

Configuration: D5H & D5H LGP TRACTORS / POWERSHIFT / 3MD00001-UP (MACHINE) POWERED BY 3304 ENGINE

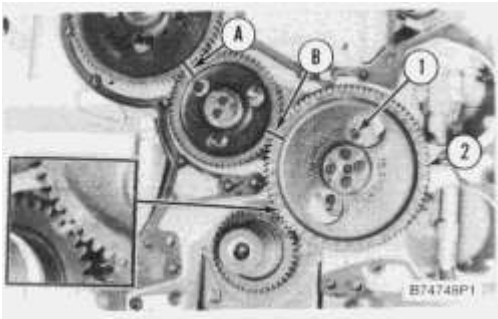
3304 MACHINE ENGINE FOR D4H SERIES III AND D5H SERIES II TRA

Date Updated -20/07/2010

Camshaft

Remove Camshaft

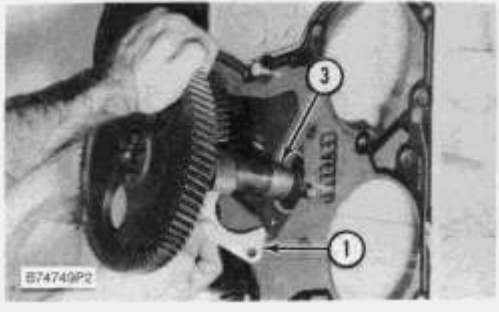
b. remove timing gear cover



- 4. If necessary, remove the bolts and gear from the camshaft.**

Install Camshaft

1. Put the camshaft drive gear in position on the end of the camshaft, and install the bolts that hold it. Tighten the bolts to a torque of **$55 \pm 7 \text{ N}\cdot\text{m}$ ($41 \pm 5 \text{ lb ft}$)**.



NOTICE

Do not cause damage to the lobes or bearings when the camshaft is installed.

2. Put **2P2506 Thread Lubricant** on the camshaft lobes and clean engine oil on the bearing journals. Install camshaft (3) in the cylinder block, and make an alignment of the "C" marks and the marks put on the gears during removal.

3. Install washer (1), the lock and bolts to hold the camshaft in position.

End By:

a. install valve lifters

b. install timing gear cover

Product: TRACK-TYPE TRACTOR

Model: D5H TRACK-TYPE TRACTOR 3MD

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Disassembly and Assembly

3304 MACHINE ENGINE FOR D4H SERIES III AND D5H SERIES II TRA

Media Number -SEN3253-01

Publication Date -01/09/1992

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SEN32530048

Camshaft Bearings

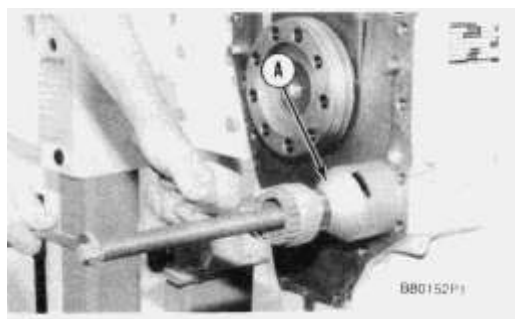
SMCS - 1211-011; 1211-012

Remove Camshaft Bearings

Tools Needed		A
8S2241	Camshaft Bearing Installation And Removal Group	1
8H684	Ratchet Wrench	1

Start By:

- a. remove flywheel housing
- b. remove oil pan plate
- c. remove camshaft

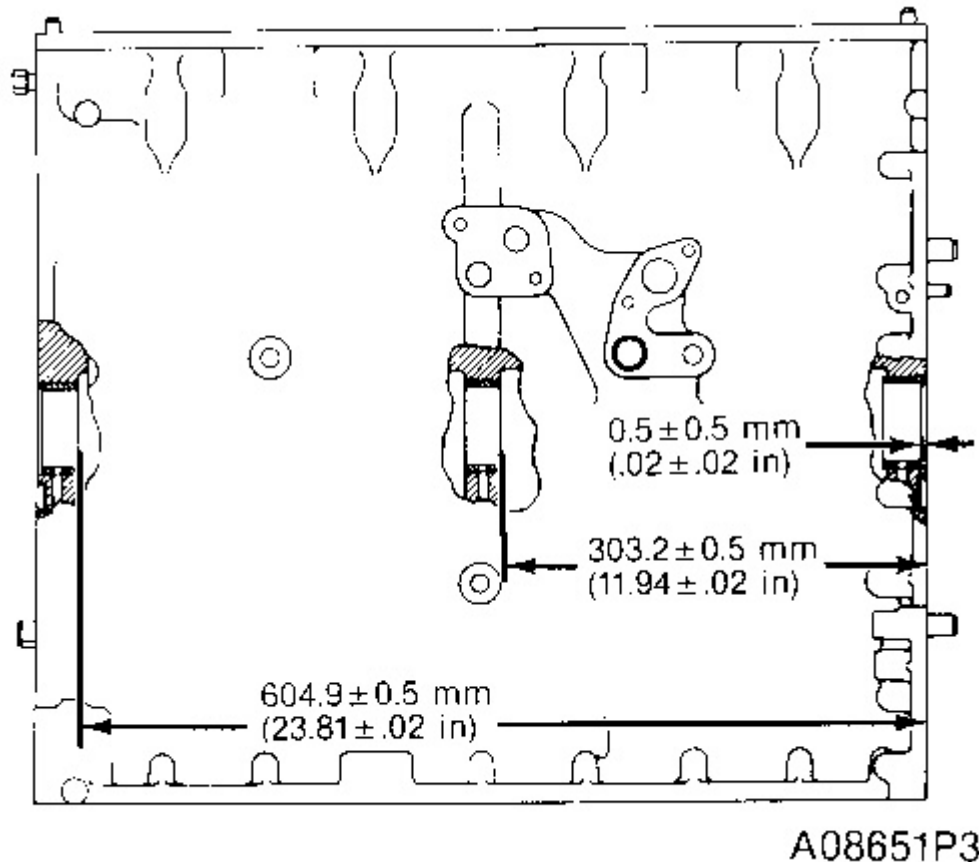


1. Remove the camshaft bearings from the cylinder block with tooling (A). Start with the front bearing and work to the rear.

Install Camshaft Bearings

Tools Needed		A
8S2241	Camshaft Bearing Installation And Removal Tool	1
8H684	Ratchet Wrench	1

1. Use tooling (A) to install the camshaft bearings in the cylinder block.



2. Install the camshaft bearings in the cylinder block as follows:

- Install the front bearing to a depth of $0.5 \pm 0.5 \text{ mm}$ ($.02 \pm .02 \text{ in}$) and with the oil holes in a horizontal position and the joint at the top of the engine. The joint cannot be more than 15° from vertical in either direction.
- Install the center bearing to a depth of $303.2 \pm 0.5 \text{ mm}$ ($11.94 \pm .02 \text{ in}$) and with the oil hole in alignment with the oil hole in the cylinder block.
- Install the rear bearing to a depth of $604.9 \pm 0.5 \text{ mm}$ ($23.81 \pm .02 \text{ in}$) and with the oil hole in alignment with the oil hole in the cylinder block.

