** Fracture split connecting rods should not be left without the connecting rod caps installed. After the removal procedure for the bearing shells is complete, carry out the

installation procedure as soon as possible. Refer to Disassembly and Assembly, "Connecting Rod Bearings - Install" for the correct procedure.

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Configuration: CS54B CP54B Vibratory Soil Compactor L4H00001-UP (MACHINE) POWERED BY C4.4 Engine

## Disassembly and Assembly

### C4.4 Engines for Caterpillar Built Machines

Media Number -UENR0602-11

Publication Date -01/08/2013

Date Updated -25/10/2017

i04047738

## Connecting Rod Bearings - Install - Connecting Rods in Position

SMCS - 1219-012

### Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A <sup>(1)</sup>	9U-6198	Crankshaft Turning Tool	1
A <sup>(2)</sup>	9U-7336	Housing	1
	5P-7305	Engine Turning Tool	1
B	8T-3052	Degree Wheel	1

<sup>(1)</sup> The Crankshaft Turning Tool is used on the front pulley.

<sup>(2)</sup> 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.

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### NOTICE

**Keep all parts clean from contaminants.**

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

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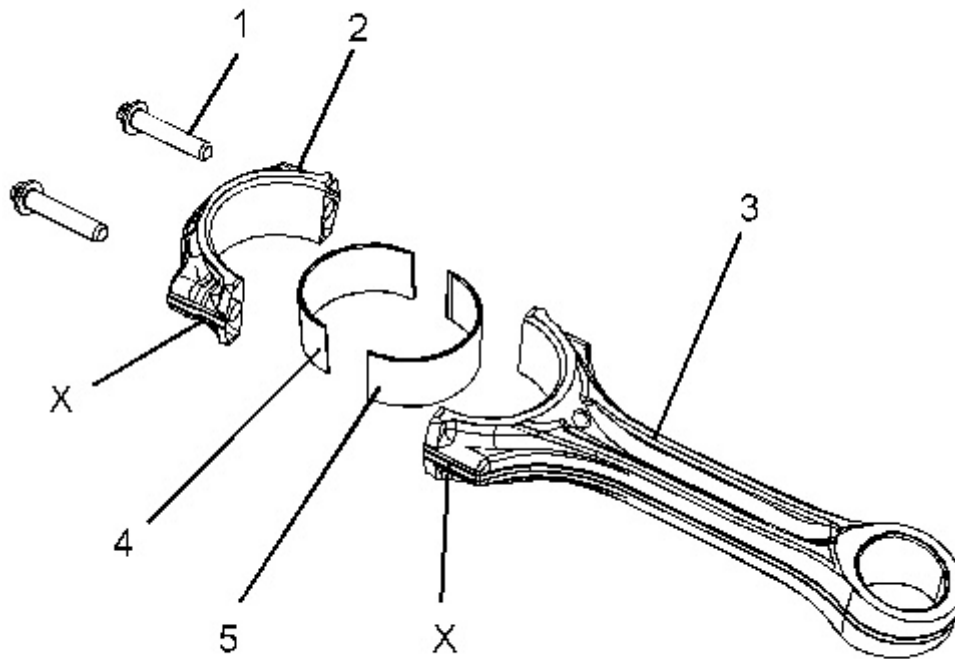
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## NOTICE

**Discard all used Connecting Rod fasteners.**

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1. Inspect the pins of the crankshaft for damage. If the crankshaft is damaged, replace the crankshaft. Refer to Disassembly and Assembly, "Crankshaft - Remove" and Disassembly and Assembly, "Crankshaft - Install" for the correct procedure. Ensure that the bearing shells are clean and free from wear and damage. If necessary, replace the bearing shells.
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Illustration 1

g02437999

2. Install upper bearing shell (5) into connecting rod (3). Ensure that the locating tab for the upper bearing shell is correctly seated in the slot in the connecting rod.

**Note:** The ends of the upper bearing shell must be centered in the connecting rod. The ends of the upper bearing shell must be equally positioned in relation to the mating faces of the connecting rod.

3. Lubricate upper bearing shell (5) with clean engine oil.
4. Use Tooling (A) to rotate the crankshaft until the crankshaft pin is at the bottom dead center position.
5. Carefully pull connecting rod (3) against the crankshaft pin.

**Note:** Do not allow the connecting rod to contact the piston cooling jet.

- Clean connecting rod cap (2). Install lower bearing shell (4) into connecting rod cap (2). Ensure that the locating tab for the lower bearing shell is correctly seated in the slot in the connecting rod cap.
- Lubricate the pin of the crankshaft and lubricate lower bearing shell (4) with clean engine oil.

