



Service Repair Manual

Models

329D L and 329D LN Excavator

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Product: EXCAVATOR

Model: 329D LN EXCAVATOR EBM

Configuration: 329D L & 329D LN Excavators EBM00001-UP (MACHINE) POWERED BY C7 Engine

Disassembly and Assembly

C7

Engines for Caterpillar Built Machines

Media Number -REN9218-13

Publication Date -01/06/2014

Date Updated -04/06/2014

i05954439

Engine Oil Pan - Remove and Install

SMCS - 1302-010

Removal Procedure

Start By:

- A. Remove the engine.

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.

1. Drain the engine oil into a suitable container for storage or disposal. Refer to Operation and Maintenance Manual, "Engine Oil and Filter - Change" for the correct draining and filling procedures.

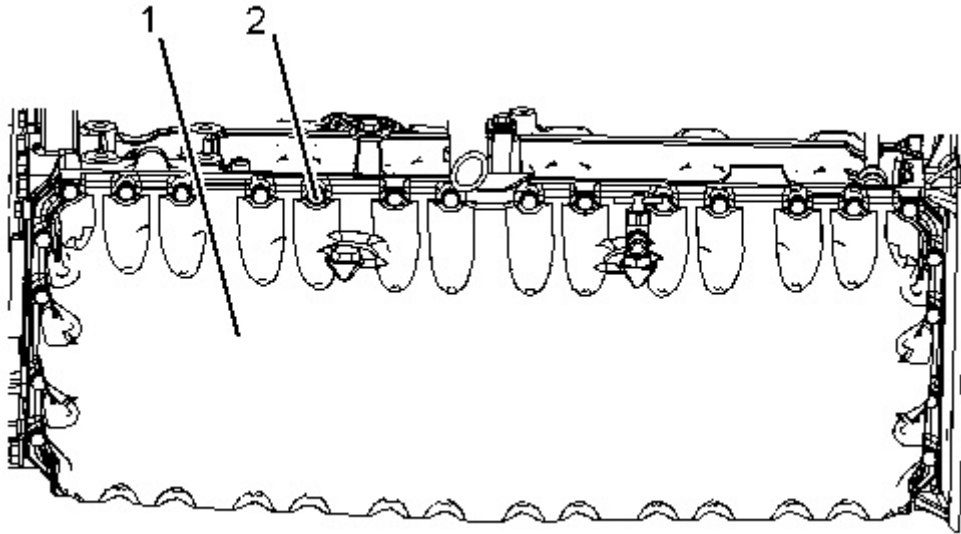


Illustration 1

g01153839

Note: Do not pry or gouge the sealing surface of the engine oil pan. Use a rubber mallet to tap lightly on the engine oil pan, if necessary.

2. Remove bolts (2) . Remove engine oil pan (1) and the gasket.

Installation Procedure

Table 1

Tool	Part number	Part Description	Qty
A	-	Loctite 598	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

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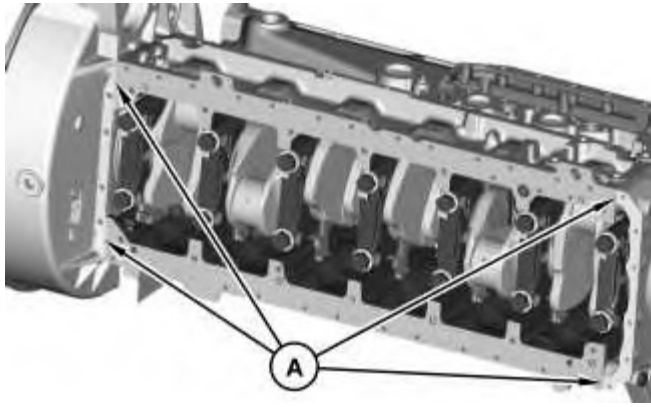


Illustration 2

g03737518

1. Apply a bead of Tooling (A) to the areas shown in Illustration 2.

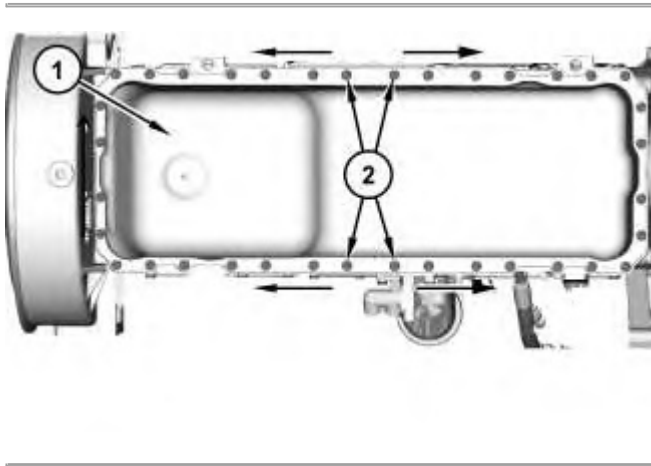


Illustration 3

g03738044

2. Position a new gasket and engine oil pan (1) on the cylinder block.
3. Install bolts (2) .
4. Tighten bolts (2) to a torque of $31 \pm 3 \text{ N}\cdot\text{m}$ ($23 \pm 2 \text{ lb ft}$). Tighten the four bolts (2) in the center and move outward in the direction shown in Illustration 3.
5. Repeat Step 4.
1. Fill the engine with engine oil to the correct level. Refer to Operation and Maintenance Manual, "Engine Oil and Filter - Change" for the correct draining and filling procedures.

