



Service Repair Manual

Models

330B and 330B L Excavator

[Previous Screen](#)

Product: EXCAVATOR

Model: 330B L EXCAVATOR 5LS

Configuration: 330B & 330B L Excavators 5LS00001-UP (MACHINE) POWERED BY 3306 Engine

Disassembly and Assembly 3304B and 3306B Engines for Caterpillar Built Machines

Media Number -SEN95598-09

Publication Date -01/01/2013

Date Updated -25/01/2013

i00987670

Connecting Rod Bearings - Install

SMCS - 1219-012

Installation Procedure

Table 1

Tool	Part Number	Part Description	Qty
A	-	Plastigage	-

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: Install the connecting rod bearings dry when the clearance checks are made. Put clean engine oil on the connecting rod bearings for final assembly.

1. Install the upper half of the connecting rod bearing in the connecting rod.
2. Install the lower half of the connecting rod bearing in the connecting rod.

Note: Align the tabs on the back of the connecting rod bearings with the tab grooves in the connecting rod.

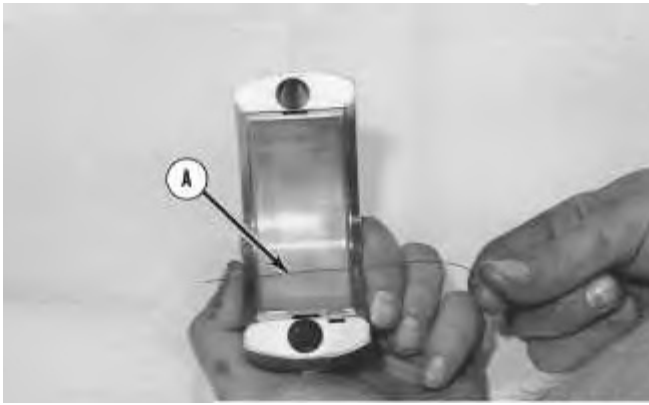


Illustration 1

g00487493

3. In order to check the connecting rod bearing clearance, put Tool (A) on the connecting rod bearing, as shown.
4. Put clean engine oil (SAE 30) on the connecting rod bolts.

NOTICE

When the connecting rod caps are installed, ensure that the identification marks are aligned.

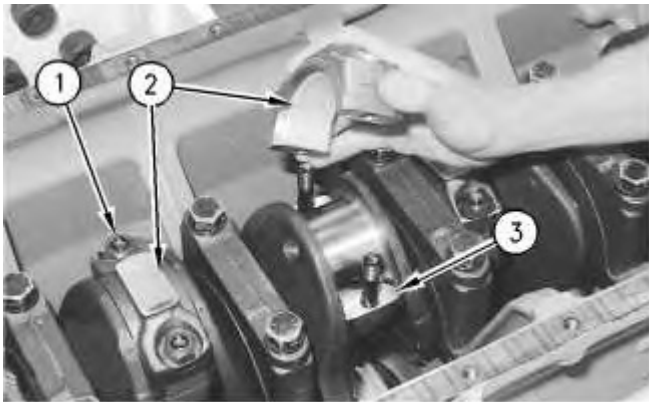


Illustration 2

g00487412

Note: Do not turn the crankshaft when Tool (A) is positioned.

5. Ensure that connecting rod (3) is in position on the crankshaft. Install connecting rod cap (2) and connecting rod nuts (1) on connecting rod (3) .
-

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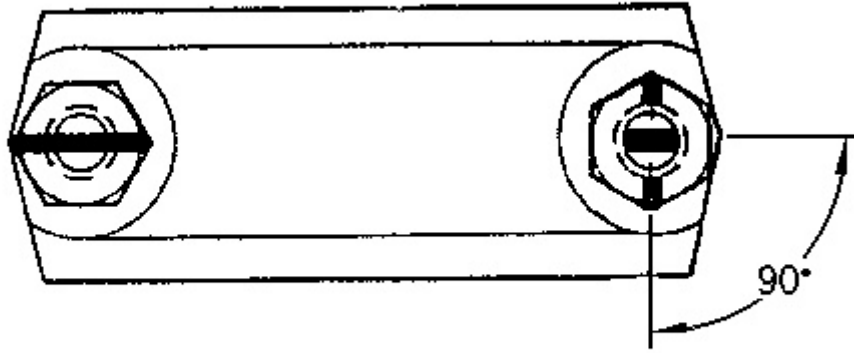


Illustration 3

g00287852

6. Tighten the connecting rod nuts to a torque of 40 ± 4 N·m (30 ± 3 lb ft). Mark the position of the nuts. Tighten each nut for an additional 90 degrees ($1/4$ turn).
7. Remove the connecting rod cap. Measure Tool (A) on the bearing surface before Tool (A) is removed. The clearance between the connecting rod bearing and a new crankshaft should be 0.076 to 0.168 mm (.0025 to .0066 inch). The clearance between the connecting rod bearing and a used crankshaft should be 0.25 mm (0.01 inch).
8. Install connecting rod cap (2) and connecting rod nuts (1) on connecting rod (3). Repeat Step 6 in order to tighten the nuts.
9. Repeat Steps 1 through 8 for the remaining connecting rod bearings.