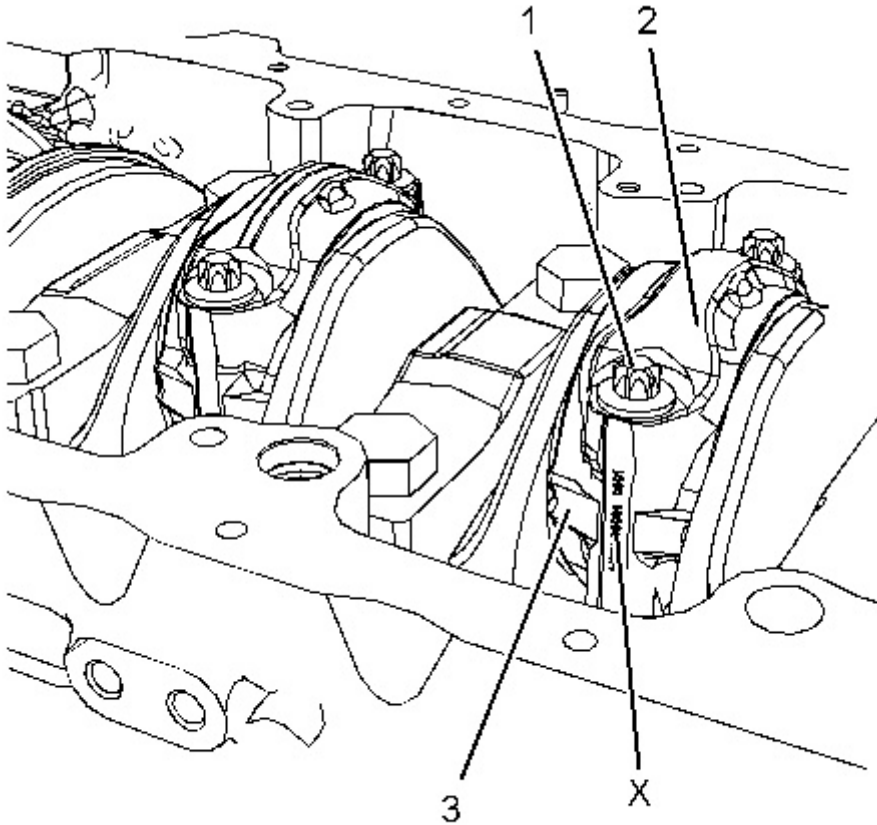


Illustration 2

g02437998

- Install connecting rod cap (2) to connecting rod (3).

**Note:** Ensure that etched Number (X) on connecting rod cap (2) matches etched Number (X) on connecting rod (3). Ensure the correct orientation of the connecting rod cap. The locating tab for the upper bearing shell and the lower bearing shell should be on the same side.

**Note:** Do not reuse the old connecting rod bolts in order to secure the connecting rod cap.

- Install new bolts (1) to the connecting rod. Tighten the bolts evenly to a torque of 40 N·m (30 lb ft).
- Turn the bolts through an additional 120 degrees in a clockwise direction. Use Tooling (B) to achieve the correct final torque.

11. Ensure that the installed connecting rod assembly has tactile side play. Rotate the crankshaft in order to ensure that there is no binding.
12. Repeat Step 2 through Step 11 for the remaining connecting rod bearings.

**Note:** If all connecting rod bearings 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 both pairs of the connecting rod bearings are installed before changing from one pair of cylinders to another pair of cylinders.** Refer to Disassembly and Assembly, "Connecting Rod Bearings - Install" for the correct procedure.

13. If the glow plugs were removed, install the glow plugs. Ref to Disassembly and Assembly, "Glow Plugs - Remove and Install" for the correct procedure.

**End By:**

- a. If the engine is equipped with a balancer, install the balancer. Refer to Disassembly and Assembly, "Balancer - Install" for the correct procedure.
  - b. If the engine is not equipped with a balancer, install the engine oil pump. Refer to Disassembly and Assembly, "Engine Oil Pump - Install" for the correct procedure.
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Product: VIBRATORY COMPACTOR

Model: CS-54B VIBRATORY COMPACTOR L4H

Configuration: CS54B CP54B Vibratory Soil Compactor L4H00001-UP (MACHINE) POWERED BY C4.4 Engine

## Disassembly and Assembly C4.4 Engines for Caterpillar Built Machines

Media Number -UENR0602-11

Publication Date -01/08/2013

Date Updated -25/10/2017

i04047751

# Crankshaft Main Bearings - Remove and Install - Crankshaft in Position

SMCS - 1203-010

## Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A <sup>(1)</sup>	9U-6198	Crankshaft Turning Tool	1
A <sup>(2)</sup>	9U-7336	Housing	1
	5P-7305	Engine Turning Tool	1
B	194-3542	5mm Allen Socket	1

<sup>(1)</sup> The Crankshaft Turning Tool is used on the front pulley.

<sup>(2)</sup> This Tool is used in the aperture for the electric starting motor.

### Start By:

- If the engine is equipped with a balancer, remove the balancer. Refer to Disassembly and Assembly, "Balancer - Remove" for the correct procedure.
- If the engine is not equipped with a balancer, remove the engine oil pump. Refer to Disassembly and Assembly, "Engine Oil Pump - Remove" for the correct procedure.
- Remove the crankshaft rear seal. Refer to Disassembly and Assembly, "Crankshaft Rear Seal - Remove" for the correct procedure.