End By: Install the engine.

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Media Number -REN9218-13

Publication Date -01/06/2014

Date Updated -04/06/2014

i02232665

Piston Cooling Jets - Remove and Install

SMCS - 1331-010

Removal Procedure

Start By:

- a. Remove the engine oil pump. Refer to Disassembly and Assembly, "Engine Oil Pump - Remove".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

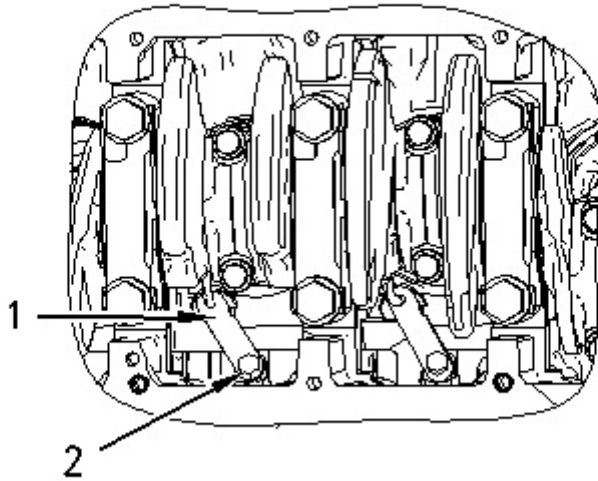


Illustration 1

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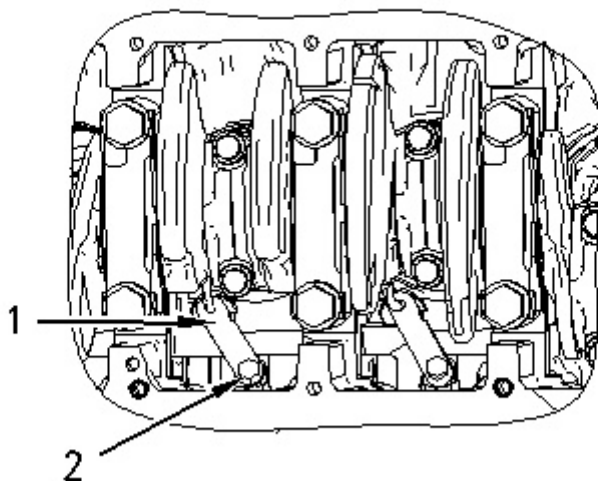
1. Remove bolt (2) and piston cooling jet (1) from each cylinder.

Installation Procedure

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.



1. Position piston cooling jet (1) in the cylinder block. Install bolt (2). Tighten bolt (2) to a torque of 28 ± 7 N·m (21 ± 5 lb ft).

End By:

- a. Install the engine oil pump. Refer to Disassembly and Assembly, "Engine Oil Pump - Install".

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Media Number -REN9218-13

Publication Date -01/06/2014

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i02232678

Pistons and Connecting Rods - Remove

SMCS - 1225-011

Removal Procedure

Start By:

- a. Remove the cylinder head. Refer to Disassembly and Assembly, "Cylinder Head - Remove".
- b. Remove the engine oil pump. Refer to Disassembly and Assembly, "Engine Oil Pump - Remove".
- c. Remove the piston cooling jets. Refer to Disassembly and Assembly, "Piston Cooling Jets - Remove and Install".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