End By:

- install camshaft

b. install oil pan plate

c. install flywheel housing

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Cylinder Liners

SMCS - 1216-011; 1216-012

Remove Cylinder Liners

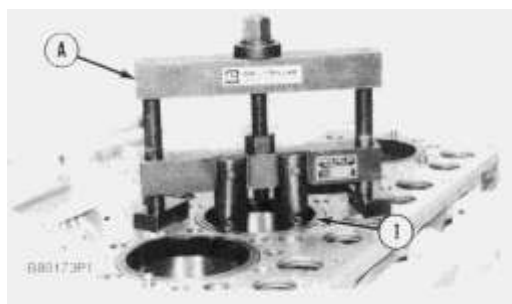
Tools Needed		A
5P8665	Cylinder Liner Puller	1

Start By:

a. remove pistons and connecting rods

1. Drain the coolant from the cylinder block.

2. Put covers on the journals of the crankshaft for protection from dirt or water.

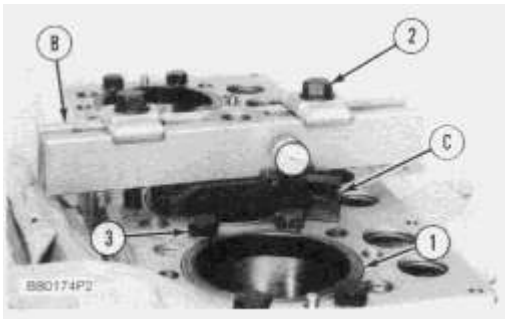


3. Remove cylinder liners (1) with tooling (A).

4. Remove the O-ring seals and filler band from each of the cylinder liners.

Install Cylinder Liners

Tools Needed		B	C	D
2P8260	Liner Installer Group			1
1P5510	Liner Projection Tool Group		1	
8B7548	Push-Puller (Crossbar)	1		
1P2394	Puller Plate	1		
3H465	Plate	2		
S1589	Bolt [5/8" -11 NC x 1.75 in. (44.5 mm) long]	12		
1S379	Washer (copper)	12		
1D4595	Bolt [5/8" -11 NC x 152.4 mm (6.00 in) long]	2		
2S736	Washer	2		



1. Clean cylinder liners (1) and the liner bores in the cylinder block.
2. Install the cylinder liners in the block without the O-ring seals of filler bands.
3. Check the cylinder liner projection as follows:
 - a. Install the S1589 Bolts (3) and **1S379 Washers** of tooling (B) on the cylinder block next to each liner. Tighten the bolts evenly, in four steps: **14 N·m (10 lb ft)**, **35 N·m (25 lb ft)**, **70 N·m (52 lb ft)** and **95 N·m (70 lb ft)**.
 - b. Put the adapter plate on top of the liner, and install the remainder of tooling (B). Tighten the **1D4595 Bolts** (2) evenly in four steps: **7 N·m (5 lb ft)**, **20 N·m (15 lb ft)**, **35 N·m (25 lb ft)** and **70 N·m (52 lb ft)**.
 - c. Check to be sure the distance from the bottom edge of the crossbar to the top of the cylinder block is the same on both sides of the liner.
 - d. Check the cylinder liner projection with tool group (C) at four locations around the liner.
 - e. Liner projection must be **0.033 to 0.175 mm (.0013 to .0069 in)**. Measurements on the same liner must not be different by more than 0.05 mm (.002 in). Average measurements between liners next to each other must not be different by more than **0.05 mm (.002 in)**. The maximum permissible difference between average projection of all cylinder liners is **0.10 mm (.004 in)**.

NOTE: If the liner is turned in the bore, it can make a difference in the liner projection.

4. If the liner projection is not **0.033 to 0.175 mm (.0013 to .0069 in)**, check the thickness of the following parts: spacer plate, spacer plate gasket and cylinder liner flange. The thickness of the spacer plate must be **9.970 ± 0.025 mm (.3925 ± .0010 in)**. The thickness of the spacer plate gasket must be **0.208 ± 0.025 mm (.0082 ± .0010 in)**. The thickness of the cylinder liner flange must be **10.282 ± 0.020 mm (.4048 ± .0008 in)**.

NOTE: If the liner projection changes from point to point around the liner, turn the liner to a new position in the bore. If the liner projection is still not to specifications, move the liner to a different bore.

5. When the cylinder projection is correct, put an alignment mark on the liner and block so the liner can be installed in the same position from which it was removed.