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

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## NOTICE

**This procedure must only be used to remove and install the main bearing shells with the crankshaft in position.**

**The removal procedure and the installation procedure must be completed for each pair of main bearing shells before the next pair of main bearing shells are removed.**

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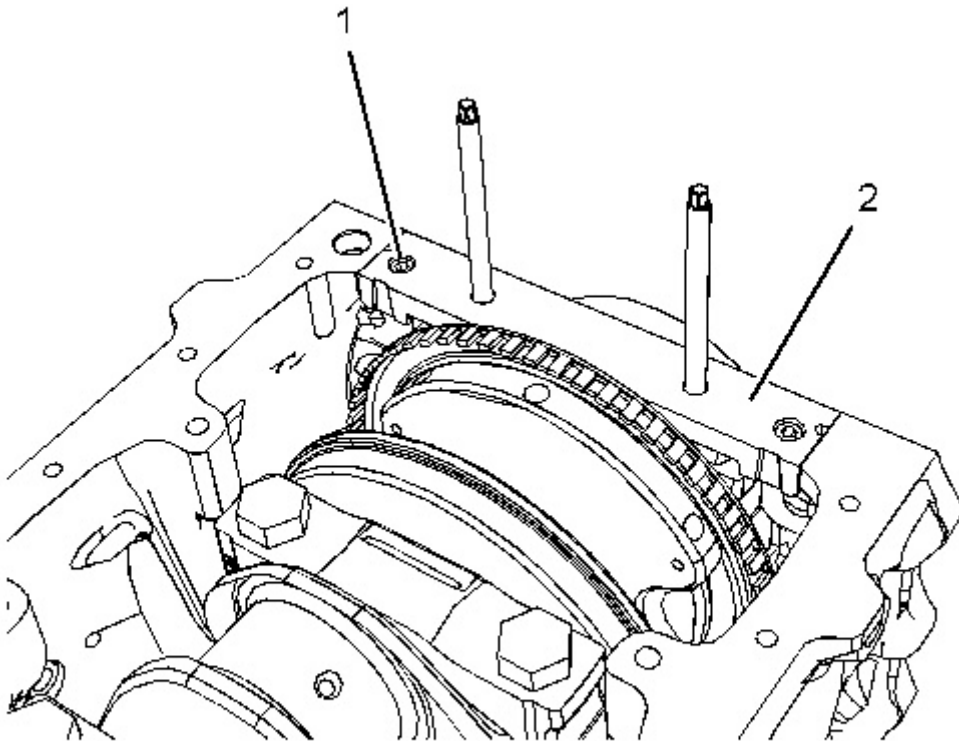
## NOTICE

**Keep all parts clean from contaminants.**

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

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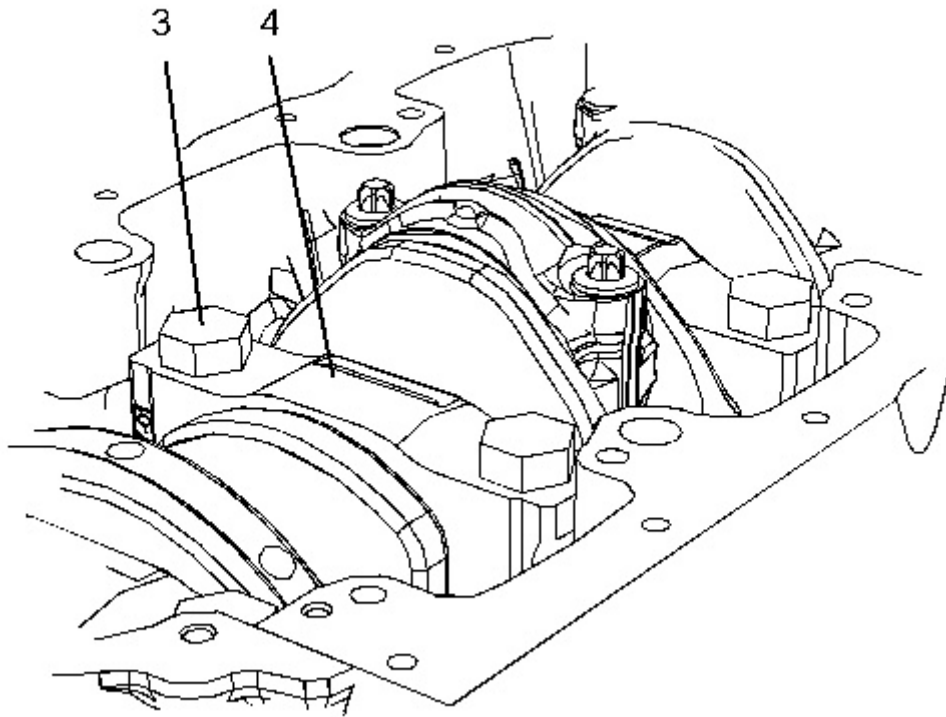


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Illustration 1

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1. Use Tooling (B) in order to remove allen head screws (1). Remove bridge piece (2).
2. Ensure that the main bearing cap is marked for the correct location and orientation.

