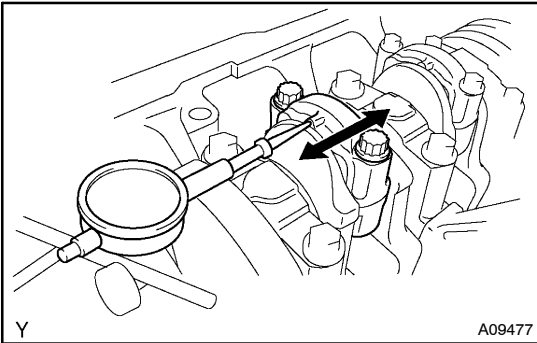


OVERHAUL

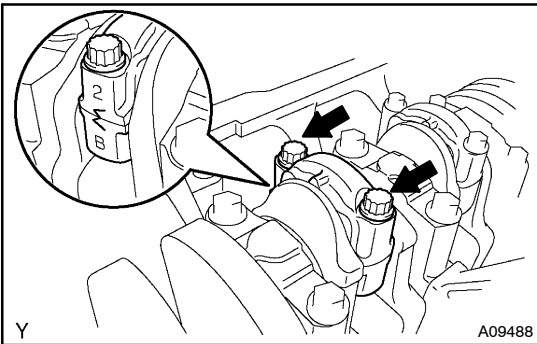


1. **INSPECT CONNECTING ROD THRUST CLEARANCE**
 - (a) Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:

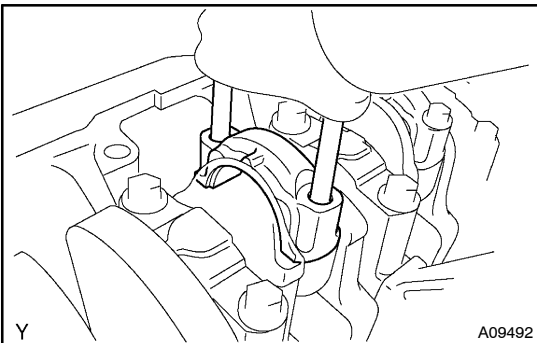
0.08 to 0.40 mm (0.0031 to 0.0157 in.)

If the thrust clearance is greater than maximum, replace the connecting rod assembly(s). If necessary, replace the crankshaft.



2. **INSPECT CONNECTING ROD OIL CLEARANCE**

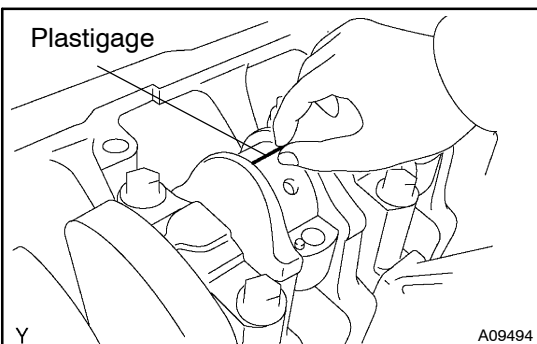
- (a) Check the match marks on the connecting rod and cap to ensure correct reassembly.
- (b) Remove the 2 connecting rod cap bolts.



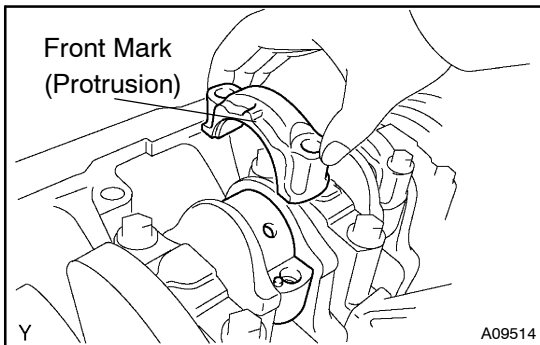
- (c) Using the 2 removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

HINT:

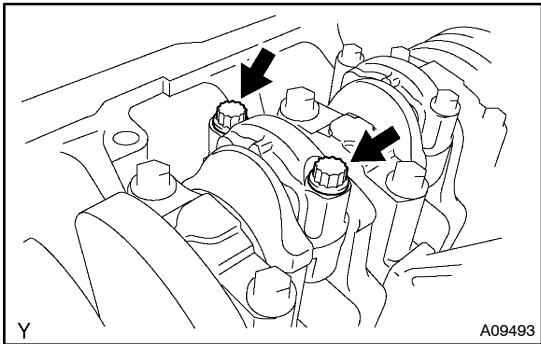
Keep the lower bearing attached to the connecting rod cap.



- (d) Clean the crank pin and bearing.
- (e) Check the crank pin and bearing for pits and scratches. If the crank pin or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.
- (f) Lay a strip of Plastigage across the crank pin.



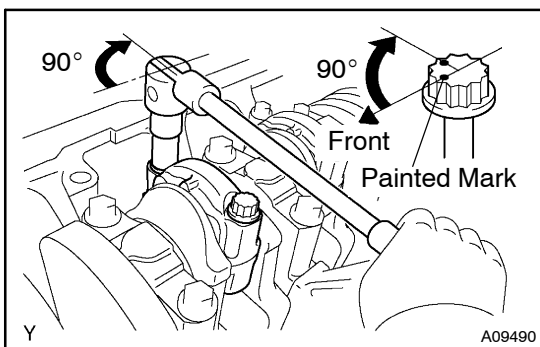
- (g) Match the numbered connecting rod cap with the connecting rod.
- (h) Install the connecting rod cap with the front mark facing forward.
- (i) Apply a light coat of engine oil to the threads and under-heads of the connecting rod cap bolts.



- (j) Install and alternately tighten the 2 cap bolts in several steps.

Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

If any of the cap bolts does not meet the specified torque, replace the connecting rod cap bolts.

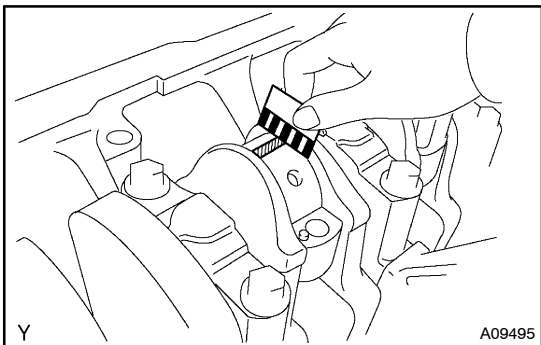


- (k) Mark the front of the cap bolt with paint.
- (l) Retighten the cap bolts by 90° as illustrated.
- (m) Check that the painted mark is now at a 90° angle to the front.

NOTICE:

Do not turn the crankshaft.

- (n) Remove the 2 bolts, connecting rod cap and lower bearing.



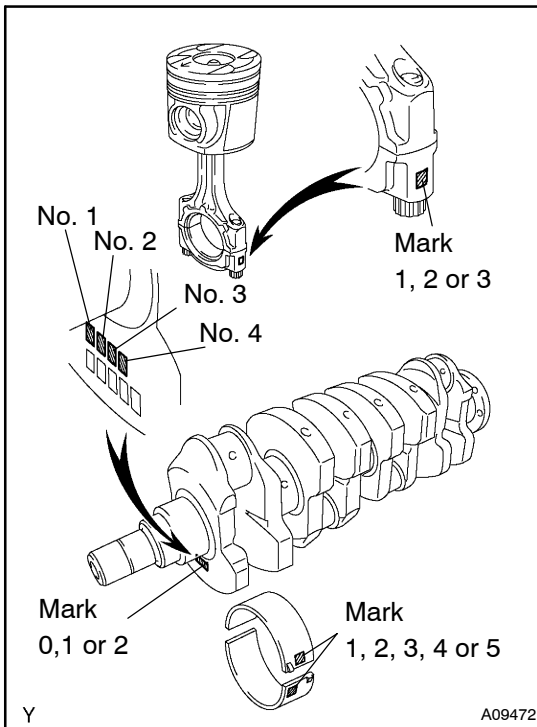
- (o) Measure the Plastigage at its widest point.

Standard oil clearance:

0.038 to 0.056 mm (0.0015 to 0.0022 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, replace the crankshaft.



- (p) If using the standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, find the correct number of the bearing by adding together the numbers imprinted on the crankshaft and connecting rod cap, then select the bearing with the same number as the total. There are 5 sizes of standard bearings, marked "1", "2", "3", "4" and "5" accordingly.

Connecting Rod Cap	Crankshaft	Use Bearing
1	0	1
1	1	2
1	2	3
2	0	2
2	1	3
2	2	4
3	0	3
3	1	4
3	2	5

HINT:

EXAMPLE: Connecting rod cap "2" + Crankshaft "1"
= Total number 3 (Use bearing "3")

Connecting rod big end inside diameter:

Mark "1"	53.500 to 53.506 mm (2.1063 to 2.1065 in.)
Mark "2"	53.506 to 53.512 mm (2.1065 to 2.1068 in.)
Mark "3"	53.512 to 53.518 mm (2.1068 to 2.1070 in.)