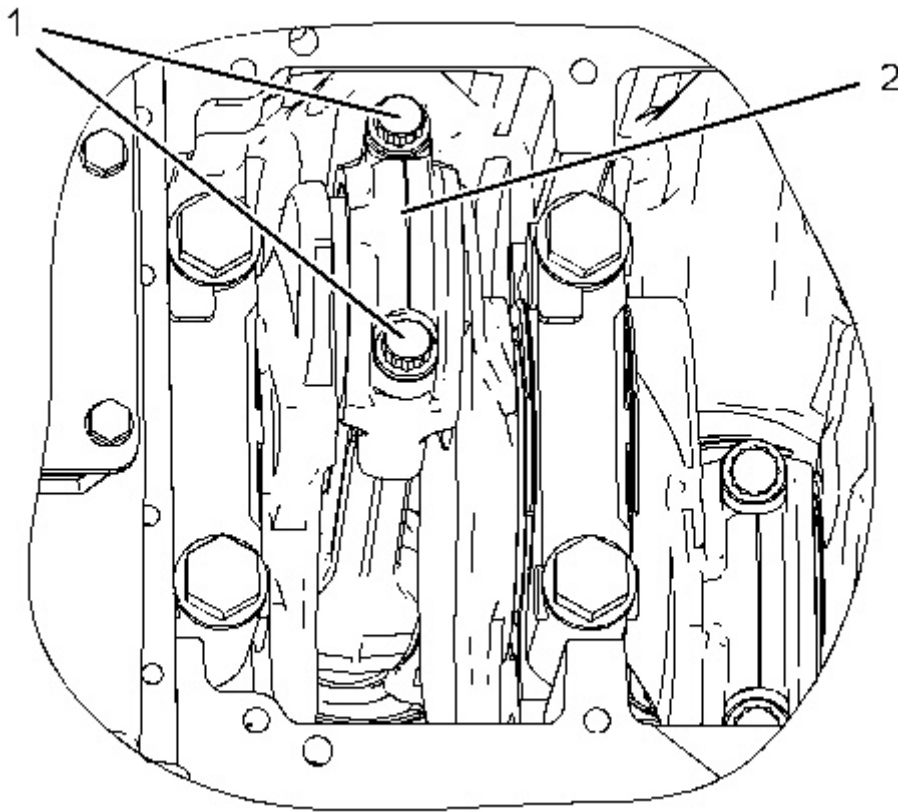
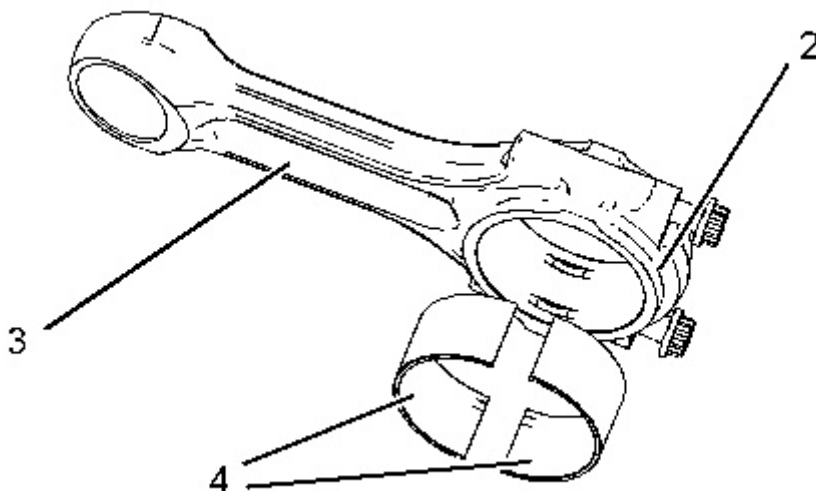


Illustration 1

g01126088

1. Turn the crankshaft until the connecting rod caps are at the bottom center.
2. Place a identification mark on the connecting rod and connecting rod cap (2). The number should match the cylinder number.
3. Remove bolts (1) and connecting rod cap (2).



4. Remove the lower half of connecting rod bearing (4) from connecting rod cap (2).
5. Push the piston and the connecting rod away from the crankshaft. Remove the upper half of connecting rod bearing (4) from connecting rod (3).
6. Remove the piston and connecting rod (3) from the cylinder block.

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i02232839

Pistons and Connecting Rods - Disassemble

SMCS - 1225-015

Disassembly Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	4C-3601	Piston Ring Expander	1
B	1P-1861	Retaining Ring Pliers	1

Start By:

- a. Remove the pistons and the connecting rods. Refer to Disassembly and Assembly, "Pistons and Connecting Rods - Remove".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

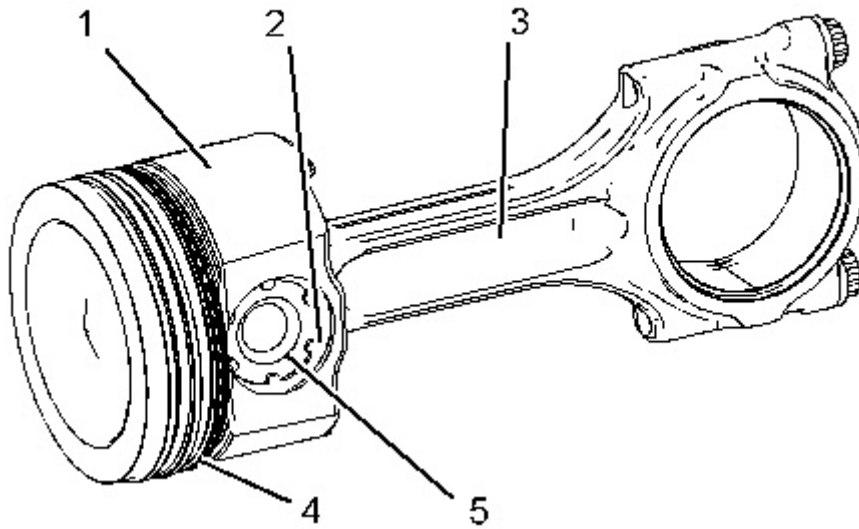


Illustration 1

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1. Use Tooling (B) to remove retaining ring (2).
2. Remove piston pin (5) and separate piston (1) from connecting rod (3).
3. Use Tooling (A) to remove piston rings (4).