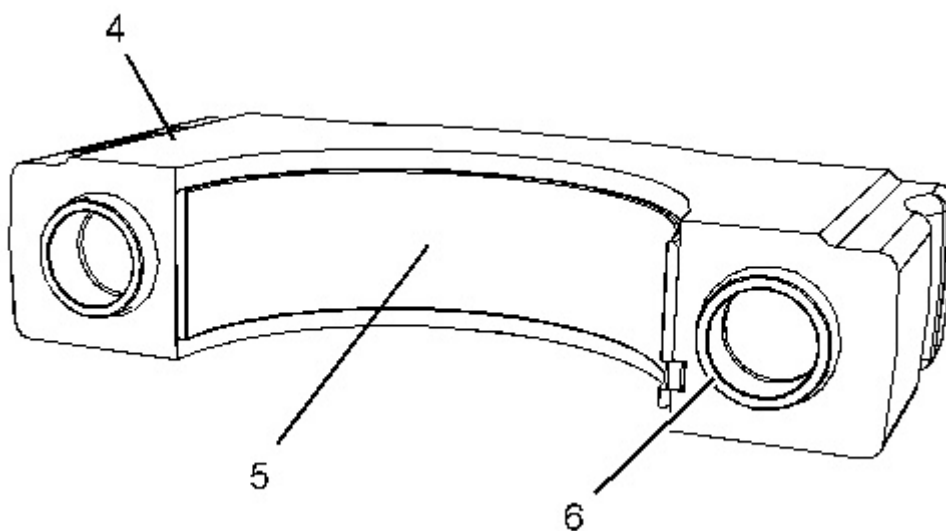


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Illustration 2

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3. Remove bolts (3) and main bearing cap (4) from the cylinder block.



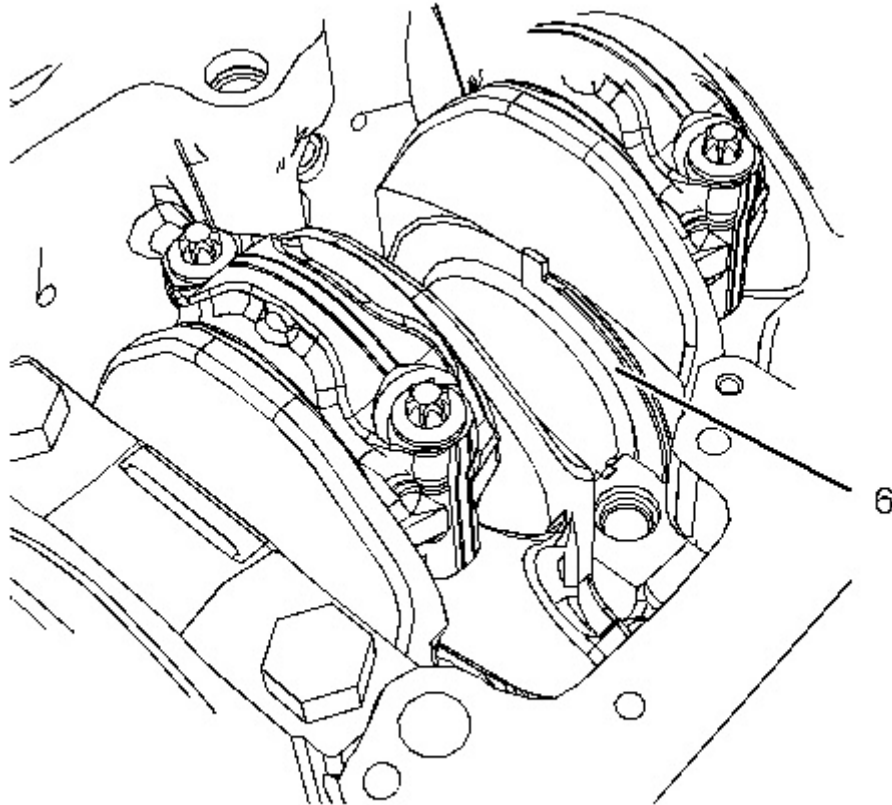
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Illustration 3

g02447418

4. Remove lower main bearing shell (5) from main bearing cap (4). Keep the main bearing shell and the main bearing cap together. Take care not to displace dowels (6).

**Note:** The lower main bearing shell is a plain bearing that has no oil holes.



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Illustration 4

g02447419

5. For number No. 3 main bearing, remove two thrust washers (7) from the cylinder block. In order to remove thrust washers (7), use Tooling (A) to rotate the crankshaft in the correct direction. If necessary, push the crankshaft toward the front of the engine or push the crankshaft toward the rear of the engine while you rotate the crankshaft, in order to aid removal.