Crankshaft crank pin diameter:

Mark "0"	50.494 to 50.500 mm (1.9880 to 1.9882 in.)
Mark "1"	50.488 to 50.494 mm (1.9877 to 1.9880 in.)
Mark "2"	50.482 to 50.488 mm (1.9875 to 1.9877 in.)

Standard size bearing center wall thickness:

Mark "1"	1.478 to 1.481 mm (0.0582 to 0.0583 in.)
Mark "2"	1.481 to 1.484 mm (0.0583 to 0.0584 in.)
Mark "3"	1.484 to 1.487 mm (0.0584 to 0.0585 in.)
Mark "4"	1.487 to 1.490 mm (0.0585 to 0.0587 in.)
Mark "5"	1.490 to 1.493 mm (0.0587 to 0.0588 in.)

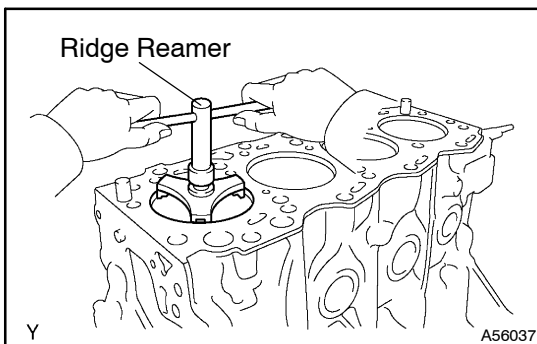
- (q) Completely remove the Plastigage.

3. REMOVE PISTON SUB-ASSY W/CONNECTING ROD

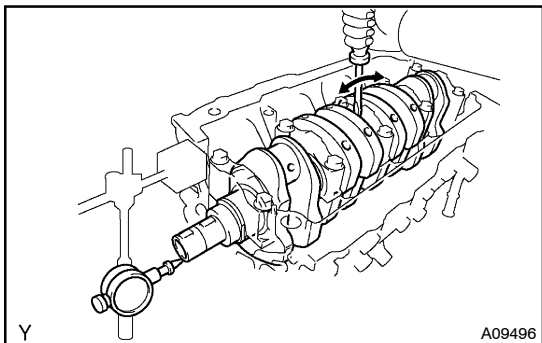
- (a) Using a ridge reamer, remove all the carbon from the top of the cylinder.
- (b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

- Keep the bearing, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in the correct order.



4. REMOVE CONNECTING ROD BEARING



5. INSPECT CRANKSHAFT THRUST CLEARANCE

- (a) Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

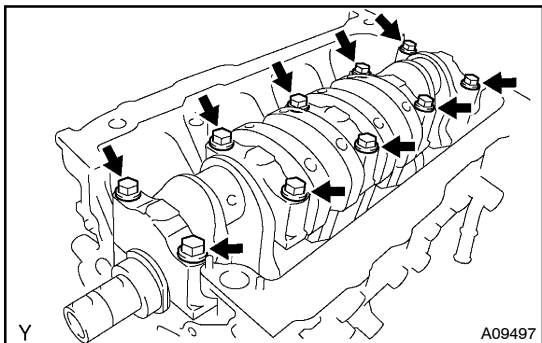
Standard thrust clearance:

0.040 to 0.300 mm (0.0016 to 0.0118 in.)

If the thrust clearance is greater than maximum, replace the thrust washer as a set.

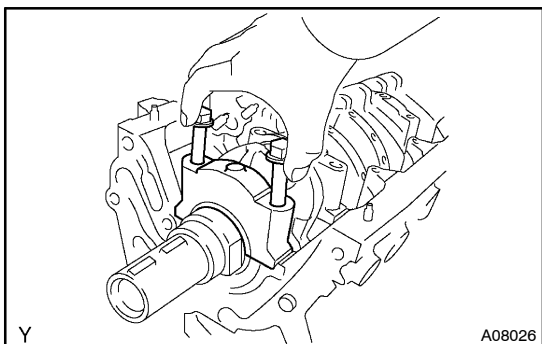
Thrust washer thickness:

Standard	2.680 to 2.730 mm (0.1055 to 0.1075 in.)
Oversize 0.125	2.743 to 2.793 mm (0.1080 to 0.1100 in.)
Oversize 0.250	2.805 to 2.855 mm (0.1104 to 0.1124 in.)



6. REMOVE CRANKSHAFT

- (a) Uniformly loosen and remove the 10 main bearing cap bolts.



- (b) Using the removed main bearing cap bolts, wiggle the cap back and forth, then remove the 5 main bearing caps, 5 lower bearings and 2 lower thrust washers (the No. 3 main bearing cap only).

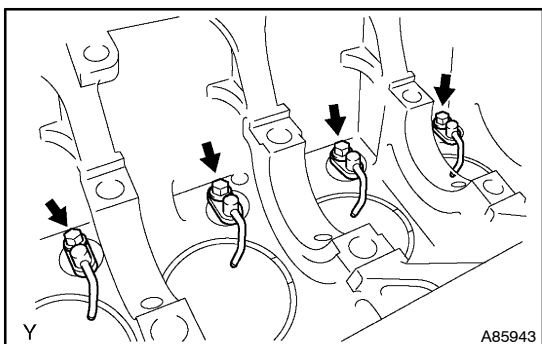
HINT:

- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in the correct order.

- (c) Lift the crankshaft out.

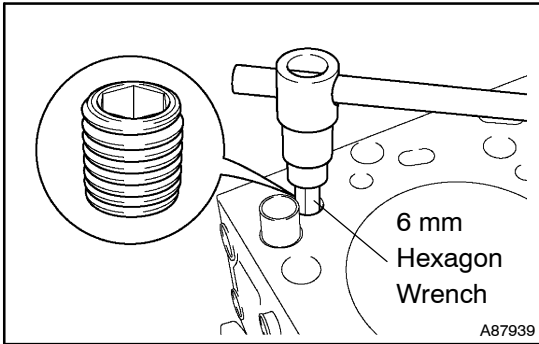
HINT:

Keep the upper bearing and upper thrust washers together with the cylinder block.

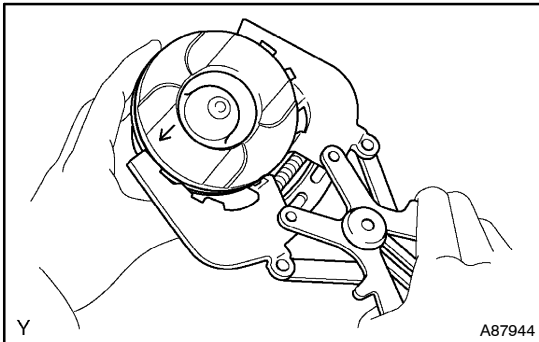


7. REMOVE SUB-ASSY OIL NOZZLE NO.1

- (a) Remove the 4 bolts and 4 oil nozzles.

**8. REMOVE CYLINDER BLOCK OIL ORIFICE**

- (a) Using a hexagon wrench (6 mm), remove the oil orifice.

**9. REMOVE PISTON RING SET**

- (a) Using a piston ring expander, remove the No. 1 and No. 2 piston ring and oil ring.

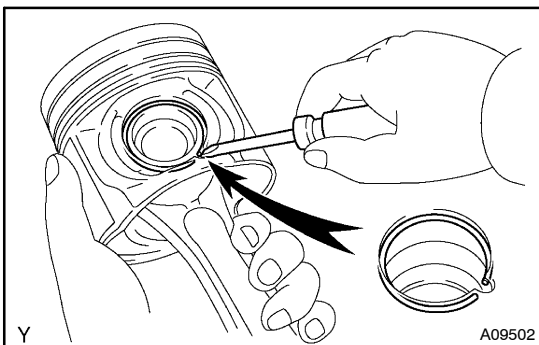
NOTICE:

Try to keep the piston ring expansion as small as possible.

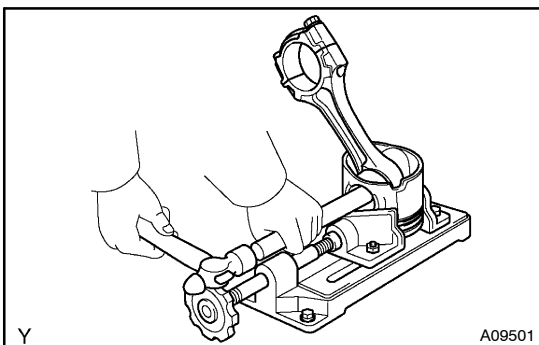
- (b) Remove the coil by hand.