End By:

- a. Install the oil pan plate. Refer to Disassembly and Assembly, "Engine Oil Pan Plate - Remove and Install".
- b. Install the engine oil pump. Refer to Disassembly and Assembly, "Engine Oil Pump - Install".

[Previous Screen](#)

Product: EXCAVATOR

Model: 330B L EXCAVATOR 5LS

Configuration: 330B & 330B L Excavators 5LS00001-UP (MACHINE) POWERED BY 3306 Engine

Disassembly and Assembly 3304B and 3306B Engines for Caterpillar Built Machines

Media Number -SEN5598-09

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Date Updated -25/01/2013

i00990466

Crankshaft Main Bearings - Remove

SMCS - 1203-011

Removal Procedure

Table 1

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

Start By:

- A. Remove the engine oil pump. Refer to Disassembly and Assembly, "Engine Oil Pump - Remove".
- B. Remove the oil pan plate. Refer to Disassembly and Assembly, "Engine Oil Pan Plate - Remove and Install".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

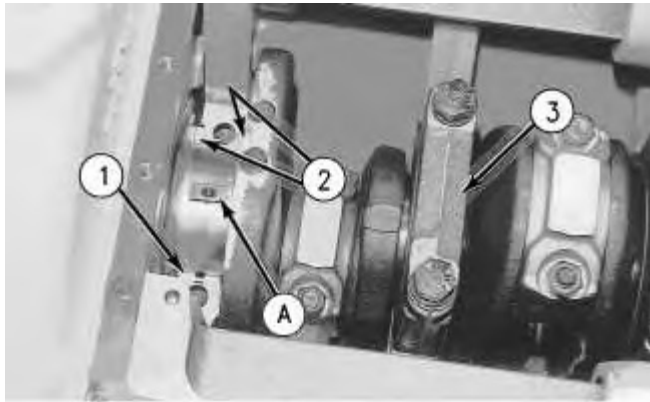


Illustration 1

g00479056

1. Remove No. 1, 3, 5 and 7 main bearing caps (3). Remove the lower halves of the main bearings from the main bearing caps.

Note: If the crankshaft is turned in the wrong direction, the tab on the bearing will be pushed between the crankshaft and the bearing area in the cylinder block. This can result in damage to the cylinder block and/or the crankshaft.

2. Install Tool (A) in the oil hole in the crankshaft journal. Turn the crankshaft in order to remove the upper halves of main bearings (1) .
3. Remove crankshaft thrust plates (2) from the crankshaft.
4. Install No. 1, 3, 5, and 7 main bearing caps (3). Refer to Disassembly and Assembly, "Crankshaft Main Bearings - Install".
5. Remove the remaining main bearing caps (No. 2, 4 and 6) (3). Remove the lower halves of the main bearings from the main bearing caps.

Note: If the crankshaft is turned in the wrong direction, the tab on the bearing will be pushed between the crankshaft and the bearing area in the cylinder block. This can result in damage to the cylinder block and/or the crankshaft.

6. Install Tool (A) in the hole in the crankshaft journal. Turn the crankshaft in order to remove the upper halves of main bearings (1) .

[Previous Screen](#)

Product: EXCAVATOR

Model: 330B L EXCAVATOR 5LS

Configuration: 330B & 330B L Excavators 5LS00001-UP (MACHINE) POWERED BY 3306 Engine

Disassembly and Assembly 3304B and 3306B Engines for Caterpillar Built Machines

Media Number -SEN5598-09

Publication Date -01/01/2013

Date Updated -25/01/2013

i03706647

Crankshaft Main Bearings - Install

SMCS - 1203-012

Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	2P-5518	Bearing Tool	1
B	-	Plastigage	-
C	8T-5096	Dial Indicator Group	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: Install the main bearings dry when the clearance checks are made. Put clean engine oil on the main bearings for final assembly.

Note: Ensure that the upper halves and the lower halves of the main bearings are installed so that the bearing tabs fit into the notch in the cylinder block and in the main bearing caps.

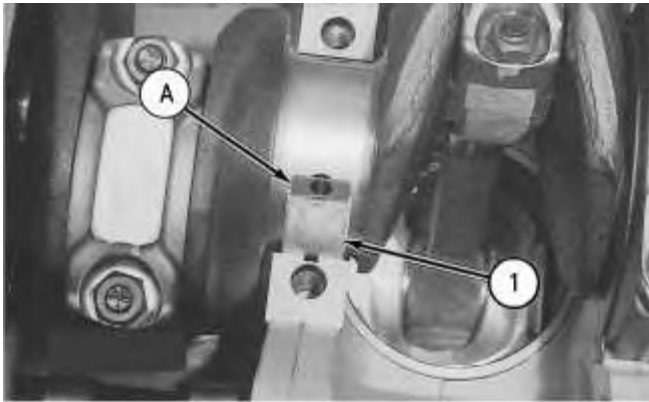


Illustration 1

g00479169

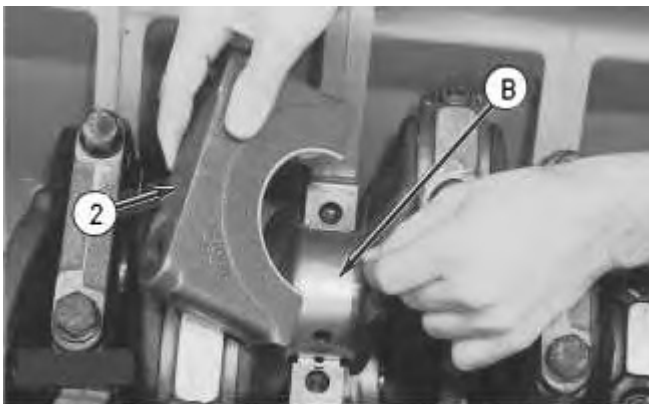


Illustration 2

g00479171

1. Use Tooling (A) and install the new upper halves of main bearings (1) in the cylinder block. Install new lower halves of main bearings (1) in main bearing caps (2) .