**Note:** The thrust washers have a locating tab at one end.

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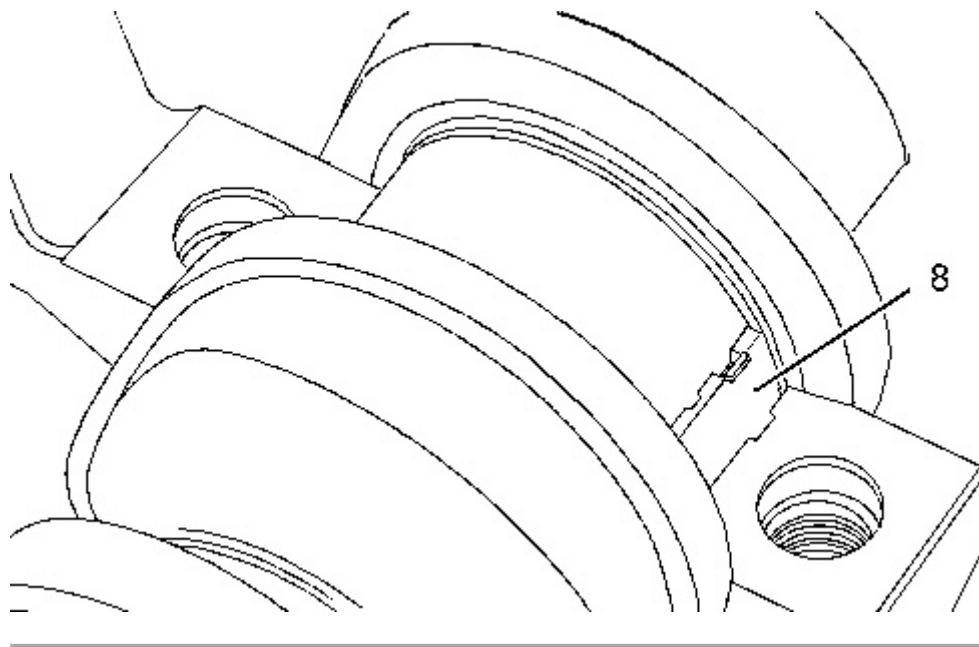


Illustration 5

g02447420

6. Push out upper main bearing shell (8) with a suitable tool from the side opposite the locating tab. Carefully rotate the crankshaft while you push on the bearing shell. Remove upper main bearing shell (8) from the cylinder block. Keep the bearing shells together.

**Note:** The upper main bearing shell has a groove and two oil holes.

## Installation Procedure

Table 2

Required Tools			
Tool	Part Number	Part Description	Qty
B	194-3542	5mm Allen Socket	1
C	8T-5096	Dial Indicator Gp	1
D	-	Straight Edge	1
E	165-2601	Silicon Sealant	1

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### NOTICE

**This procedure must only be used to remove and install the main bearing shells with the crankshaft in position.**

**The removal procedure and the installation procedure must be completed for each pair of main bearing shells before the next pair of main bearing shells are removed.**

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## NOTICE

**Keep all parts clean from contaminants.**

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

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1. Ensure that the main bearing shells are clean and free from wear and damage. If necessary, replace the main bearing shells.
2. Clean the journals of the crankshaft. Inspect the journals of the crankshaft for damage. If necessary, replace the crankshaft or recondition the crankshaft.