HINT:

Arrange the piston rings in the correct order.

**10. REMOVE W/PIN PISTON SUB-ASSY**

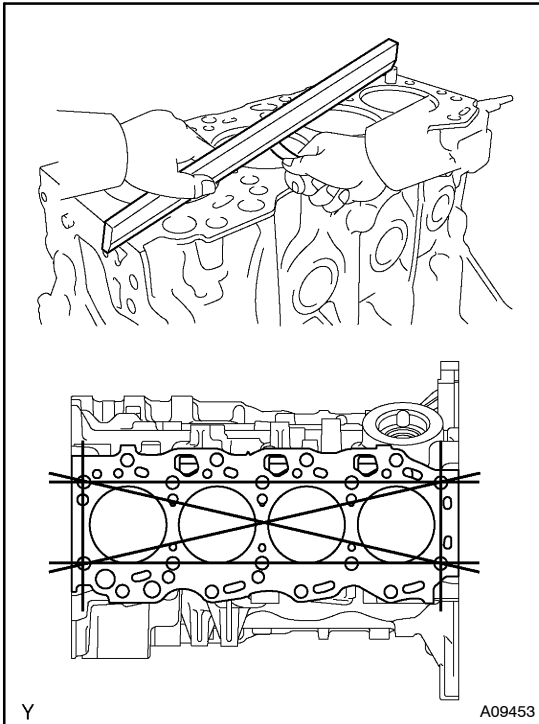
- (a) Using a small screwdriver, pry the snap rings off the piston.
- (b) Gradually heat the piston up to approximately 60°C (140°F).



- (c) Using a plastic-faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

HINT:

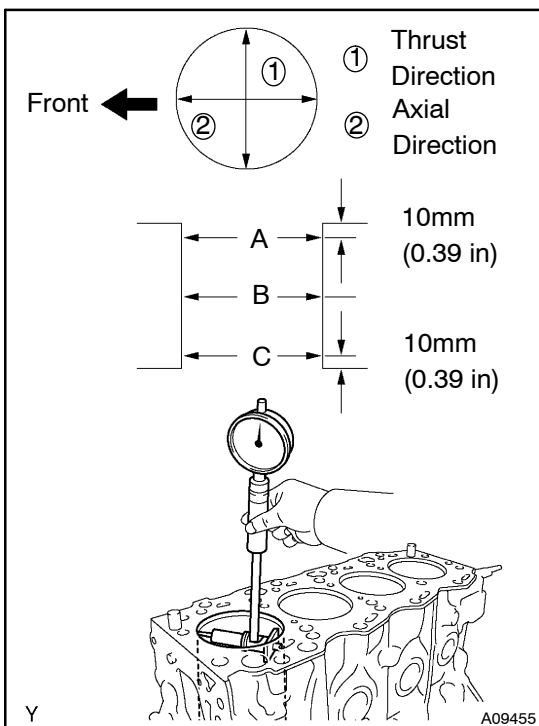
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.

**11. INSPECT CYLINDER BLOCK FOR FLATNESS**

- (a) Using a precision straight edge and feeler gauge, measure the warpage on the surface which contacts the cylinder head gasket.

Maximum warpage: 0.05 mm (0.0020 in.)

If the warpage is greater than maximum, replace the cylinder block.

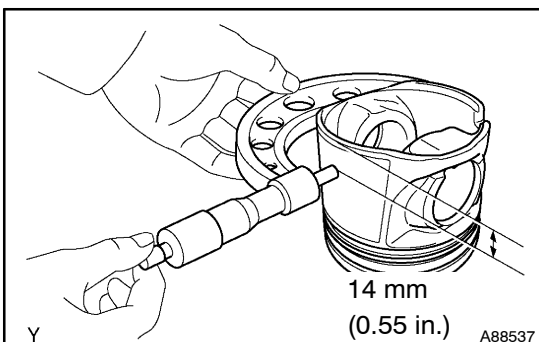
**12. INSPECT CYLINDER BORE DIAMETER**

- (a) Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

Standard diameter:

82.200 to 82.400 mm (3.2362 to 3.2441 in.)

If the diameter is greater than maximum, replace the cylinder block.

**13. INSPECT W/PIN PISTON SUB-ASSY**

- (a) Using a micrometer, measure the piston diameter at a right angle to the piston pin center line and 14 mm (0.55 in.) from the skirt bottom edge.

Piston diameter:

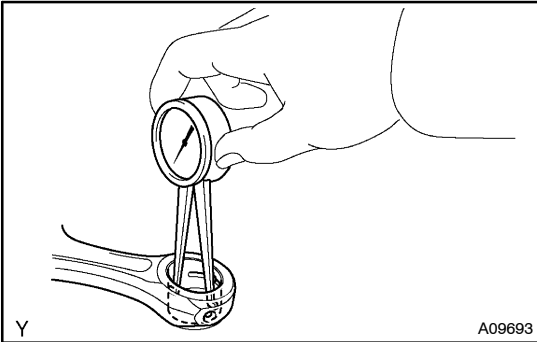
82.118 to 82.132 mm (3.2330 to 3.2335 in.)

- (b) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

0.068 to 0.140 mm (0.0027 to 0.0055 in.)

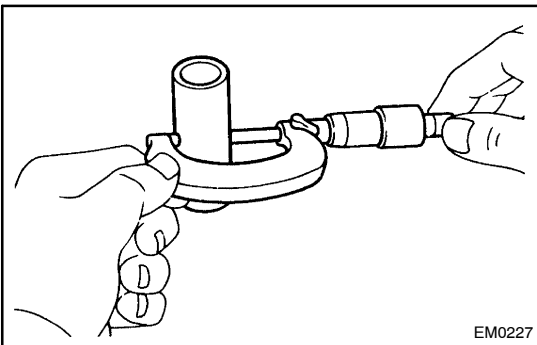
If the oil clearance is greater than maximum, replace all the 4 pistons. If necessary, replace the cylinder block.



- (c) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

Bushing inside diameter:

31.015 to 31.027 mm (1.2211 to 1.2215 in.)



- (d) Using a micrometer, measure the piston pin diameter.

Piston pin diameter:

31.000 to 31.012 mm (1.2205 to 1.2209 in.)

- (e) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

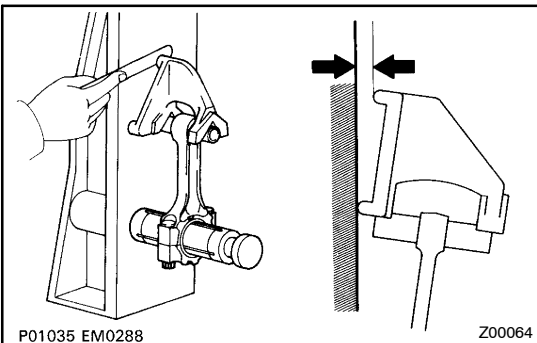
Standard oil clearance:

0.005 to 0.019 mm (0.0002 to 0.0007 in.)

If the oil clearance is greater than maximum, replace the connecting rod. If necessary, replace the piston and piston pin as a set.

14. INSPECT CONNECTING ROD SUB-ASSY

- (a) Using a rod aligner and feeler gauge, check the connecting rod alignment.

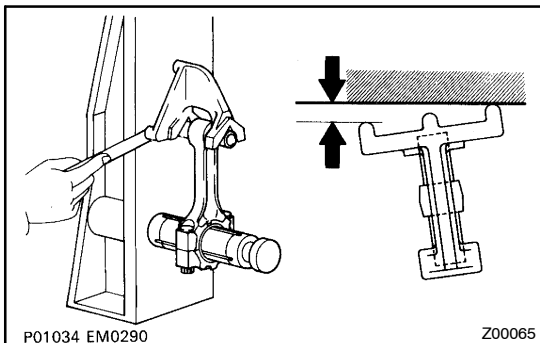


- (1) Inspect the misalignment.

Maximum misalignment:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If the alignment is greater than maximum, replace the connecting rod assembly.

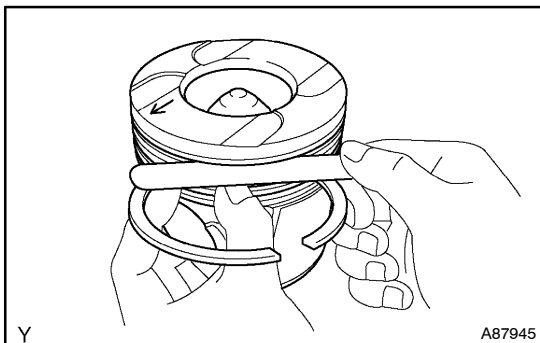


(2) Inspect the twist.

Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If the twist is greater than maximum, replace the connecting rod assembly.