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i02233056

Pistons and Connecting Rods - Assemble

SMCS - 1225-016

Assembly Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	4C-3601	Piston Ring Expander	1
B	1P-1861	Retaining Ring Pliers	1
C	5P-8639	Hydraulic Press (CONNECTING ROD BEARING)	1
	8F-0024	Hose As	1
	1P-2375	Quick Connect Coupler	1
	1P-2376	Quick Connect Coupler	1
	4C-9751	Spacer	1
	4C-9749	Bushing Adapter	1
	4C-9750	Bushing Adapter	1
	9U-6600	Hand Hydraulic Pump	1

Note: Prior to removal from the engine, the pistons and connecting rod assemblies were marked. The components must be reassembled together. The components must be installed in the original location in the engine. Do not interchange any of the components.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

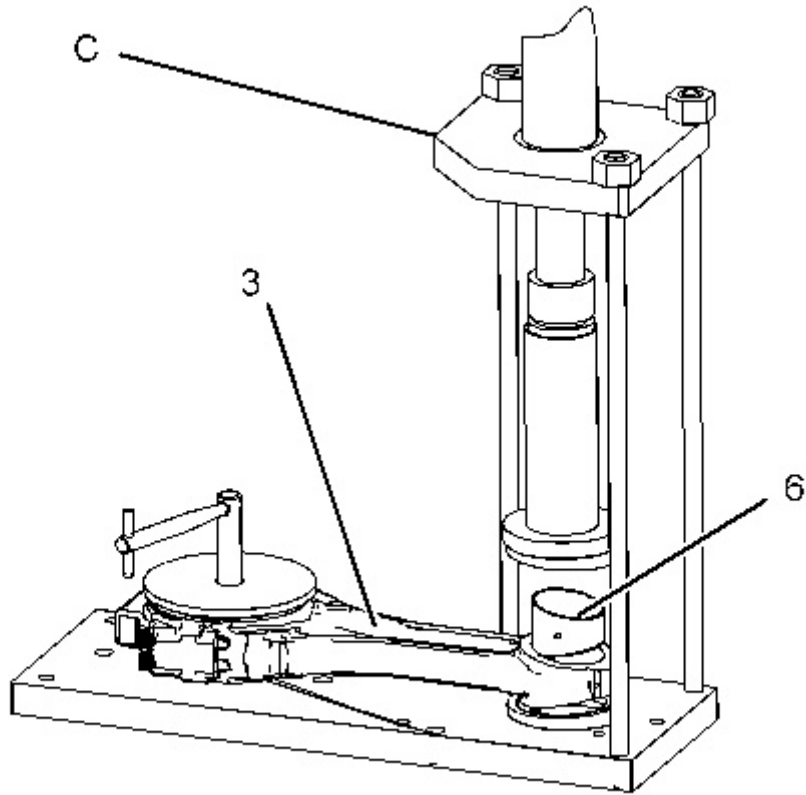
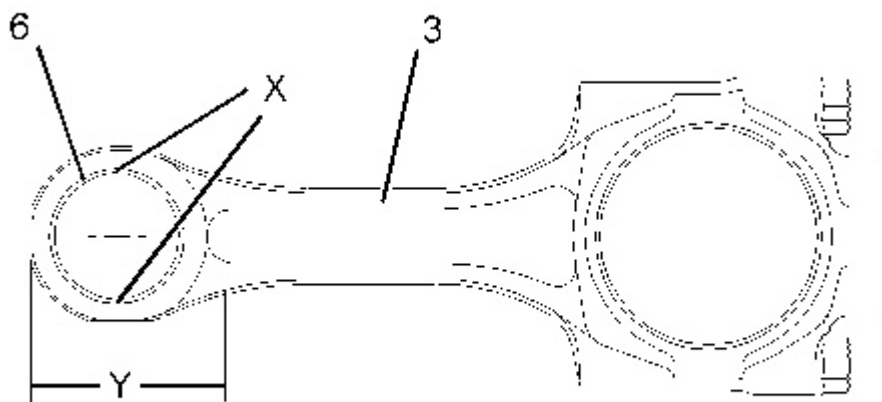


Illustration 1

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1. Use Tooling (C) to remove the old bearing and install the new bearing (6) at the same time. The adapter of Tooling (C) should make full contact with the surfaces of connecting rod (3).

Note: Orient the bearing joint within 12 ± 5 degrees of either Location (X).

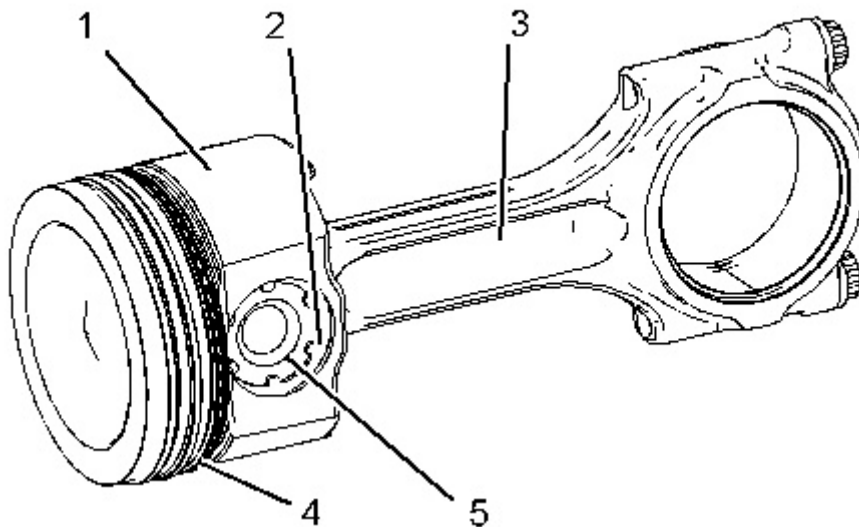
NOTICE

The connecting rod must be heated for the installation of the piston pin bearing. Do not use a torch.