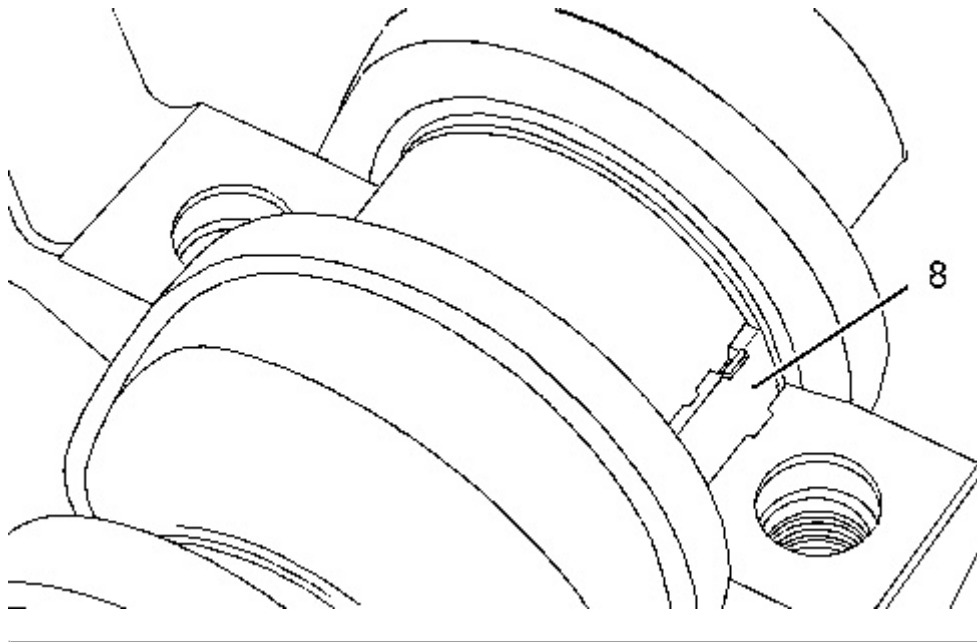


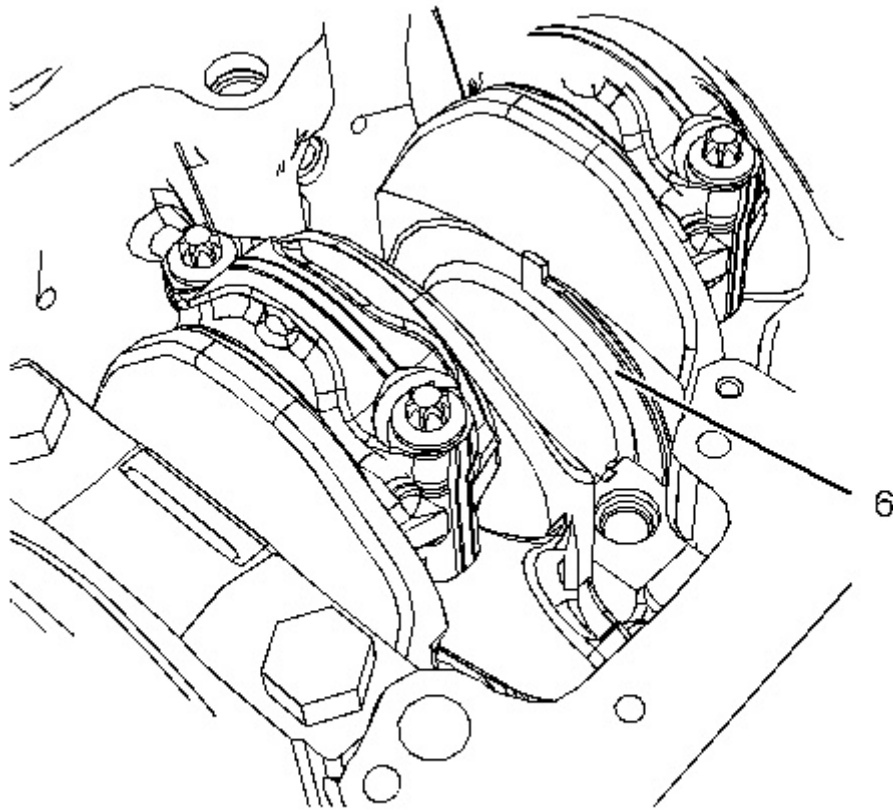
Illustration 6

g02447420

3. Lubricate the crankshaft journal and upper main bearing shell (8) with clean engine oil. Slide upper main bearing shell (8) into position between the crankshaft journal and the cylinder block. Ensure that the locating tab for the upper main bearing shell is correctly seated in the slot in the cylinder block.

**Note:** The upper main bearing shell has a groove and two oil holes.

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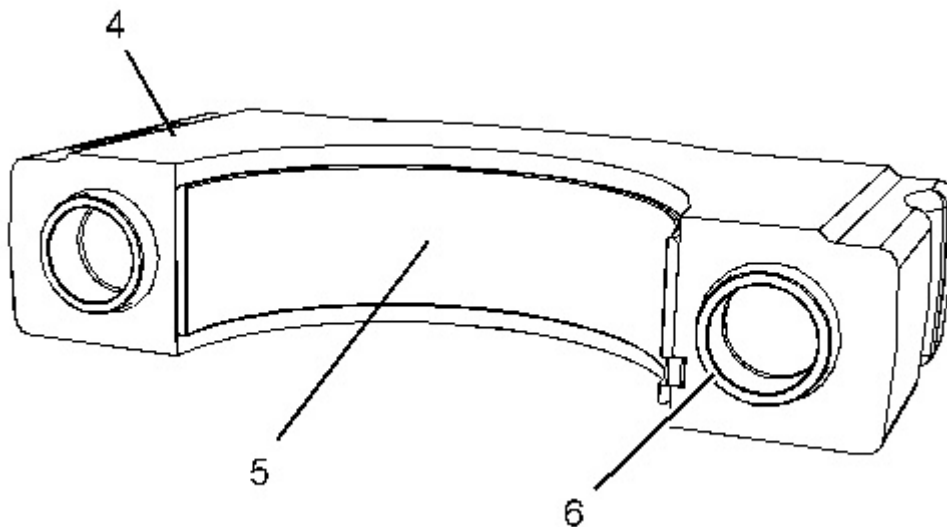


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Illustration 7

g02447419

4. For number No. 3 main bearing, ensure that two thrust washers (7) are clean and free from wear and damage. If necessary, replace the thrust washers. Lubricate thrust washers (7) with clean engine oil. Slide thrust washers (4) into position between the crankshaft and the cylinder block. Ensure that the locating tab is correctly seated in the cylinder block.