Note: When the bearing clearance is checked and the engine is in an upright position or on the engine's side, the crankshaft must be supported against the upper halves of the main bearings. This is done in order to get a correct measurement with Tooling (B) . If the crankshaft is not supported, the weight of the crankshaft will cause an incorrect reading. If the engine is not in an upright position or on the engine's side, it is not necessary to support the crankshaft. Do not rotate the crankshaft when Tooling (B) is positioned.

Note: Refer to Guideline For Reusable Parts, SEBV0544, "Engine Bearings and Crankshafts" for complete details concerning the measurement of bearing clearances.

2. Check the main bearing clearance with Tooling (B) , as follows:
 - a. Put a piece of Tooling (B) on the crankshaft journals, as shown.

Note: Make sure that the part number on the main bearing cap is facing toward the front of the engine. Also, make sure that the number on the main bearing cap matches the number on the cylinder block on the left side of each main bearing cap.

- b. Put main bearing caps (2) in position in the engine. Put **4C-5593** Anti-Seize Compound on the bolt threads and the face of the washers. Install the bolts and tighten the bolts to torque of 40 ± 4 N·m (30 ± 3 lb ft).
- c. Put a mark on each bolt and main bearing cap. Tighten the bolts for an additional 90 degrees (1/4 turn).
- d. Remove the main bearing caps and measure Tooling (B) in order to find the bearing clearance. The main bearing clearance for new bearings must be 0.076 to 0.165 mm (0.0030 to 0.0065 inch). The maximum permissible clearance with used bearings is 0.25 mm (0.010 inch).

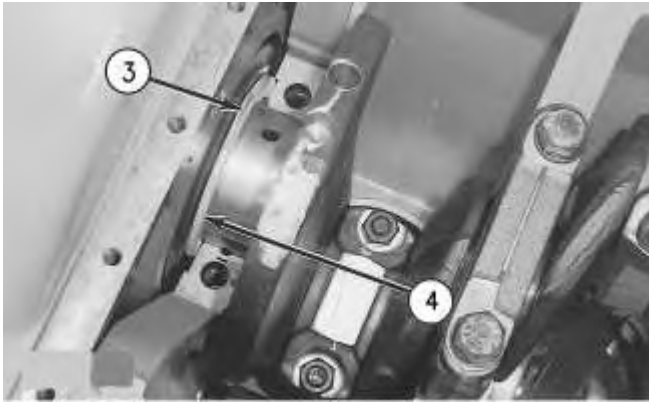


Illustration 3

g00479203

3. Put clean oil on thrust plate (4) and install a new thrust plate for the rear main bearing. Install the new thrust plate so that the mark that is identified as the "BLOCK SIDE" faces toward the cylinder block and toward the tabs on the thrust plates in the machined area on the cylinder block. Tabs (3) on thrust plate (4) will not allow the thrust plate to be installed backward.

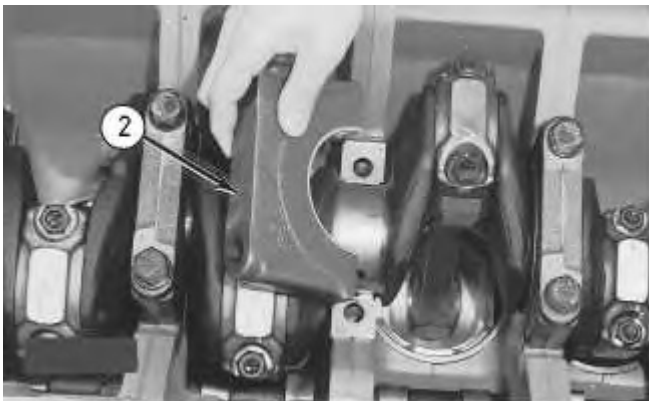


Illustration 4

g00479205

4. Install main bearing caps (2) . Use the same procedure that is described in Step 2.b and Step 2.c.
5. Remove the remainder of the main bearing caps. Perform Steps 1, 2 and 4 again.