- a. Raise the temperature of connecting rod (3) along Length (Y).

(Y) Maximum Length for heating the connecting rod ... 75 ± 5 mm (3.0 ± 0.2 inch)

- b. Allow the connecting rod and the bearing to cool to room temperature.



2. Use the following procedure to install piston rings (4).
 - a. Position the spring for the oil control ring in the oil ring groove in the piston body assembly.
 - b. Position the oil control ring over the spring. Position the oil control ring so that the gap is 180 degrees from the joint in the spring. Use Tooling (A) to install the oil control ring on the piston.
 - c. Use Tooling (A) to install the intermediate piston ring with the side that has the identification "UP-2" toward the top of the piston.

- d. Use Tooling (A) to install the top piston ring with the side that has the identification “UP-1” toward the top of the piston.
 - e. Position piston rings (4) so the gaps are 120 degrees from each other.
3. Check the clearance between the ends of piston rings (4). Refer to Specifications, "Piston And Rings".
 4. Position piston (1) on connecting rod (3). Apply clean engine oil to piston pin (5) and install the piston pin. Use Tooling (B) to install retaining ring (2). Make sure that the retaining rings are fully seated in the grooves of the piston assembly.

End By:

- a. Install the pistons and the connecting rods. Refer to Disassembly and Assembly, "Pistons and Connecting Rods - Install".

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i04805646

Pistons and Connecting Rods - Install

SMCS - 1225-012

Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	173-5529	Piston Ring Compressor	1
B	4C-5593	Anti-Seize Compound	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Apply clean engine oil to the pistons, the piston rings, and the cylinder bore.
-

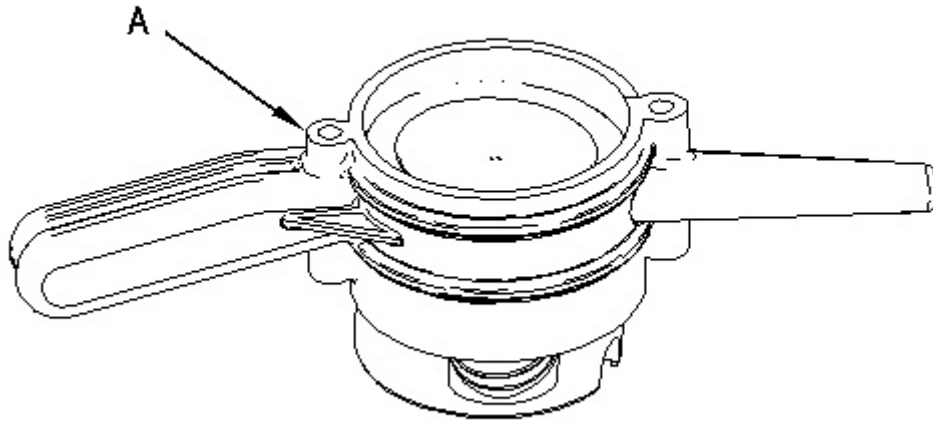


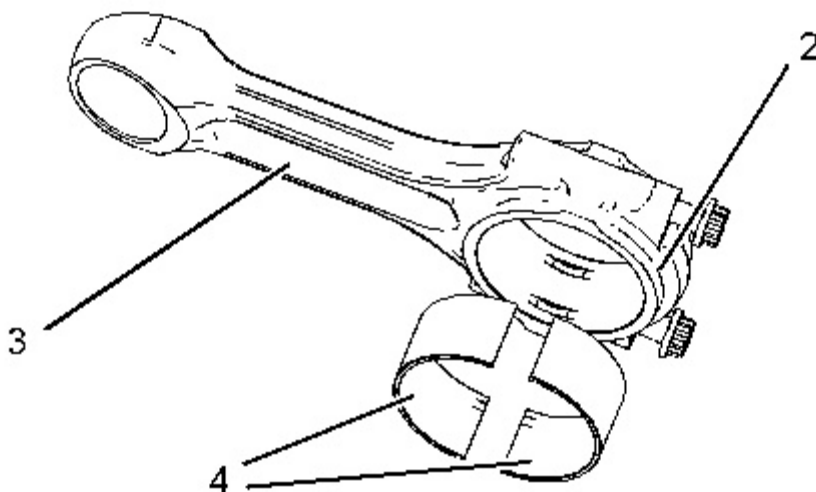
Illustration 1

g00954373

2. Position the piston rings so that the end gaps are located 120 degrees from each other. Install Tooling (A) in order to compress the piston rings.