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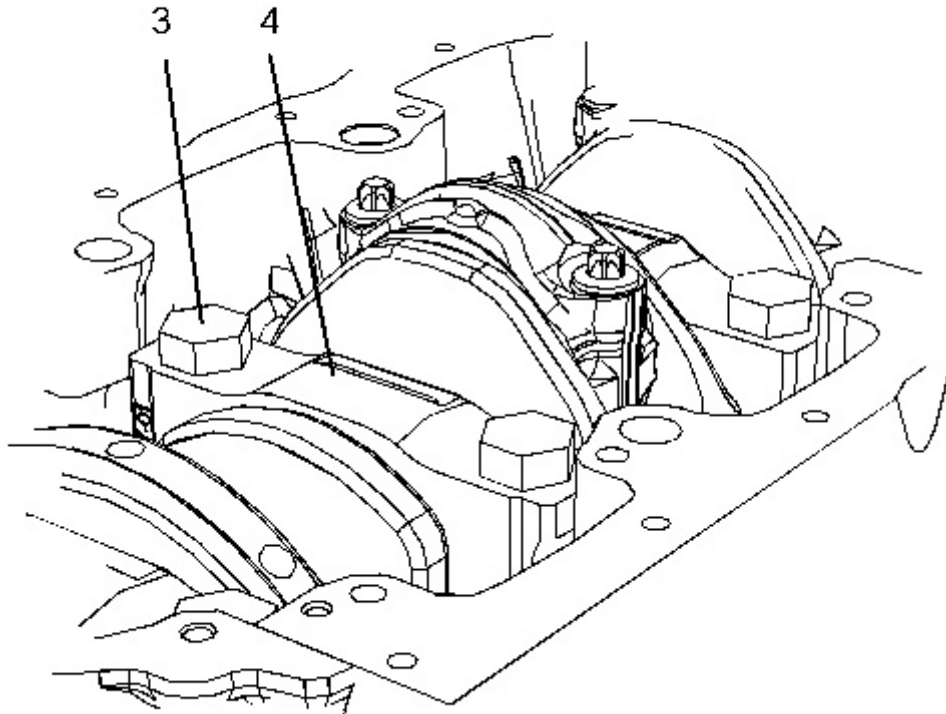
Illustration 8

g02447418

5. Install lower main bearing shell (3) into main bearing cap (2). Ensure that the locating tab for the lower main bearing shell is correctly seated into the slot in the bearing cap. Ensure that the dowel (6) is correctly located.

**Note:** The lower main bearing shell is a plain bearing that has no oil holes.

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Illustration 9

g02447416

6. Lubricate the crankshaft journal and the lower main bearing shell with clean engine oil. Install main bearing cap (4) to the cylinder block.

**Note:** Ensure the correct orientation of the main bearing cap. The locating tab for the upper and the lower bearing should be on the same side of the engine.

7. Lubricate the threads of bolts (3) with clean engine oil. Lubricate the underside of the heads of bolts (3) with clean engine oil.
8. Install bolts (3) to main bearing cap (4). Evenly tighten the bolts in order to pull cap (3) into position. Ensure that the cap is correctly seated.

**Note:** Do not tap the main bearing cap into position as the bearing shell may be dislodged.

9. Tighten bolts (3) to a torque of 245 N·m (181 lb ft).
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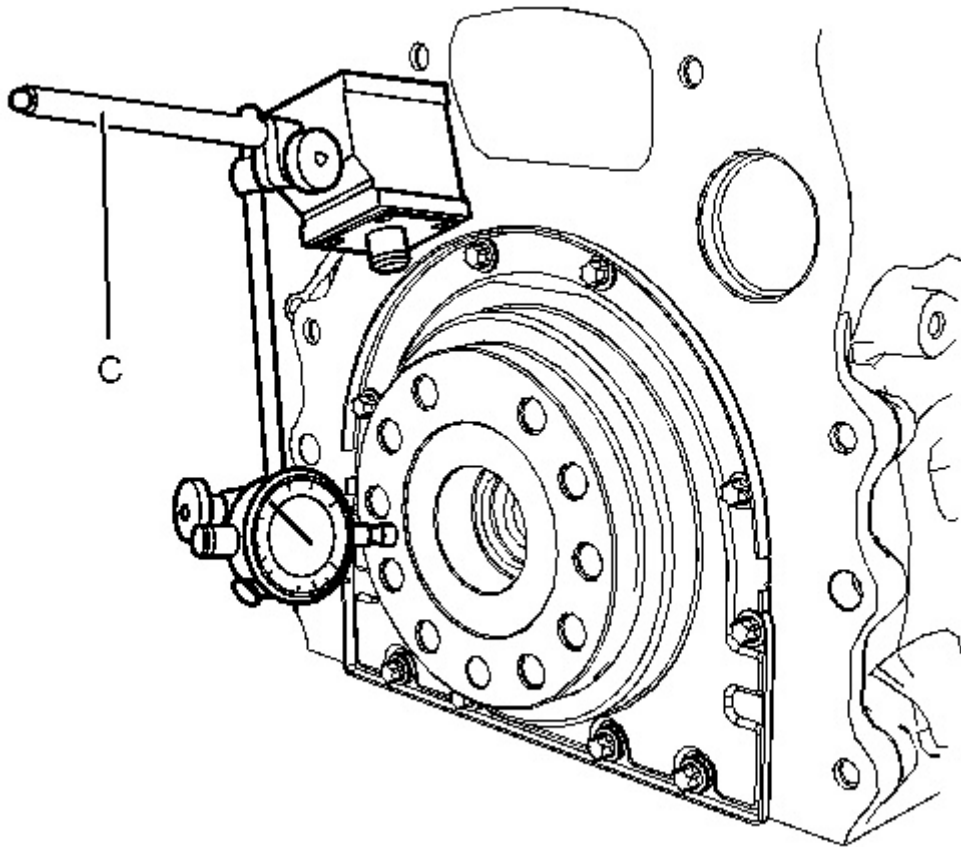


Illustration 10

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10. Check the crankshaft end play. Push the crankshaft toward the front of the engine. Install Tooling (C) to the cylinder block and the rear face of the crankshaft. Push the crankshaft toward the rear of the engine. Use Tooling (C) to measure the crankshaft end play. The permissible crankshaft end play is 0.10 mm (0.004 inch) to 0.41 mm (0.016 inch).