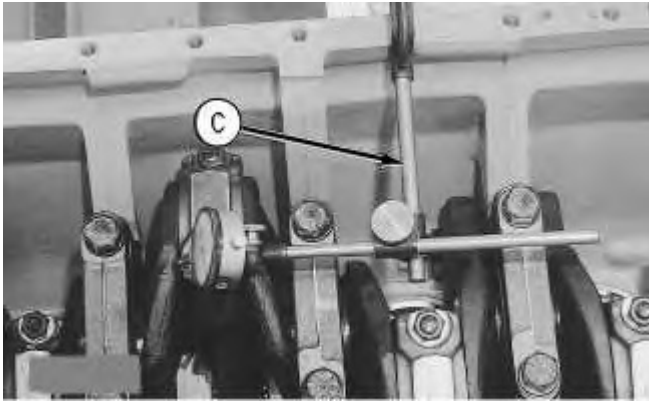


Illustration 5

g00479212

6. Use Tooling (C) in order to check the crankshaft end play. The end play is controlled by the thrust plates on the rear main bearing. End play with new bearings must be 0.122 to 0.579 mm (0.0048 to 0.0228 inch).

End By:

- a. Install the oil pan plate. Refer to Disassembly and Assembly, "Engine Oil Pan Plate - remove and install".
- b. Install the engine oil pump. Refer to Disassembly and Assembly, "Engine Oil Pump - Install".

[Previous Screen](#)

Product: EXCAVATOR

Model: 330B L EXCAVATOR 5LS

Configuration: 330B & 330B L Excavators 5LS00001-UP (MACHINE) POWERED BY 3306 Engine

Disassembly and Assembly 3304B and 3306B Engines for Caterpillar Built Machines

Media Number -SEN5598-09

Publication Date -01/01/2013

Date Updated -25/01/2013

i01112752

Crankshaft - Remove

SMCS - 1202-011

Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	138-7575	Link Bracket	2
B	8B-7551	Bearing Puller	1
	8B-7549	Puller Leg	2
	3H-0465	Push-Puller Plate	4
	1B-4207	Full Nut	2
	8B-7560	Step Plate	1
	1P-0820	Hydraulic Puller	1
	9U-6600	Hand Hydraulic Pump	1

Start By:

- A. Remove the front housing. Refer to Disassembly and Assembly, "Front Housing - Remove".
 - B. Remove the flywheel housing. Refer to Disassembly and Assembly, "Flywheel Housing - Remove and Install".
 - C. Remove the engine oil pump. Refer to Disassembly and Assembly, "Engine Oil Pump - Remove".
 - D. Remove the oil pan plate. Refer to Disassembly and Assembly, "Engine Oil Pan Plate - Remove and Install".
-

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

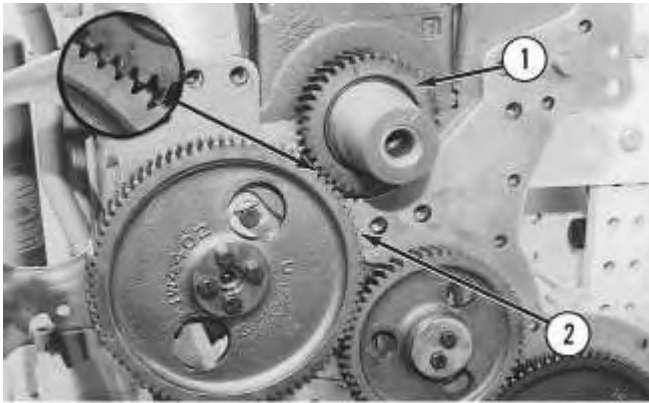


Illustration 1

g00503163

1. Turn the crankshaft until timing mark "C" on crankshaft gear (1) is aligned with timing mark "C" on camshaft gear (2) .

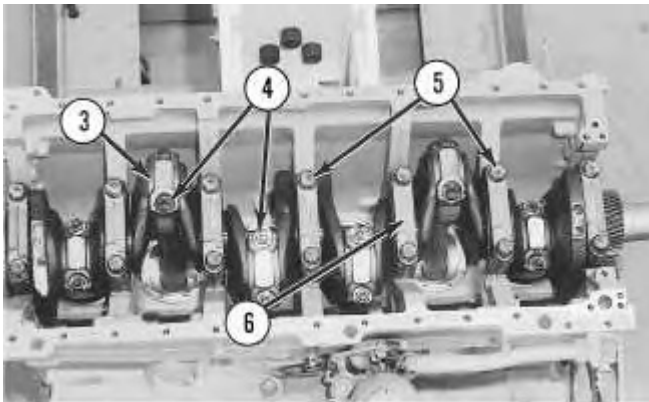


Illustration 2

g00503180

2. Remove connecting rod nuts (4) and connecting rod caps (3) from the connecting rods.
-

NOTICE

Damage may occur to the fuel injection nozzle or the piston if the piston and connecting rod are pushed too far down in the cylinder liners.

Note: The piston will be difficult to push down into the cylinder when the inlet valves and exhaust valves are closed.

3. Push down on the pistons that are not at the top center position in order to clear the crankshaft.
4. Remove main bearing cap bolts (5) and main bearing caps (6) from the cylinder block.