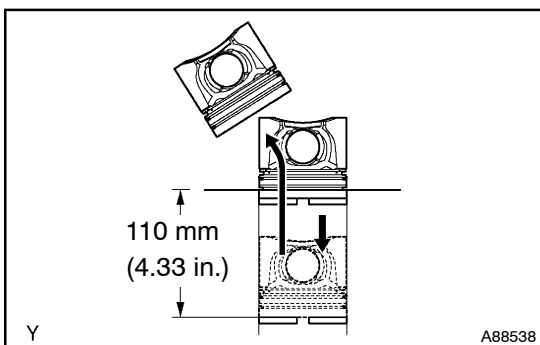
15. INSPECT RING GROOVE CLEARANCE

(a) Using a feeler gauge, measure the clearance between a new piston ring and wall of the ring groove.

Ring groove clearance:

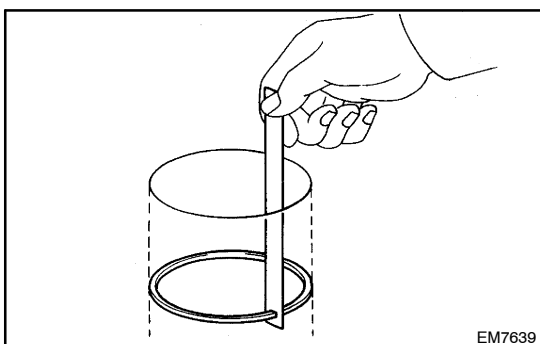
No. 1	0.11 to 0.15 mm (0.0043 to 0.0059 in.)
No. 2	0.075 to 0.115 mm (0.0030 to 0.0045 in.)
Oil	0.03 to 0.07 mm (0.0012 to 0.0028 in.)

If the clearance is not as specified, replace the piston.



16. INSPECT PISTON RING END GAP

(a) Using a piston, push the piston ring until it is a little below the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.



(b) Using a feeler gauge, measure the end gap.

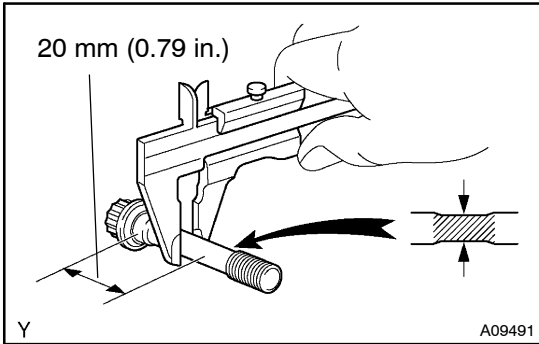
Standard end gap:

No. 1	0.27 to 0.39 mm (0.0106 to 0.0514 in.)
No. 2	0.39 to 0.54 mm (0.0154 to 0.0213 in.)
Oil	0.20 to 0.40 mm (0.0079 to 0.0157 in.)

Maximum end gap:

No. 1	0.82 mm (0.0323 in.)
No. 2	1.00 mm (0.0394 in.)
Oil	0.90 mm (0.0354 in.)

If the end gap is greater than maximum, replace the piston ring.
If the end gap is greater than maximum, even with a new piston ring, replace the cylinder block.

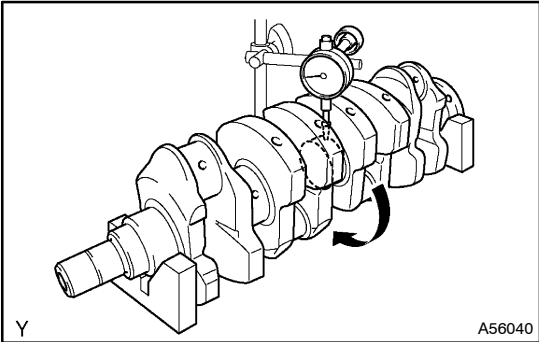
**17. INSPECT CONNECTING ROD BOLT**

- (a) Using vernier calipers, measure the tension portion diameter.

Standard diameter:

8.0 to 8.3 mm (0.315 to 0.327 in.)

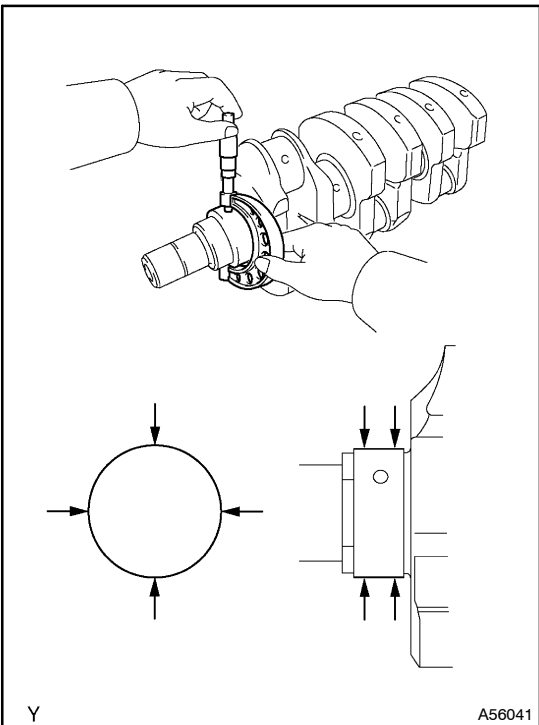
If the diameter is less than minimum, replace the connecting rod bolt.

**18. INSPECT CRANKSHAFT**

- (a) Place the crankshaft on V-blocks.
(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.025 mm (0.0010 in.)

If the circle runout is greater than maximum, replace the crankshaft.



- (c) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:

56.992 to 57.010 mm (2.2438 to 2.2445 in.)

Crank pin diameter:

50.482 to 50.500 mm (1.9875 to 1.9882 in.)

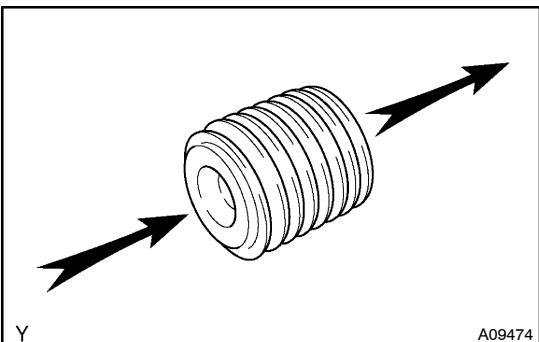
If the diameter is not as specified, replace the crankshaft.

- (d) Check each main journal and crank pin for taper and out-of-round as illustrated.

Maximum taper and out-of-round:

0.01 mm (0.0004 in.)

If the taper and out-of-round is greater than maximum, replace the crankshaft.

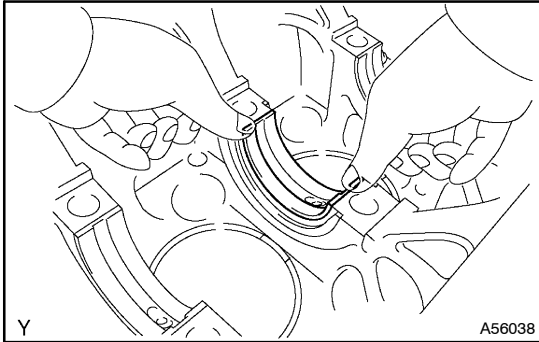
**19. INSPECT CYLINDER BLOCK OIL ORIFICE**

- (a) Check the oil orifice for clogging.

If necessary, replace the oil orifice.

20. INSPECT CRANKSHAFT OIL CLEARANCE

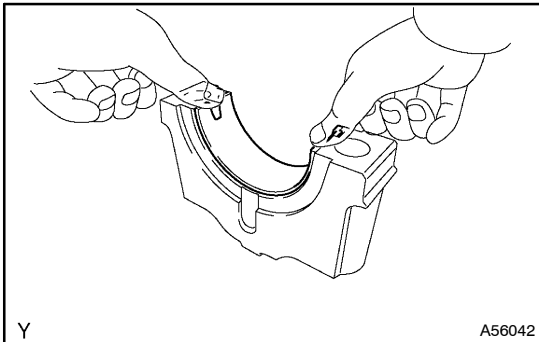
- (a) Clean each main journal and bearing.



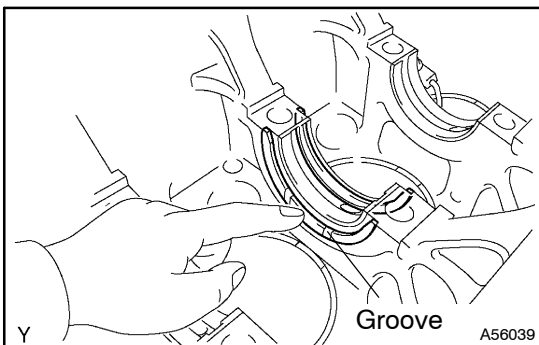
(b) Install the bearing on the cylinder block and bearing cap.
HINT:

Each upper bearing has an oil groove and oil hole and each lower bearing does not.