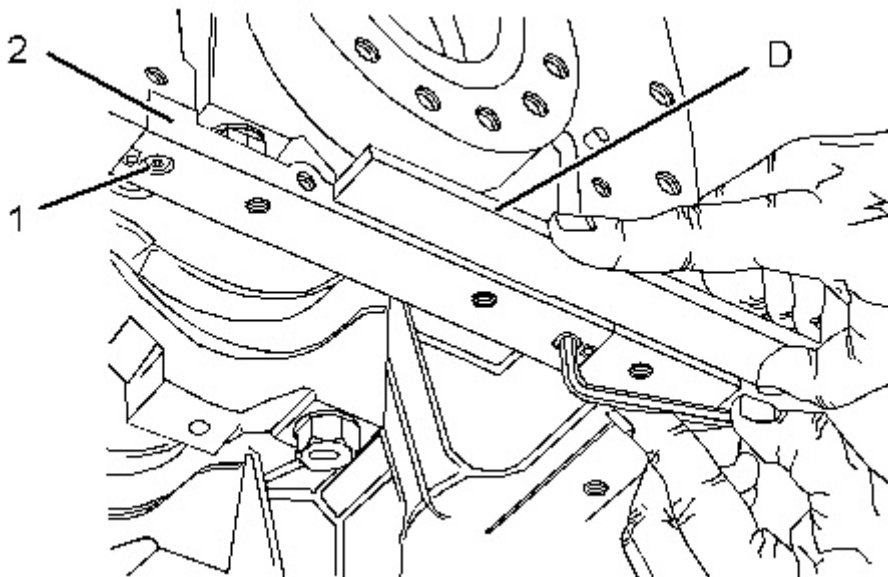


Illustration 11

g02447422

11. Follow Steps 11.a through Step 11.d in order to install the bridge piece.

- a. Ensure that the cylinder block and the bridge piece are clean, dry, and free from old sealant.
- b. Install bridge piece (2) and allen head screws (1). Tighten the allen head screws finger tight.
- c. Use Tooling (D) in order to align the rear face of the bridge piece with the rear face of the cylinder block.
- d. Use Tooling (B) in order to tighten the allen head screws to a torque of 16 N·m (142 lb in).

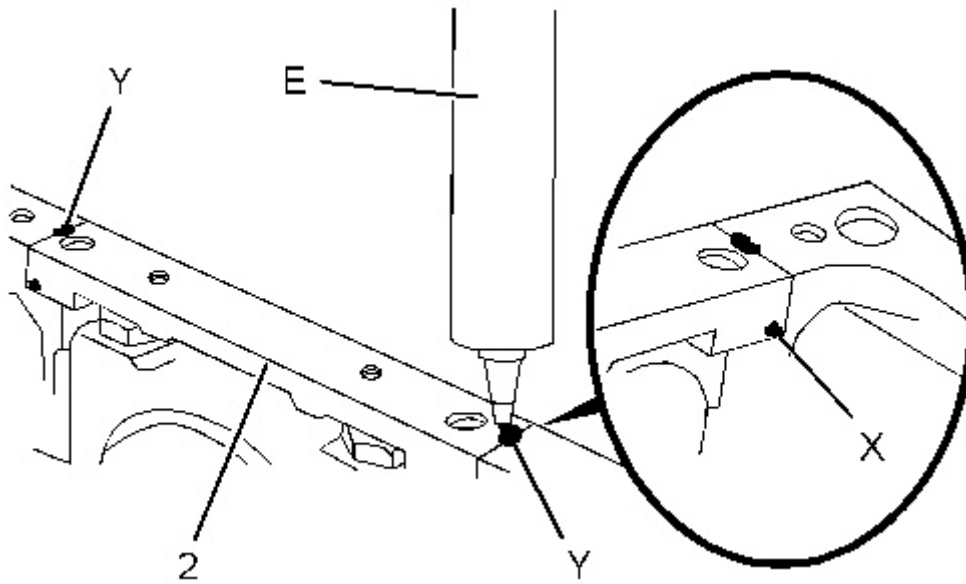


Illustration 12

g02442239

12. Apply Tooling (E) to cavities (Y) in the bridge piece (2). Continue to apply Tooling (E) until sealant extrudes from cavities (X).

**Note:** If the oil pan will not be installed immediately, ensure that the joint face of the bridge piece and the cylinder block are left free of sealant.

**End By:**

- a. Install the crankshaft rear seal. Refer to Disassembly and Assembly, "Crankshaft Rear Seal - Install" for the correct procedure.
  - b. If the engine is equipped with a balancer, install the balancer. Refer to Disassembly and Assembly, "Balancer - Install" for the correct procedure.
  - c. If the engine is not equipped with a balancer, install the engine oil pump. Refer to Disassembly and Assembly, "Engine Oil Pump - Install" for the correct procedure.
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