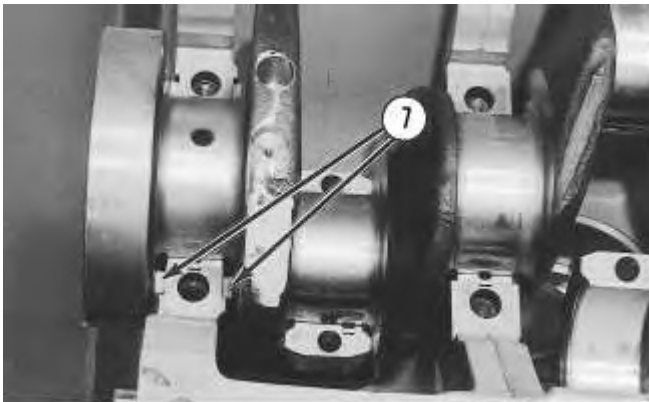


Illustration 3

g00503320

5. Remove thrust plates (7) from the rear main bearing.

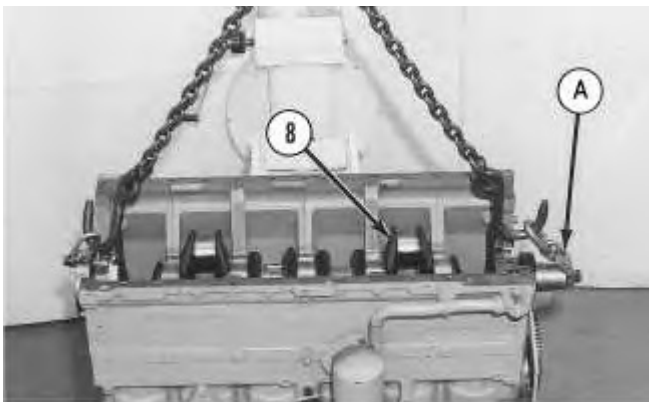


Illustration 4

g00503353

6. Install Tool (A) and a suitable lifting device on crankshaft (8), as shown. Lift the crankshaft straight up from the cylinder block. The weight of the 3304B crankshaft is 65 kg (143 lb). The weight of the 3306B crankshaft is 95 Kg (210 lb).

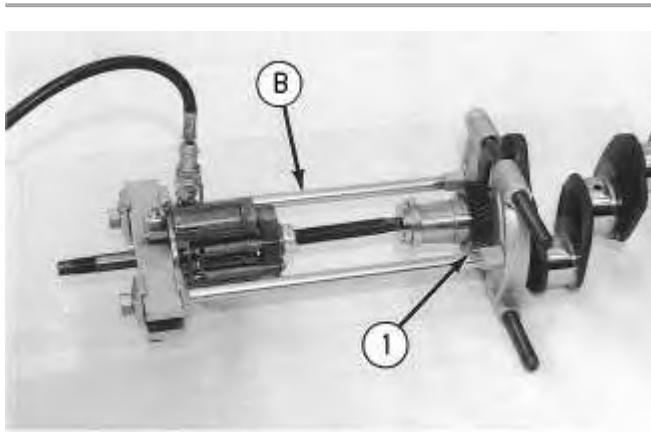


Illustration 5

g00503384

7. Use Tool (B) in order to remove the crankshaft gear and the oil seal wear sleeve from the crankshaft.

Note: Put identification marks on the bearings and on the bearing caps prior to removal.

8. Remove the main bearings from the main bearing caps and from the cylinder block.
Remove the connecting rod bearings from the connecting rods and from the connecting rod caps.

[Previous Screen](#)

Product: EXCAVATOR

Model: 330B L EXCAVATOR 5LS

Configuration: 330B & 330B L Excavators 5LS00001-UP (MACHINE) POWERED BY 3306 Engine

Disassembly and Assembly 3304B and 3306B Engines for Caterpillar Built Machines

Media Number -SEN5598-09

Publication Date -01/01/2013

Date Updated -25/01/2013

i03706543

Crankshaft - Install

SMCS - 1202-012

Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	138-7575	Link Bracket	2
B	-	Plastigage	-
C	8T-5096	Dial Indicator Group	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: Install the main bearings dry when the clearance checks are made. Put clean engine oil on the main bearings for final assembly.

Note: Ensure that the upper halves and the lower halves of the main bearings are installed so that the bearing tabs fit into the bearing tab grooves in the cylinder block and in the main bearing caps.

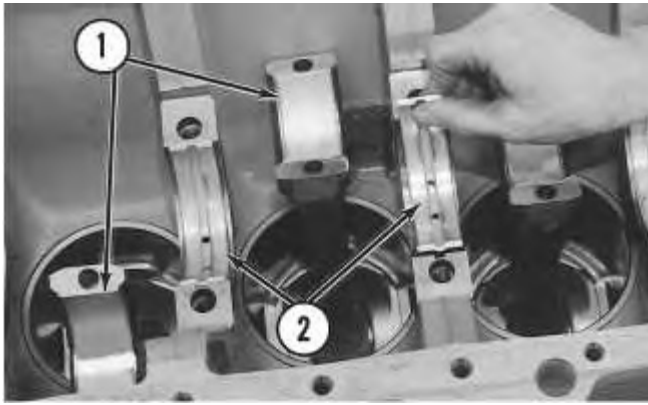


Illustration 1

g00503582

1. If the bearings were removed from the engine, clean the bearing surfaces in the cylinder block and the main bearing caps. Install the upper halves of connecting rod bearings (1) and main bearings (2) .