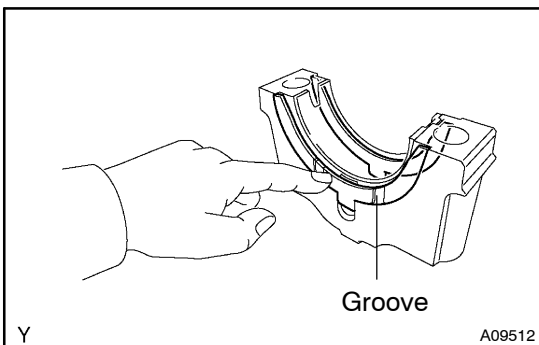
- (1) Align the bearing claw with the claw groove of the cylinder block, then push in the 5 upper bearings.



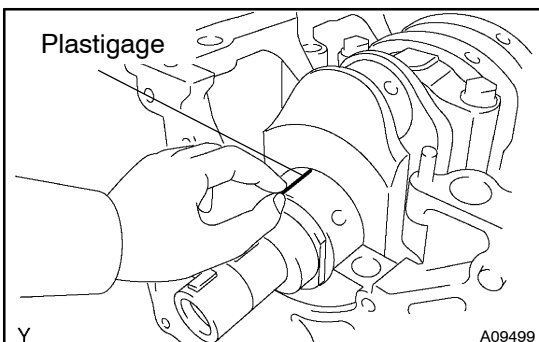
- (2) Align the bearing claw with the claw groove of the main bearing cap, then push in the 5 lower bearings.



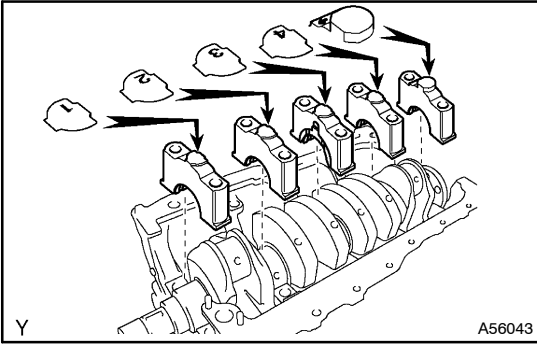
- (c) Install the 2 thrust washers under the No. 3 journal position of the cylinder block with the oil grooves facing outward.



- (d) Install the 2 thrust washers on the No. 3 bearing cap with the oil grooves facing outward.
- (e) Place the crankshaft on the cylinder block.



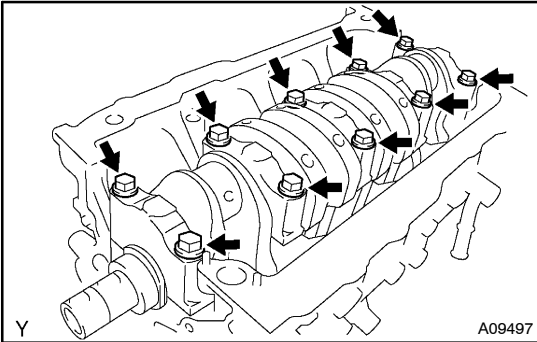
- (f) Lay a strip of Plastigage across each journal.



(g) Install the 5 main bearing caps in their proper locations.

HINT:

Each bearing cap has a number and front mark.



(h) Apply a light coat of engine oil to the threads and under the heads of the main bearing cap bolts.

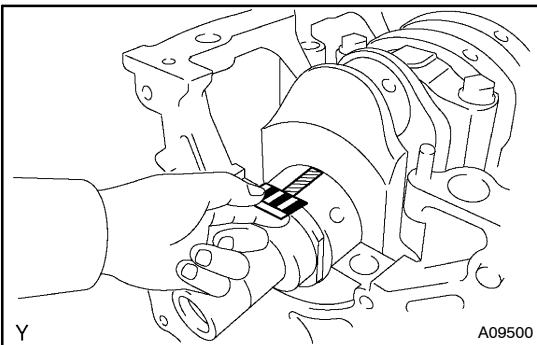
(i) Install and uniformly tighten the 10 bolts of the main bearing cap in several steps.

Torque: 115 N·m (1,173 kgf·cm, 85 ft·lbf)

NOTICE:

Do not turn the crankshaft.

(j) Remove the bearing cap.

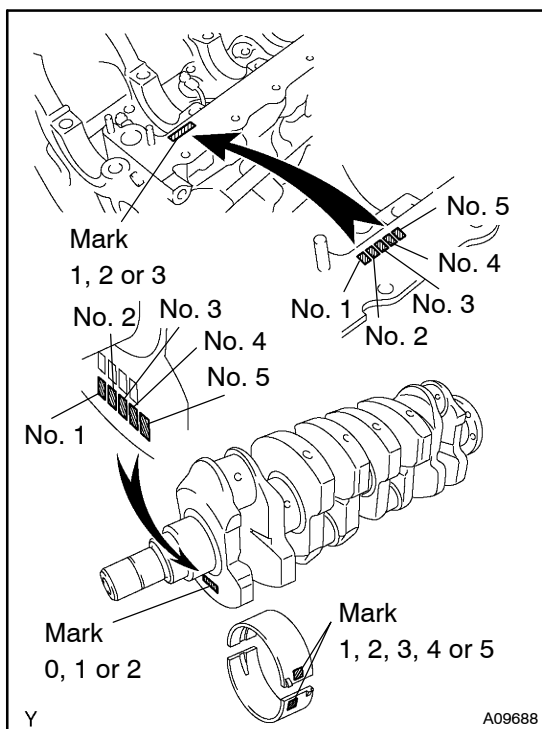


(k) Measure the Plastigage at its widest point.

Standard oil clearance:

0.032 to 0.100 mm (0.0013 to 0.0039 in.)

If the oil clearance is greater than maximum, replace the bearing. If necessary, replace the crankshaft.



- (l) If using the standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, find the correct number of the bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then select the bearing with the same number as the total. There are 5 sizes of standard bearings, marked "1", "2", "3", "4" and "5" accordingly.

Number Marked

Cylinder Block	Crankshaft	Use Bearing
1	0	1
1	1	2
1	2	3
2	0	2
2	1	3
2	2	4
3	0	3
3	1	4
3	2	5

HINT:

EXAMPLE

Cylinder block "2" + Crankshaft "1" = Total number 3 (Use bearing "3")

Cylinder block main journal bore diameter:

Mark "1"	61.000 to 61.006 mm (2.4016 to 2.4018 in.)
Mark "2"	61.006 to 61.012 mm (2.4018 to 2.4020 in.)
Mark "3"	61.012 to 61.018 mm (2.4020 to 2.4023 in.)

Crankshaft main journal diameter:

Mark "0"	57.004 to 57.010 mm (2.2443 to 2.2445 in.)
Mark "1"	56.998 to 57.004 mm (2.2440 to 2.2443 in.)
Mark "2"	56.992 to 56.998 mm (2.2438 to 2.2440 in.)

Standard size bearing center wall thickness:

Mark "1"	1.976 to 1.979 mm (0.0778 to 0.0779 in.)
Mark "2"	1.979 to 1.982 mm (0.0779 to 0.0780 in.)
Mark "3"	1.982 to 1.985 mm (0.0780 to 0.0781 in.)
Mark "4"	1.985 to 1.988 mm (0.0781 to 0.0783 in.)
Mark "5"	1.988 to 1.991 mm (0.0783 to 0.0784 in.)

- (m) Completely remove the Plastigage.

21. INSTALL TIGHT PLUG

- (a) Apply adhesive around new tight plugs.

Adhesive: Part No.08833 – 00070, THREE BOND 1324 or equivalent.

- (b) Using SST, tap in the tight plugs as shown in the illustration.

SST 09950–60010 (09951–00350), 09950–70010 (09951–07100)

Standard depth:

2.0 mm (0.079 in.) for intake side

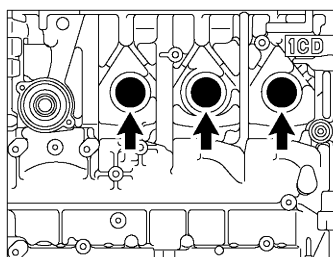
2.0 mm (0.079 in.) for exhaust side

1.5 mm (0.059 in.) for front side

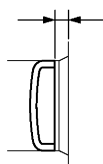
1.5 mm (0.059 in.) for rear side A

2.0 mm (0.079 in.) for rear side B

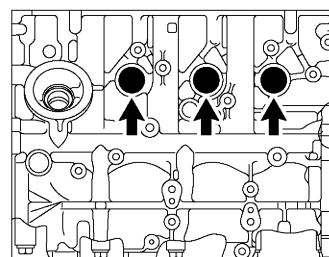
Intake Side:



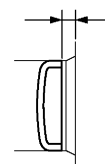
2.0 mm
(0.079 in.)