Note: Install the piston and connecting rod so that the forging number on the connecting rod points toward the flywheel end of the engine.

3. With the number one crankshaft throw at the bottom center, install the piston and connecting rod in the engine. Ensure that the proper piston and connecting rod are in the corresponding cylinder with the bearing retainer notch toward the right side of the engine.
4. Line up the piston and the connecting rod with the crankshaft. Use a soft faced hammer and tap the piston into the cylinder bore until Tooling (A) comes off the piston.



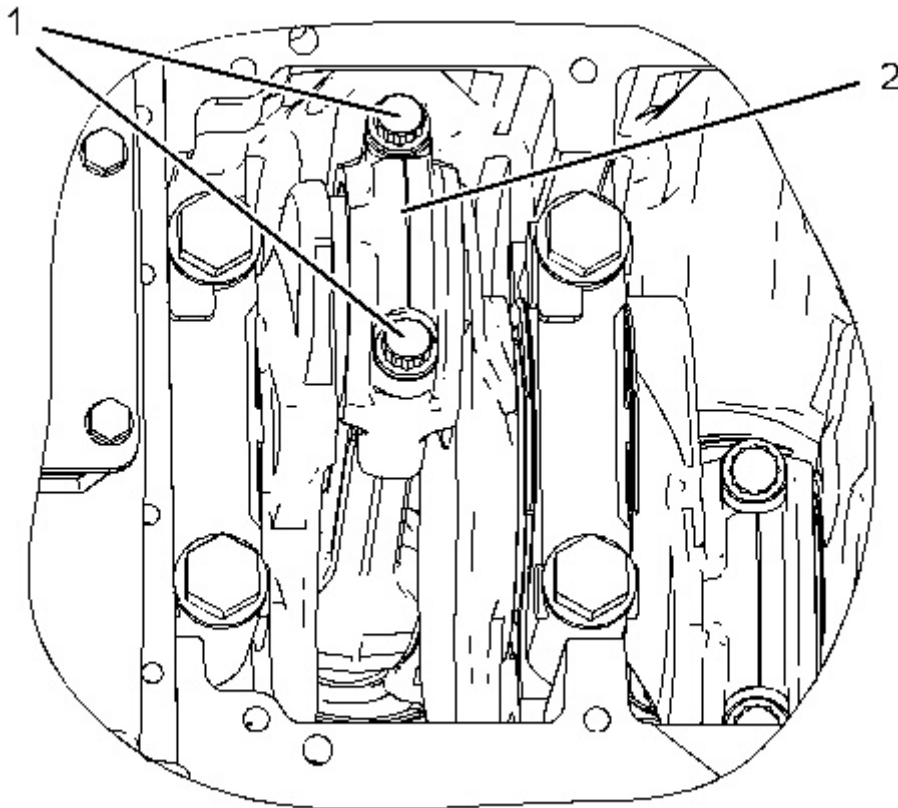


Illustration 3

g01126088

5. Before connecting rod (3) comes in contact with the crankshaft, install the upper half of connecting rod bearing (4) . Ensure that the bearing tab engages with the slot in connecting rod (3) .
6. Apply clean engine oil to the surface of the upper half of connecting rod bearing (4) . Use a soft faced hammer in order to tap the piston into the cylinder bore while you guide connecting rod (3) onto the crankshaft.
7. Place the lower half of connecting rod bearing (4) in corresponding connecting rod cap (2) . Ensure that the bearing tab engages with the groove in connecting rod cap (2) .
8. Apply clean engine oil to the surface of the lower half of connecting rod bearing (4) . Install connecting rod bearing cap (2) on connecting rod (3) . Ensure that the number on connecting rod cap (2) matches the number on connecting rod (3) . Ensure that the numbers are on the same side.
9. Lubricate the new connecting rod bolts with Tooling (B) .
10. Install new bolts (1) . Tighten bolts (1) to a torque of $70 \pm 5 \text{ N}\cdot\text{m}$ ($52 \pm 4 \text{ lb ft}$).

Note: Refer to Truck Engine News, SEBD6775, "New Fractured Connecting Rod Has Been Released " for the proper torque procedure on Reman Connecting Rods.

11. Place an index mark on each bolt. Tighten each bolt (1) for an additional 120 ± 5 degrees (1/3 turn).

End By:

- a. Install the piston cooling jets. Refer to the Disassembly and Assembly Manual, "Piston Cooling Jets - Remove and Install".
- b. Install the engine oil pump. Refer to the Disassembly and Assembly Manual, "Engine Oil Pump - Install".
- c. Install the cylinder head. Refer to the Disassembly and Assembly Manual, "Cylinder Head - Install".