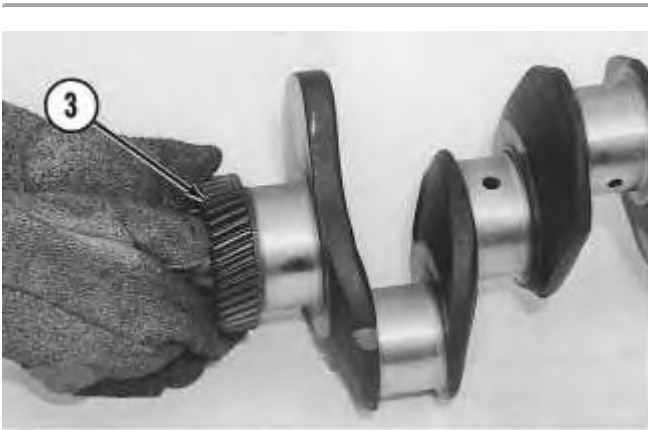


Illustration 2

g00503642

 **WARNING**

Hot oil and hot components can cause personal injury. Do not allow hot oil or hot components to contact the skin.

2. Heat crankshaft gear (3) to a maximum temperature of 315 °C (600 °F). Install crankshaft gear (3) on the crankshaft.
-



Illustration 3

g00503668

3. Install Tooling (A) on the ends of the crankshaft and use a hoist to lower the crankshaft into position above the cylinder block. Align the connecting rods with the crankshaft. Align the "C" mark on crankshaft gear (3) with the "C" mark on camshaft gear (4) . Lower the crankshaft into position in the cylinder block.

Note: When the bearing clearance is checked and the engine is in an upright position or on the engine's side, the crankshaft must be supported against the upper halves of the main bearings. This is done in order to get a correct measurement with Tooling (B) . If the crankshaft is not supported, the weight of the crankshaft will cause an incorrect reading. If the engine is not in an upright position or on the engine's side, it is not necessary to support the crankshaft. Do not rotate the crankshaft when Tooling (B) is positioned.

Note: Refer to Guideline For Reusable Parts, SEBV0544, "Engine Bearings and Crankshafts" for complete details concerning the measurement of bearing clearances.

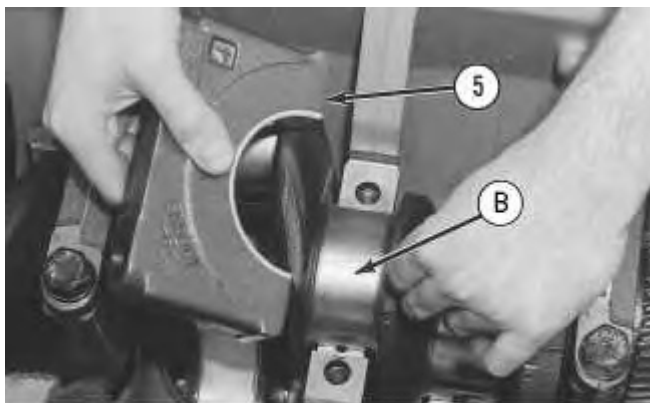


Illustration 4

g00503884

4. Check the main bearing clearance with Tooling (B) , as follows:
 - a. Put a piece of Tooling (B) on the crankshaft journal, as shown.

Note: Make sure that the part number on the main bearing cap is facing toward the front of the engine. Also, make sure that the number on the main bearing cap matches the number on the cylinder block on the left side of each main bearing cap.

- b. Put the main bearing caps in position in the engine. Put **4C-5593** Anti-Seize Compound on the bolt threads and the face of the washers. Install the bolts and tighten the bolts to a torque of 40 ± 4 N·m (30 ± 3 lb ft).
- c. Put a mark on each bolt and main bearing cap. Tighten the bolts for an additional 90 degrees (1/4 turn).
- d. Remove the main bearing caps and measure Tooling (B) in order to find the bearing clearance. The main bearing clearance for new bearings must be 0.076 to 0.165 mm (0.0030 to 0.0065 inch). The maximum permissible clearance with used bearings is 0.25 mm (0.010 inch).

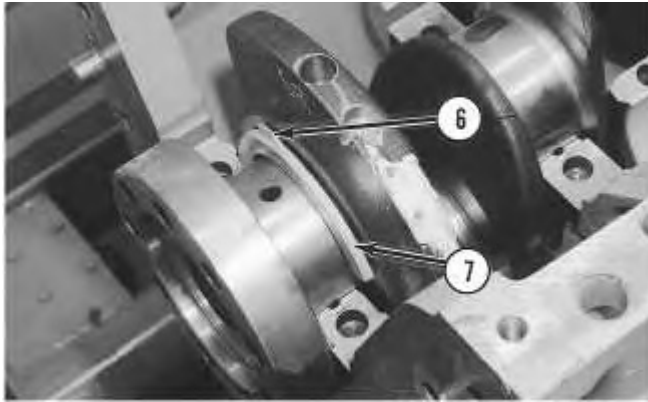


Illustration 5

g00503913

5. Put clean engine oil on thrust plate (7) for the rear main bearing. Install the new thrust plate so that the mark that is identified as the "BLOCK SIDE" faces toward the cylinder block and toward the tabs on the thrust plates in the machined area on the cylinder block. Tabs (6) will not allow thrust plate (7) to be installed backward.