NOTE: Cylinder liner projection can be adjusted by the removal of material from (machining) the contact face of the cylinder block with the use of the 8S3140 Cylinder Block Counterboring Tool Arrangement. Machine to a minimum depth of 0.76 mm (.030 in) and to a maximum depth of 1.14 mm (.045 in). The instructions for the use of the tool group are in Special Instruction, Form No. FM055228. Shims are available for the adjustment of the liner projection. See Cylinder Liner Projection in Testing And Adjusting for the shim thickness and part number.

6. Remove tooling (B) and (C). Remove the liner.



7. Put liquid soap on the bottom of the liner bore in the block, on the grooves in lower liner and on O-ring seals (4). Install the O-ring seals on the liner.

8. Put filler band (5) in clean **SAE 30 oil** for a moment, and install it on the liner. Install the cylinder liner immediately in the cylinder block (before expansion of filler band).



9. Make sure the mark on the liner is in alignment with the mark on the block. Use tooling (D) to push the liner into position.

10. Do Steps 5 through 9 for the remainder of the cylinder liners.

End By:

a. install pistons and connecting rods

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Disassembly and Assembly

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SEN32530050

Connecting Rod Bearings

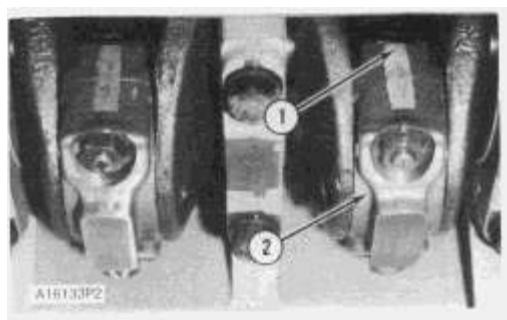
SMCS - 1219-010

Remove And Install Connecting Rod Bearings

Tools Needed		A
Plastigage		*

Start By:

- a. remove oil pump
- b. remove oil pan plate



1. Turn the crankshaft until two pistons are at the bottom center. Remove connecting rod caps (2) from the two connecting rods. Remove the lower half of the rod bearing from the rod bearing cap.

NOTICE

The connecting rod bolts are loose on the connecting rods and can fall out when the nuts are removed.

2. Push connecting rods (1) away from the crankshaft. Remove the upper half of the rod bearing from the connecting rod.

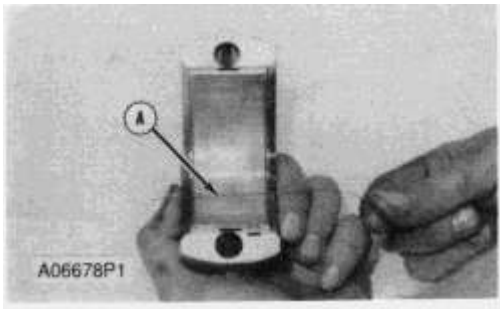
NOTE: Install the connecting rod bearings dry when the clearance checks are made. Put clean engine oil on the connecting rod bearings for final assembly.

NOTICE

Be sure the tabs in the back of the connecting rod bearings are in the tab grooves of the connecting rod and cap.

3. Install the upper half of the rod bearing in the connecting rod, and put the connecting rod in position on the crankshaft.

4. Install the lower half of the rod bearing in the connecting rod cap.



The serviceman must be very careful to use Plastigage, tool (A) correctly. The following points must be remembered:

...Make sure that the backs of the bearings and the bores are clean and dry.

...Make sure that the bearing locking tabs are properly seated in their slots.

...The crankshaft must be free of oil where the Plastigage touches it.

...Put a piece of Plastigage on the crown of the bearing half that is in the cap. Do not allow the Plastigage to extend over the edge of the bearing.

...Install the bearing cap using the correct torque-turn specifications. Do not use an impact wrench. Be careful not to dislodge the bearing when the cap is installed.

...Do not turn the crankshaft with the Plastigage installed.