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Publication Date -01/06/2014

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i02233237

Connecting Rod Bearings - Remove

SMCS - 1219-011

Removal Procedure

Start By:

- A. Remove the engine oil pump. Refer to Disassembly and Assembly, "Engine Oil Pump - Remove".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

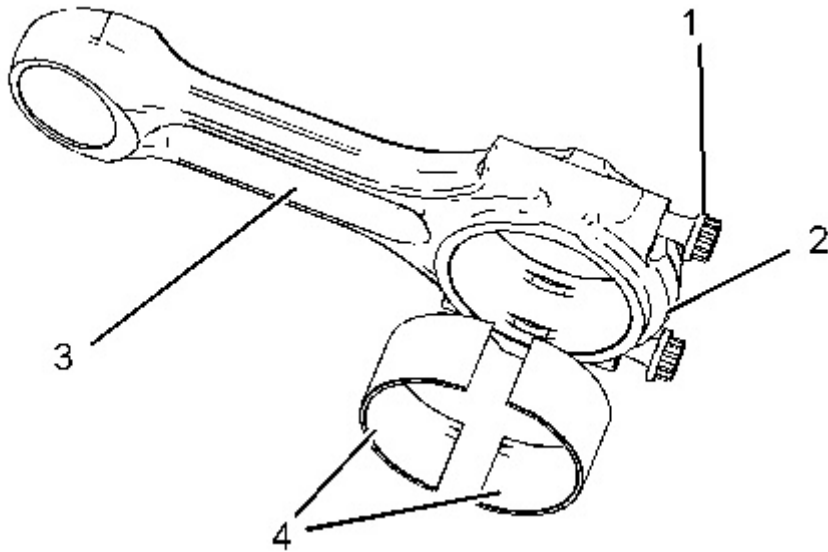


Illustration 1

g01126410

1. Turn the crankshaft until the connecting rod bearing caps are accessible.
2. Place an identification mark on connecting rod (3) and connecting rod bearing cap (2). The number should match the cylinder number.
3. Remove bolts (1) and connecting rod bearing cap (2) from connecting rod (3). Remove the lower half of connecting rod bearing (4) from connecting rod bearing cap (2) .
4. Push the connecting rod away from the crankshaft. Remove the upper half of connecting rod bearing (4) from connecting rod (3) .

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i03744497

Connecting Rod Bearings - Install

SMCS - 1219-012

Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	4C-5593	Anti-Seize Compound	-

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

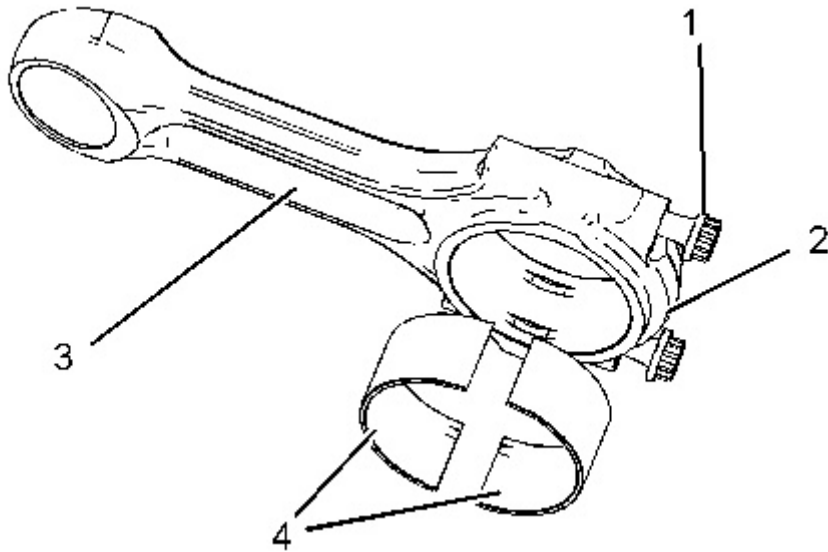


Illustration 1

g01126410

Note: Install the connecting rod bearings dry when clearance checks are performed. Refer to Disassembly and Assembly, "Bearing Clearance - Check". Apply clean engine oil on the connecting rod bearings for final assembly.

1. Install a new lower half of connecting rod bearing (4) in connecting rod bearing cap (2) .
2. Install a new upper half of connecting rod bearing (4) in connecting rod (3) .
3. Pull connecting rod (3) onto the crankshaft.
4. Lubricate the new connecting rod bolts with Tooling (A) .
5. Install connecting rod bearing cap (2) and bolts (1) . Ensure that the number on the side of connecting rod bearing cap (2) is on the same side as the number on connecting rod (3) .
6. Tighten bolts (1) to a torque of $70 \pm 5 \text{ N}\cdot\text{m}$ ($52 \pm 4 \text{ lb ft}$).
7. Place an index mark on each bolt. Tighten each bolt (1) for an additional 120 ± 5 degrees ($1/3$ turn).

End By: Install the engine oil pump. Refer to Disassembly and Assembly, "Engine Oil Pump - Install".