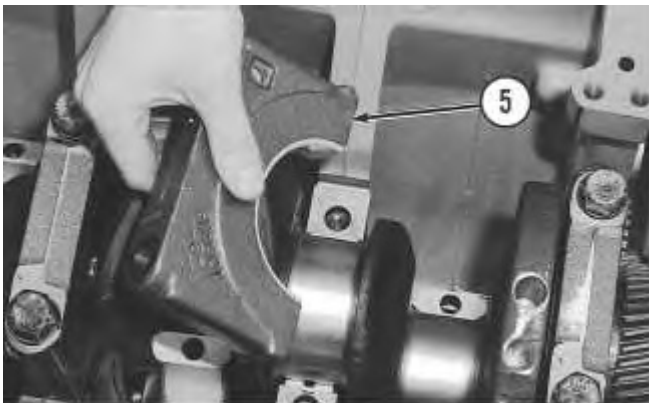


Illustration 6

g00504005

6. Install the remaining main bearing caps. Use the same procedure that is described in Step 4.b and Step 4.c.

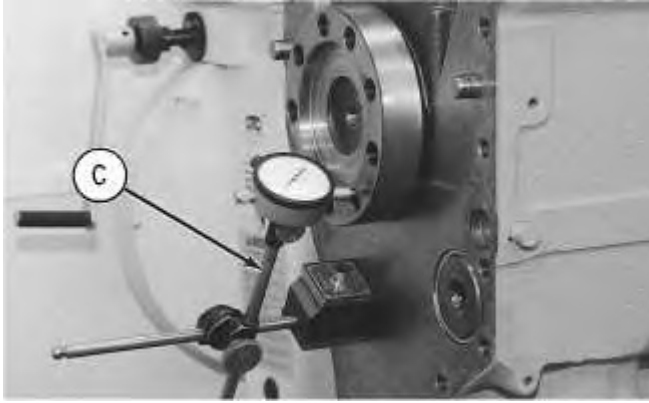


Illustration 7

g00504013

7. Check the crankshaft end play with Tooling (C) . The end play is controlled by the thrust plates on the rear main bearing. End play with new thrust plates must be 0.122 to 0.579 mm (0.0048 to 0.0228 inch).

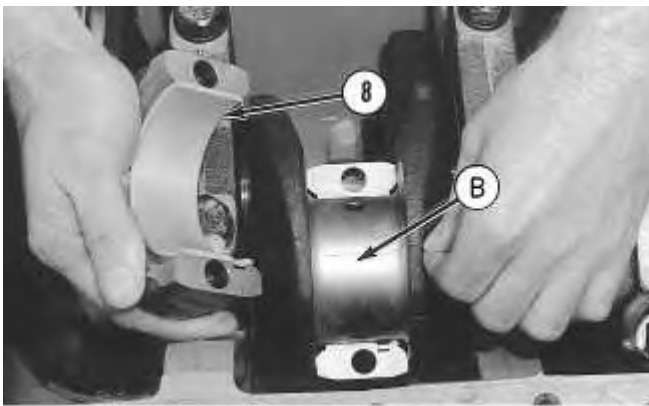


Illustration 8

g00504198

8. Pull the connecting rod into position against the crankshaft.
Note: Install the connecting rod bearings dry when the clearance checks are made. Put clean engine oil on the connecting rod bearings for final assembly.
9. Install the lower half of rod bearing (8) in the connecting rod cap. Align the tab in the connecting rod bearing with the tab in the connecting rod cap.
10. In order to check the connecting rod bearing clearance, put Tooling (B) in position on the crankshaft, as shown.

NOTICE

When the connecting rod caps are installed, ensure that the identification marks are aligned.

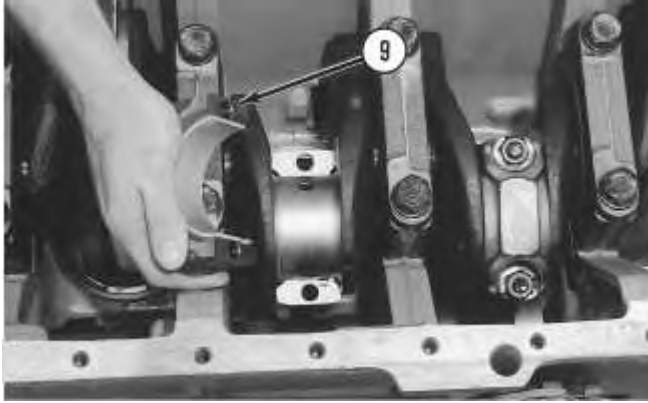


Illustration 9

g00504276

11. Make sure that the connecting rod is in position on the crankshaft. Install connecting rod cap (9) and the connecting rod nuts.
12. Tighten the connecting rod nuts to a torque of $40 \pm 4 \text{ N}\cdot\text{m}$ ($30 \pm 3 \text{ lb ft}$). Mark the position of the connecting rod nuts. Tighten each nut for an additional 90 degrees ($1/4$ turn).
13. Remove connecting rod cap (9) and measure the thickness of the Plastigage on the crankshaft. The connecting rod clearance must be 0.076 to 0.168 mm (0.0030 to 0.0066) for new bearings. The maximum clearance for used connecting rod bearings should be 0.25 mm (0.010 inch).
14. Install connecting rod cap (9) and tighten the nuts. Refer to Step 12 for the tightening procedure.
15. Repeat Steps 8 through 14 for the remaining connecting rod bearings.