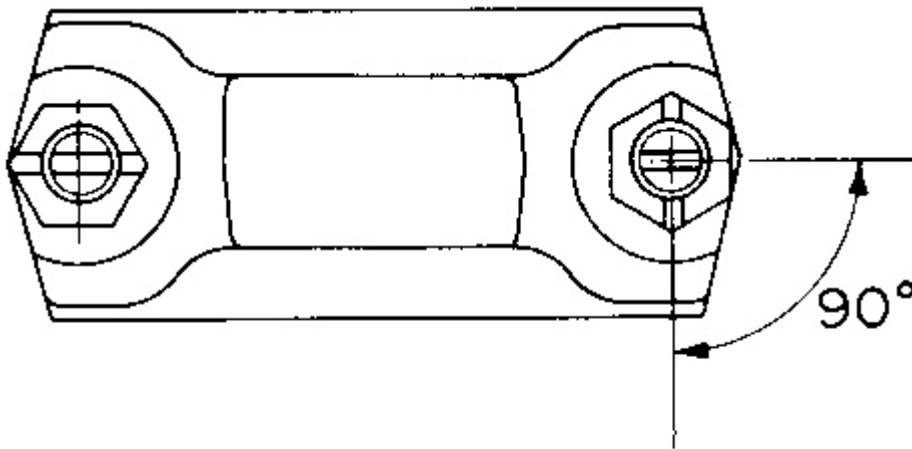
...Carefully remove the cap but do not remove the Plastigage. Measure the width of the Plastigage while it is in the bearing cap or on the crankshaft journal. Do this by using the correct scale on the package. Record the measurements.

...Remove the Plastigage before reinstalling the cap.

When using Plastigage, the readings can sometimes be unclear. For example, all parts of the Plastigage are not the same width. Measure the major widths to make sure that they are within the specification range. Also, experience has shown that when checking clearances tighter than **0.10 mm (.004")** the readings may be low by **0.013 to 0.025 mm (.0005 to .0010")**. Out-of-round journals can give faulty readings. Also, journal taper may be indicated when one end of the Plastigage is wider than the other.

For complete details concerning measuring bearing clearances, see Engine Bearings And Crankshafts, Form No. SEBD0531.

5. Use Plastigage (A) to check the connecting rod bearing clearance.
6. Put Plastigage (A) on the connecting rod bearing.
7. Put clean **2P2506 Thread Lubricant** on the threads of the rod bolts and seat surfaces of the nuts.



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NOTICE

When connecting rod caps are installed, make sure the number on the side of the cap is next to and respective with the number on the side of the connecting rod.

8. Install connecting rod cap (2). Install the nuts. Tighten the nuts to a torque of **40 ± 4 N·m (30 ± 3 lb ft)**. Put a mark on each nut and the end of each bolt. Tighten the nuts **90° more**. Remove the connecting rod caps. Remove Plastigage (A), and measure the thickness of the Plastigage. The connecting rod clearance must be **0.076 to 0.168 mm (.0030 to .0066 in)** for new bearings. The maximum clearance with used bearings is **0.25 mm (.010 in)**.
9. Install the connecting rod caps, and tighten the nuts as in Step 8.
10. Do Steps 1 through 9 for the remainder of the connecting rod bearings.

End By:

a. install oil pan plate

b. install oil pump.

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SEN32530051

Crankshaft Main Bearings

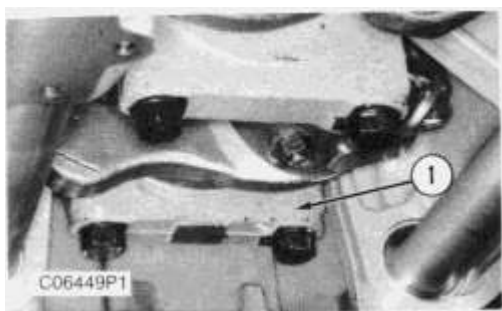
SMCS - 1203-010

Remove And Install Crankshaft Main Bearings

Tools Needed		A	B	C
2P5518	Bearing Removal And Installation Tool	1		
	Plastigage		*	
8S2328	Dial Indicator Test Group			1