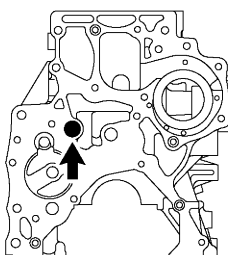
Exhaust Side:



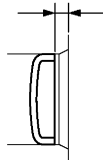
2.0 mm
(0.079 in.)



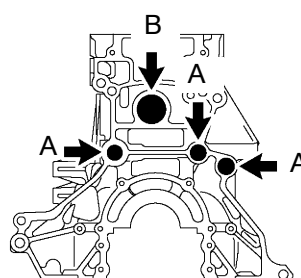
Front Side:



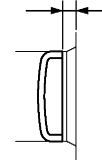
1.5 mm
(0.059 in.)



Rear Side:



A 1.5 mm
(0.059 in.)
B 2.0 mm
(0.079 in.)

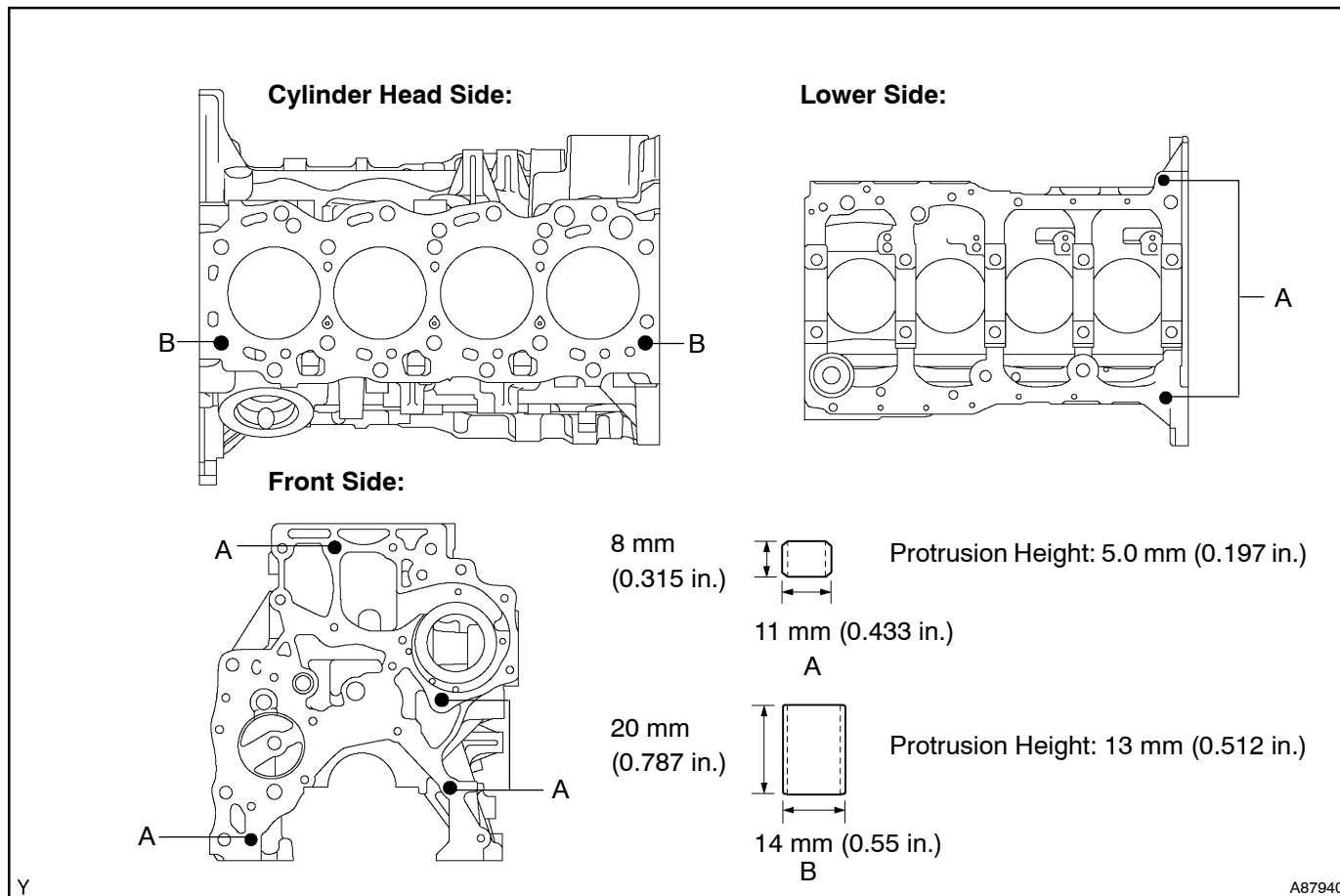


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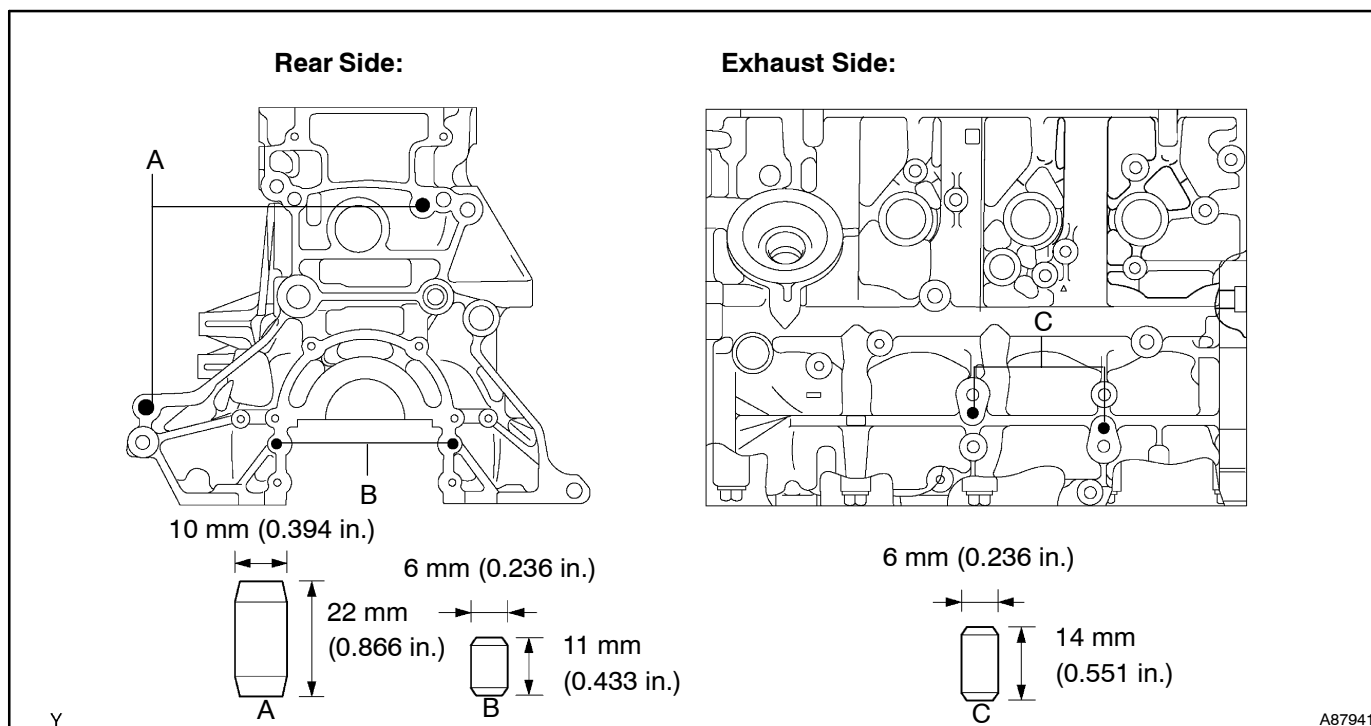
22. INSTALL RING PIN

- (a) Using a plastic-faced hammer, tap in new ring pins until their protrusion heights are as specified.