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i02304516

Crankshaft Main Bearings - Remove

SMCS - 1203-011

Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	2P-5518	Main Bearing Tool	1

Start By:

- a. Remove the engine oil pump. Refer to Disassembly and Assembly, "Engine Oil Pump - Remove".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

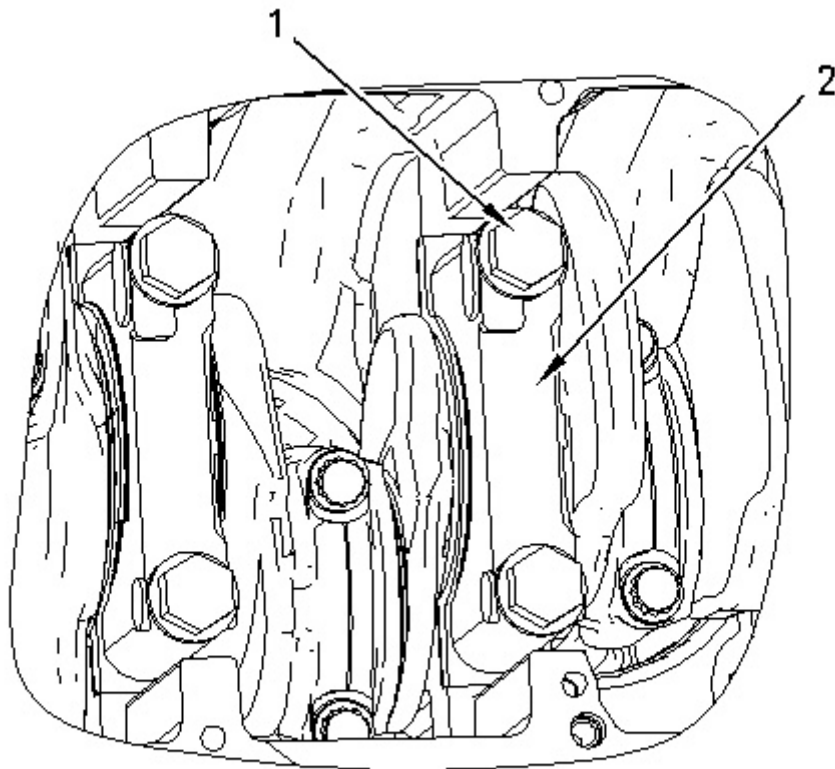


Illustration 1

g00988316

1. Remove bolts (1) that hold crankshaft main bearing cap (2). Remove crankshaft main bearing cap (2).
 2. Remove the lower half of the crankshaft main bearing from crankshaft main bearing cap (2).
-



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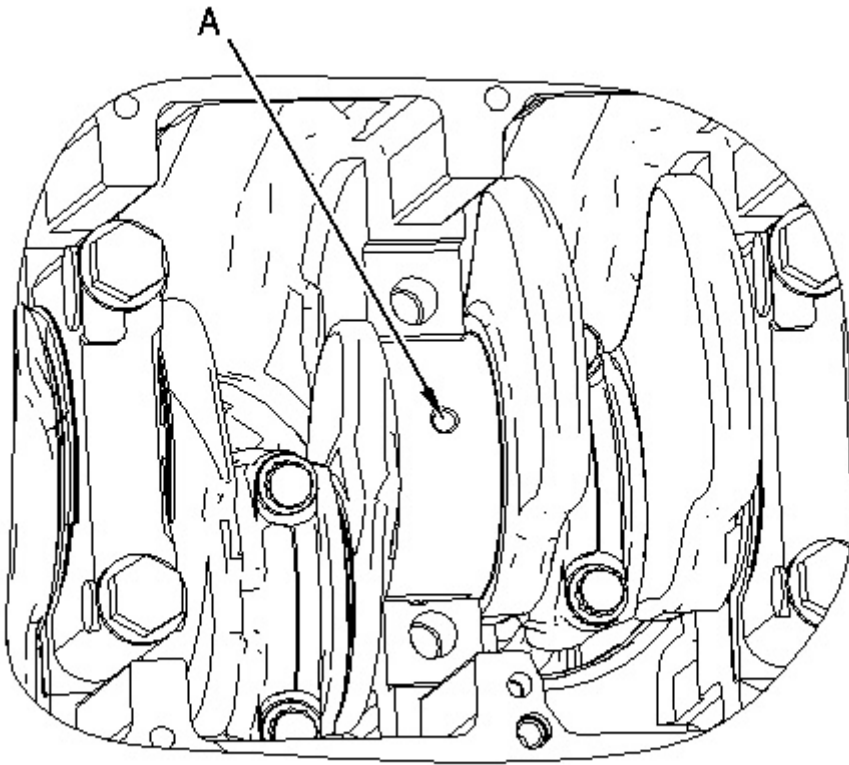


Illustration 2

g00988318

NOTICE

If the crankshaft is turned in the wrong direction, the tab of the crankshaft main bearing will be pushed between the crankshaft and the cylinder block. This can cause damage to either or both the crankshaft and the cylinder block.

3. Use the following steps in order to remove the upper half of crankshaft main bearings:
 - a. Turn the crankshaft until Tooling (A) can be installed in the crankshaft journal. Install Tooling (A).
 - b. Turn the crankshaft in order to remove the upper half of the crankshaft main bearing. Tooling (A) must first contact the crankshaft main bearing opposite the tab end of the crankshaft main bearing. In order to get the tab out first, the crankshaft must be turned in the correct direction.
 - c. Check the condition of the crankshaft main bearings. Refer to the Guideline For Reusable Parts, SEBF8009, "Main and Connecting Rod Bearings" or refer to the Guideline For Reusable Parts, SEBV0544, "Engine Bearings and Crankshafts".
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