End By:

- a. Install the oil pan plate. Refer to Disassembly and Assembly, "Engine Oil Pan Plate - Remove and Install".
- b. Install the engine oil pump. Refer to Disassembly and Assembly, "Engine Oil Pump - Install".
- c. Install the flywheel housing. Refer to Disassembly and Assembly, "Flywheel Housing - Remove and Install".
- d. Install the front housing. Refer to Disassembly and Assembly, "Front Housing - Install".

[Previous Screen](#)

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Model: 330B L EXCAVATOR 5LS

Configuration: 330B & 330B L Excavators 5LS00001-UP (MACHINE) POWERED BY 3306 Engine

Disassembly and Assembly 3304B and 3306B Engines for Caterpillar Built Machines

Media Number -SEN5598-09

Publication Date -01/01/2013

Date Updated -25/01/2013

i05977048

Bearing Clearance - Check

SMCS - 1203-535; 1219-535

Measurement Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	198-9142	Plastic Gauge (Green) 0.025 to 0.076 mm (0.001 to 0.003 inch)	1
	198-9143	Plastic Gauge (Red) 0.051 to 0.152 mm (0.002 to 0.006 inch)	1
	198-9144	Plastic Gauge (Blue) 0.102 to 0.229 mm (0.004 to 0.009 inch)	1
	198-9145	Plastic Gauge (Yellow) 0.230 to 0.510 mm (0.009 to 0.020 inch)	1

Note: Plastic gauge may not be necessary when the engine is in the chassis.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: Cat does not recommend the checking of the actual bearing clearances particularly on small engines. This is because of the possibility of obtaining inaccurate results and the possibility of damaging the bearing or the journal surfaces. Each Cat engine bearing is quality checked for specific wall thickness.

Note: The measurements should be within specifications and the correct bearings should be used. If the crankshaft journals and the bores for the block and the rods were measured during disassembly, no further checks are necessary. However, if the technician still wants to measure the bearing clearances, Tooling (A) is an acceptable method. Tooling (A) is less accurate on journals with small diameters if clearances are less than 0.10 mm (0.004 inch).

NOTICE

Lead wire, shim stock or a dial bore gauge can damage the bearing surfaces.

The technician must be very careful to use Tooling (A) correctly. The following points must be remembered:

- Ensure that the backs of the bearings and the bores are clean and dry.
- Ensure that the bearing locking tabs are properly seated in the tab grooves.
- The crankshaft must be free of oil at the contact points of Tooling (A).

1. Put a piece of Tooling (A) on the crown of the bearing that is in the cap.

Note: Do not allow Tooling (A) to extend over the edge of the bearing.

2. Use the correct torque-turn specifications in order to install the bearing cap. Do not use an impact wrench. Be careful not to dislodge the bearing when the cap is installed.

Note: Do not turn the crankshaft when Tooling (A) is installed.

3. Carefully remove the cap, but do not remove Tooling (A). Measure the width of Tooling (A) while Tooling (A) is in the bearing cap or on the crankshaft journal. Refer to Illustration 1.

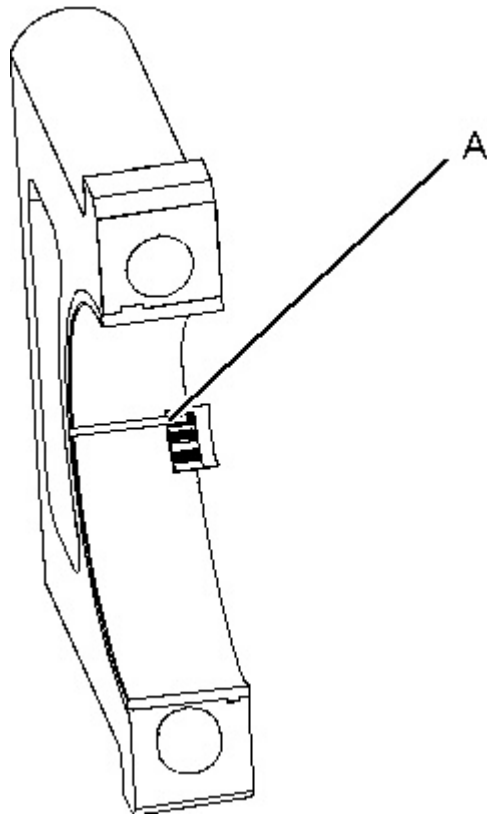


Illustration 1
Typical Example

g01152855

4. Remove all of Tooling (A) before you install the bearing cap.

Note: When Tooling (A) is used, the readings can sometimes be unclear. For example, all parts of Tooling (A) are not the same width. Measure the major width in order to ensure that the parts are within the specification range. Refer to Specifications Manual, "Connecting Rod Bearing Journal" and Specifications Manual, "Main Bearing Journal" for the correct clearances.



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Disassembly and Assembly 3304B and 3306B Engines for Caterpillar Built Machines

Media Number -SEN5598-09

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i02107209

Coolant Temperature Sensor - Remove and Install

SMCS - 1906-010

Removal Procedure

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, "Caterpillar Tools and Shop Products Guide" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

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