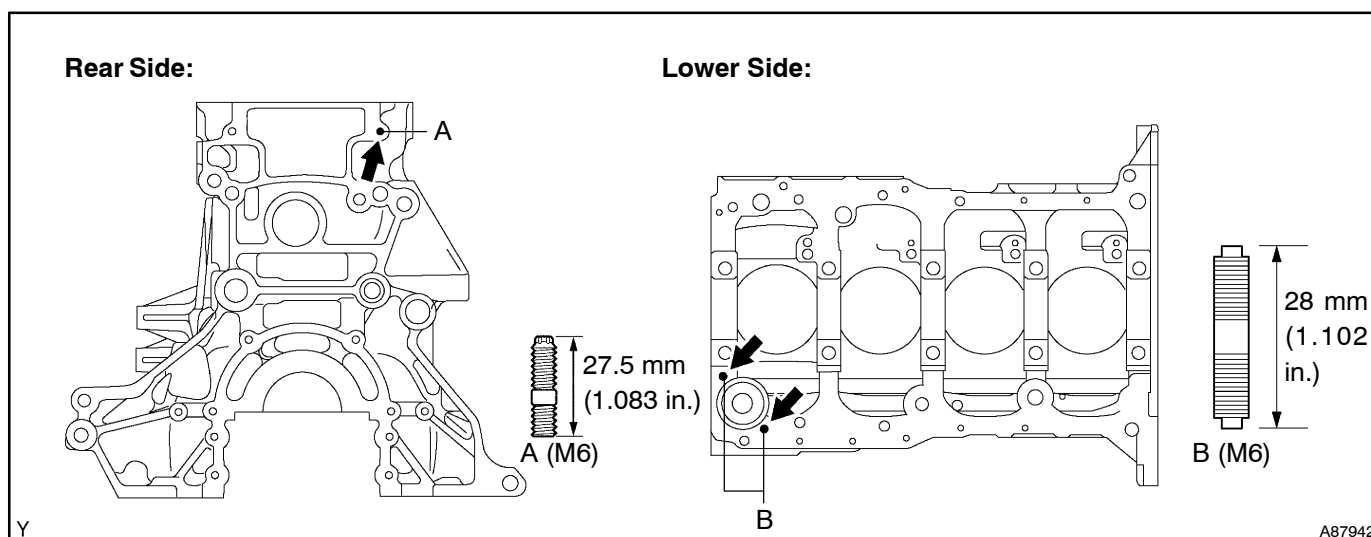


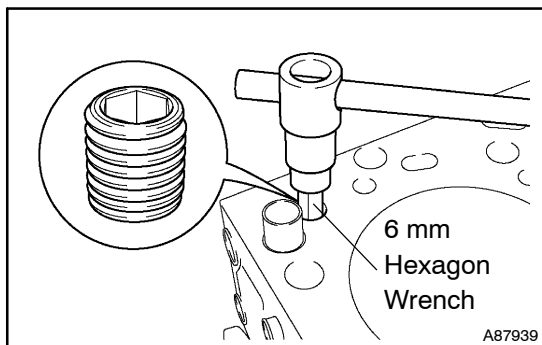
23. INSTALL STRAIGHT PIN

- (a) Using a plastic-faced hammer, tap in new straight pins.

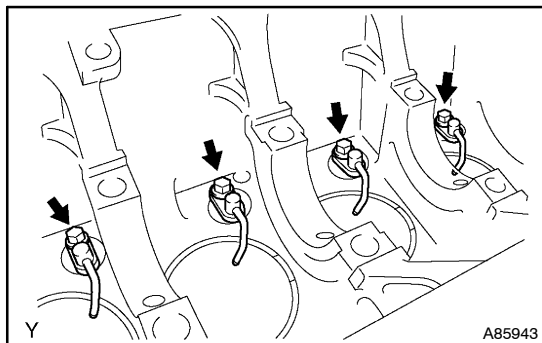
Standard protrusion:**13 mm (0.5118 in.) for straight pin A****4.0 mm (0.1575 in.) for straight pin B****5.0 mm (0.1968 in.) for straight pin C****24. INSTALL STUD BOLT**

- (a) Install the stud bolts as shown in the illustration.

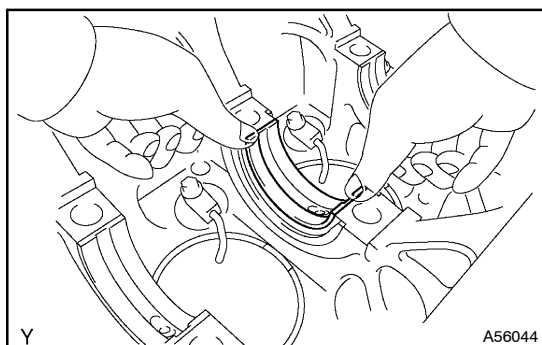
Torque: 2.9 N·m (30 kgf·cm, 27 in.·lbf)

**25. INSTALL CYLINDER BLOCK OIL ORIFICE**

- (a) Using a hexagon wrench (6 mm), install the oil orifice.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

**26. INSTALL SUB-ASSY OIL NOZZLE NO.1**

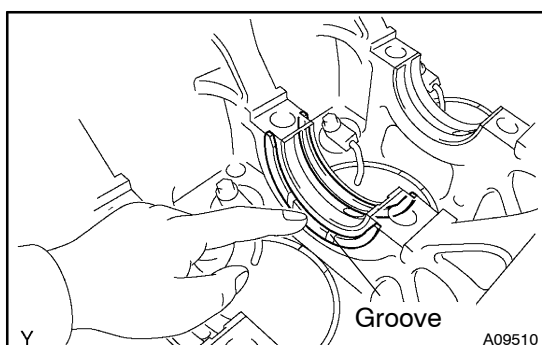
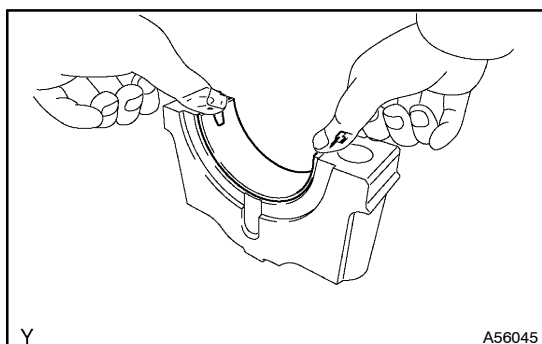
- (a) Install the 4 oil nozzles with the 4 bolts.
Torque: 7.4 N·m (75 kgf·cm, 65 in.·lbf)

**27. INSTALL CRANKSHAFT**

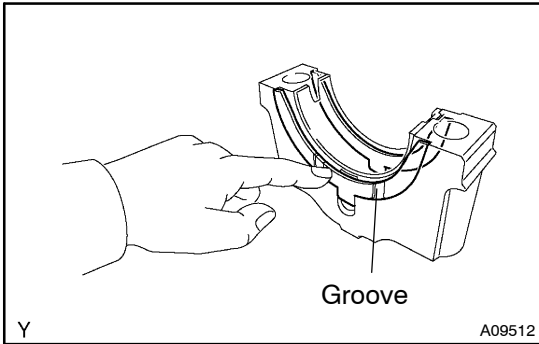
- (a) Install the bearing on the cylinder block and bearing cap.
HINT:

Each upper bearing has an oil groove and oil hole and each lower bearing does not.

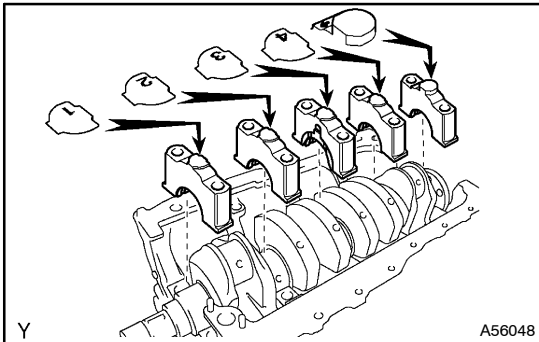
- (1) Align the bearing claw with the claw groove of the cylinder block, then push in the 5 upper bearings.
- (2) Align the bearing claw with the claw groove of the main bearing cap, then push in the 5 lower bearings.



- (b) Install the 2 thrust washers under the No. 3 journal position of the cylinder block with the oil grooves facing outward.



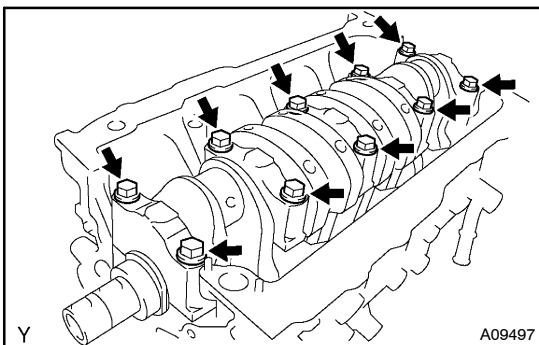
- (c) Install the 2 thrust washers on the No. 3 bearing cap with the oil grooves facing outward.



- (d) Install the 5 main bearing caps in their proper locations.

HINT:

Each bearing cap has a number and font mark.