Start by:

- a. remove oil pump
- b. remove oil pan plate

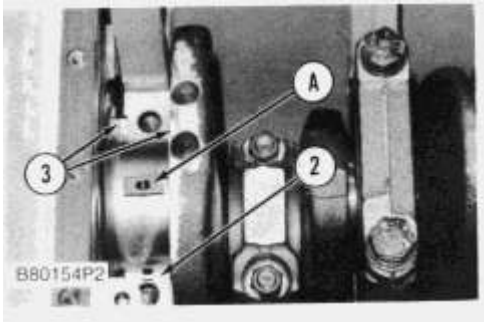


1. Remove the bolts and No. 1, 3, and 5 main bearing caps (1). Remove the lower halves of the main bearings from the main bearing caps.

NOTICE

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.

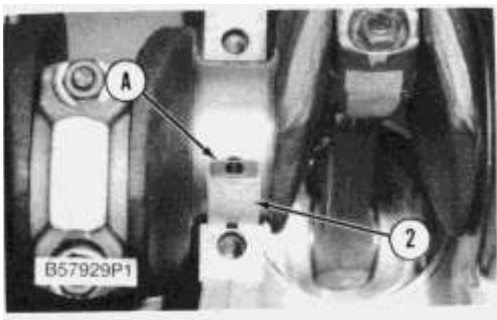
NOTE: On the center main journal that has no oil hole, put a thin piece of soft material that will not damage the crankshaft journal against the end of the bearing opposite the tab. Hit the bearing with the soft material until the tab of the bearing is free from the groove in the cylinder block. Remove the upper half of the main bearing.



2. Remove the upper half of the other main bearings as follows:

- a.** Turn the crankshaft until tool (A) can be installed in the hole in the crankshaft journal. Install tool (A).
- b.** Turn the crankshaft in the direction which will push the upper halves of main bearings (2) out, tab end first.
- c.** Check the condition of the bearings. See Guideline For Reusable Parts, Main And Connecting Rod Bearings, Form No. SEBF8009.

3. Remove crankshaft thrust bearings (3) from the rear main bearing.



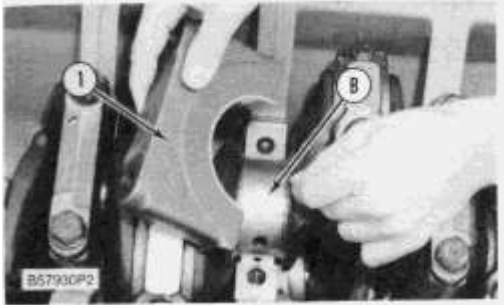
NOTE: Install the main bearings dry when the clearance checks are made. Put clean engine oil on the main bearings for final assembly.

NOTICE

Make sure the upper and lower halves of the main bearings are installed so the bearing tabs fit into the notch in the cylinder block and the main bearing caps.

4. Clean the surfaces in the cylinder block for the main bearings. Use tool (A), and install new upper halves of main bearings (bearings with the oil hole) (2) in the cylinder block. Do not put oil on the bearing.

5. Clean the surfaces of the main bearing caps for the main bearings. Install the new lower halves of main bearings (2) in the main caps without oil.



The serviceman must be very careful to use Plastigage, tool (B) correctly. The following points must be remembered:

...Make sure that the backs of the bearings and the bores are clean and dry.

...Make sure that the bearing locking tabs are properly seated in their slots.

...The crankshaft must be free of oil where the Plastigage touches it.

...If the main bearing clearances are checked with the engine upright or on its side, the crankshaft must be supported. Use a jack under an adjacent crankshaft counterweight and hold the crankshaft against the crown of the bearing. If the crankshaft is not supported, the weight of the crankshaft will cause incorrect readings.