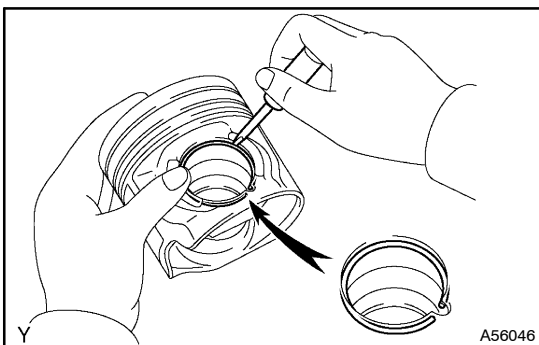


- (e) Apply a light coat of engine oil to the threads and under-heads of the main bearing cap bolts.

- (f) Install and uniformly tighten the 10 bolts of the main bearing cap in several steps.

Torque: 115 N·m (1,173 kgf·cm, 85 ft·lbf)

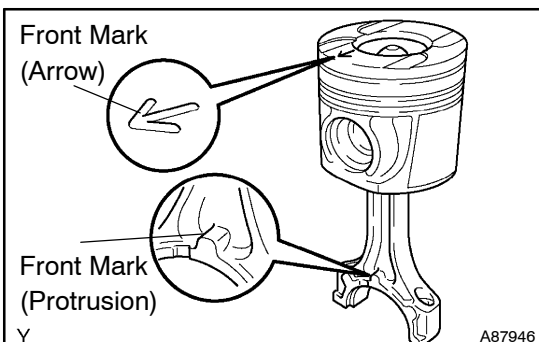
- (g) Check that the crankshaft turns smoothly.



28. INSTALL W/PIN PISTON SUB-ASSY

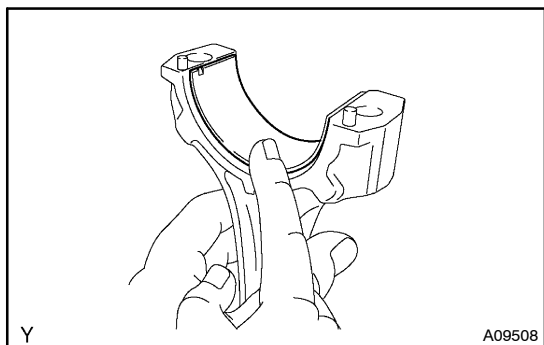
- (a) Install a new snap ring on one side of the piston pin hole.
- (b) Gradually heat the piston up to approximately 60°C (140°F).

- (c) Coat the piston pin and piston hole of the piston with engine oil.



- (d) Align the front marks of the piston and connecting rod, then push in the piston pin by hand.

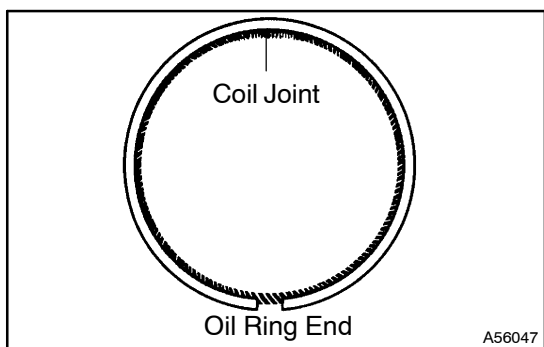
- (e) Install a new snap ring on the other side of the piston pin hole.

**29. INSTALL CONNECTING ROD BEARING**

- (a) Align the bearing claw with the groove of the connecting rod or connecting cap.
- (b) Install the bearings in the connecting rod and connecting rod cap.

30. INSTALL PISTON RING SET

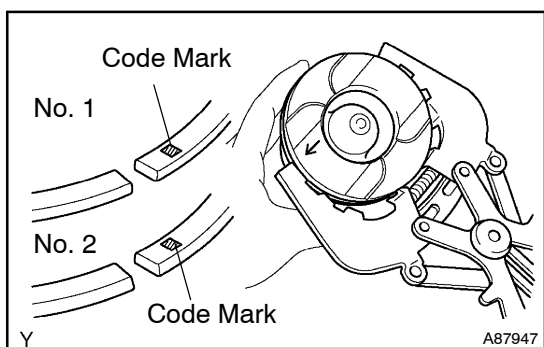
- (a) Install the coil by hand.



- (b) Using a piston ring expander, install the oil ring.

HINT:

Align the oil ring so its end faces the opposite of the coil joint.



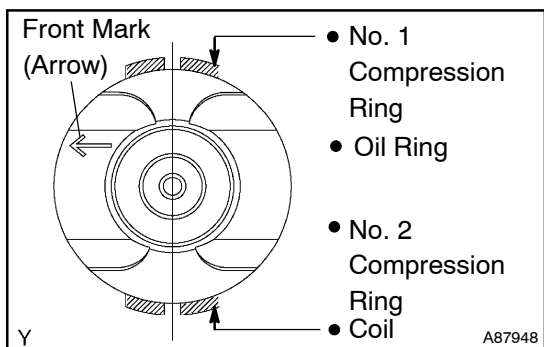
- (c) Using a piston ring expander, install the No. 2 and No. 1 piston rings with the code mark facing upward.

Code mark:

No. 1	1T
No. 2	2T

NOTICE:

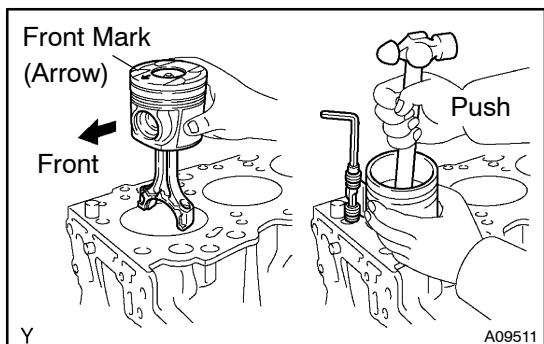
Try to keep the piston ring expansion as small as possible.



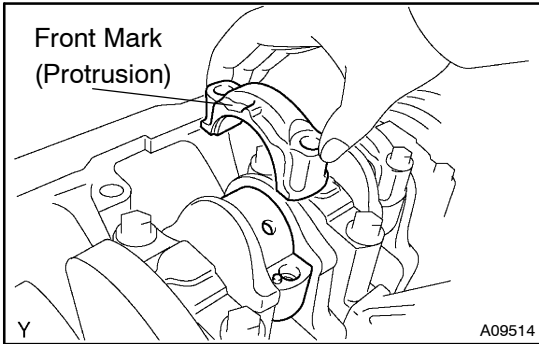
- (d) Position the piston rings so that the ring ends are as illustrated.

31. INSTALL PISTON SUB-ASSY W/CONNECTING ROD

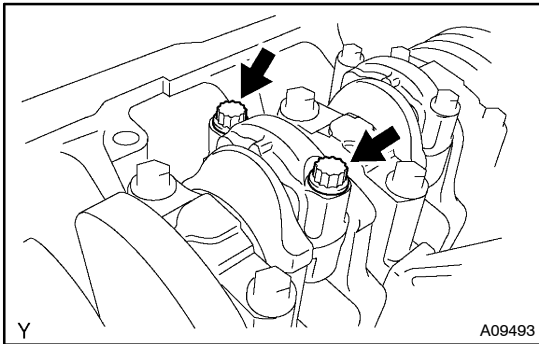
- (a) Apply engine oil to the cylinder walls, pistons, and surfaces of the connecting rod bearings.
- (b) Check the position of the piston ring ends.



- (c) Using a piston ring compressor, push the correctly-numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



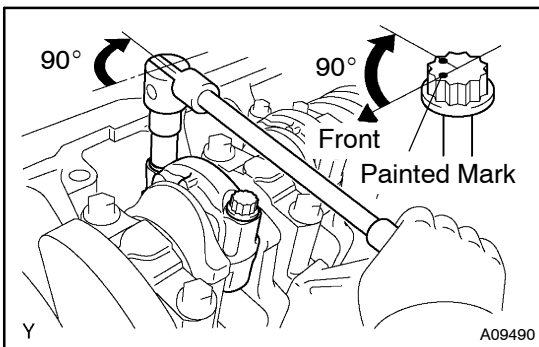
- (d) Match the numbered connecting rod cap with the connecting rod.
- (e) Install the connecting rod cap with the front mark facing forward.
- (f) Apply a light coat of engine oil to the threads and under-heads of the connecting rod cap bolts.



- (g) Install and alternately tighten the 2 cap bolts in several steps.

Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

If any of the cap bolts does not meet the specified torque, replace the connecting rod cap bolts.



- (h) Mark the front of the cap bolt with paint.
- (i) Retighten the cap bolts by 90° as illustrated.
- (j) Check that the painted mark is now at a 90° angle to the front.
- (k) Check that the crankshaft turns smoothly.