...Do not allow the Plastigage to extend over the edge of the bearing.

...Install the bearing cap using the correct torque-turn specifications. Do not use an impact wrench. Be careful not to dislodge the bearing when the cap is installed.

...Do not turn the crankshaft with the Plastigage installed.

...Carefully remove the cap but do not remove the Plastigage. Measure the width of the Plastigage while it is in the bearing cap or on the crankshaft journal. Do this by using the correct scale on the package. Record the measurements.

...Remove the Plastigage (B) before reinstalling the cap.

When using Plastigage, the readings can sometimes be unclear. For example, all parts of the Plastigage are not the same width. Measure the major widths to make sure that they are within the specification range. Also, experience has shown that when checking clearances tighter than **0.10 mm (.004")** the readings may be low by **0.013 to 0.025 mm (.0005 to .0010")**. Out-of-round

journals can give faulty readings. Also, journal taper may be indicated when one end of the Plastigage is wider than the other.

For complete details concerning measuring bearing clearances, see Engine Bearings And Crankshafts, Form No. SEBD0531.

6. Check the main bearing clearance with Plastigage (B) as follows:

a. Put a piece of Plastigage (B) on the crown of the bearing half that is in the cap or on the crankshaft journal as shown.

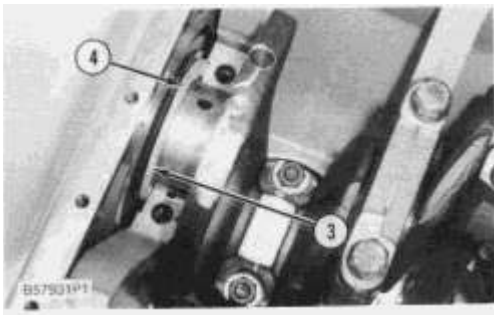
NOTICE

Make sure the part number on the main bearing caps is toward the front of the engine and the number on the main bearing caps is the same as the number on the outside (camshaft side) of the cylinder block.

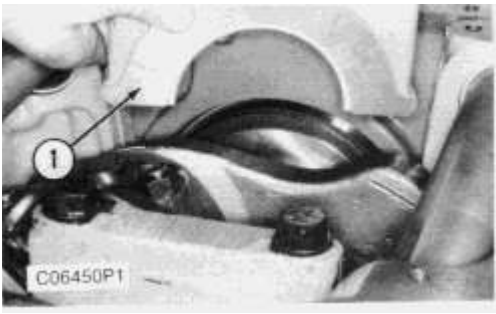
b. Put main bearing caps (1) in position on the cylinder block. Put **2P2506 Thread Lubricant** on the bolt threads and the contact surface of the bolts heads, and install the bolts. Tighten the bolts to a torque of **$40 \pm 4 \text{ N}\cdot\text{m}$ ($30 \pm 3 \text{ lb ft}$)**.

c. Put a mark on each bolt and main bearing cap; then turn the bolts an extra **90°** from the mark.

d. Remove the main bearing caps, and measure the width of Plastigage (B) to find the bearing clearance. The main bearing clearance for new bearings must be **0.076 to 0.165 mm (.0030 to .0065 in)**. The maximum permissible clearance with used main bearings must not be more than **0.25 mm (.010 in)**.



7. Put clean oil on the thrust bearings, and install new thrust bearings for the rear main bearing. Install the thrust bearings with the identification "BLOCK SIDE" toward the bearing saddle and the side with the oil grooves toward the crankshaft. Also, put the tabs on the thrust bearings in the machined area in the cylinder block. Tabs (4) on thrust bearings (3) will not let the thrust bearings be installed backward.



- 8.** Install main bearing caps (1), and tighten the bolts as in Steps 6b and 6c.
- 9.** Remove the remainder of the main bearing caps, and do Steps 2, 4, 5, 6 and 8.

End By:

- a.** install oil pump
 - b.** install oil pan plate
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