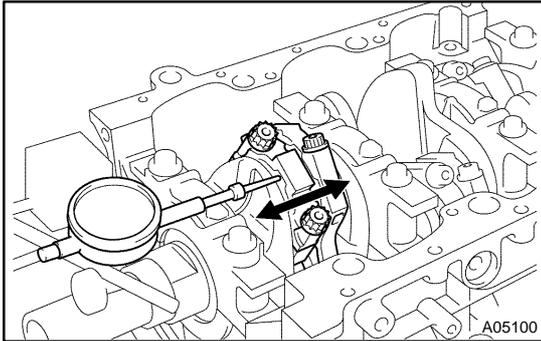


## OVERHAUL

### HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O-rings and oil seals with new parts.



- 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:**

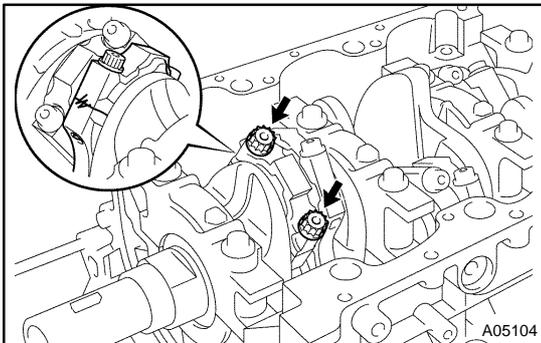
**0.160 - 0.290 mm (0.0063 - 0.0114 in.)**

**Maximum thrust clearance: 0.35 mm (0.0138 in.)**

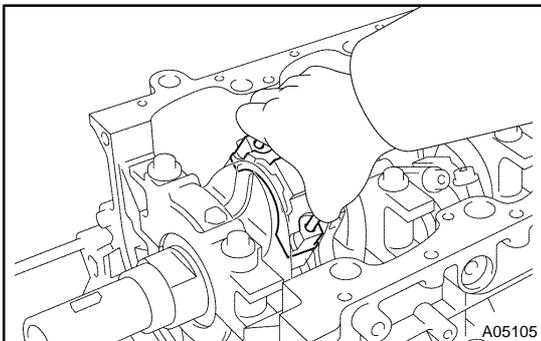
If the thrust clearance is greater than maximum, replace the connecting rod assembly(s). If necessary, replace the crankshaft.

**Connecting rod thickness:**

**22.880 - 22.920 mm (0.9008 - 0.9024 in.)**



- 2. INSPECT CONNECTING ROD OIL CLEARANCE**
  - (a) Check the matchmarks on the connecting rod and cap ensure correct reassembly.
  - (b) Remove the 2 connecting rod cap bolts.

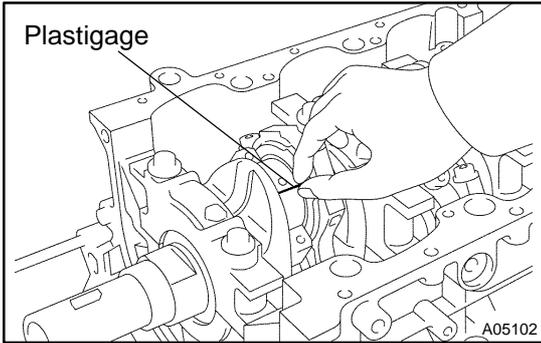


- (c) Using the removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

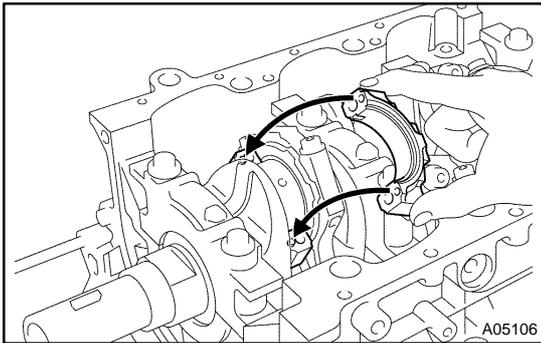
### HINT:

Keep the lower bearing inserted with the connecting rod cap.

- (d) Clean the crank pin and bearing.
- (e) Check the crank pin and bearing for pitting and scratches. If the crank pin or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.

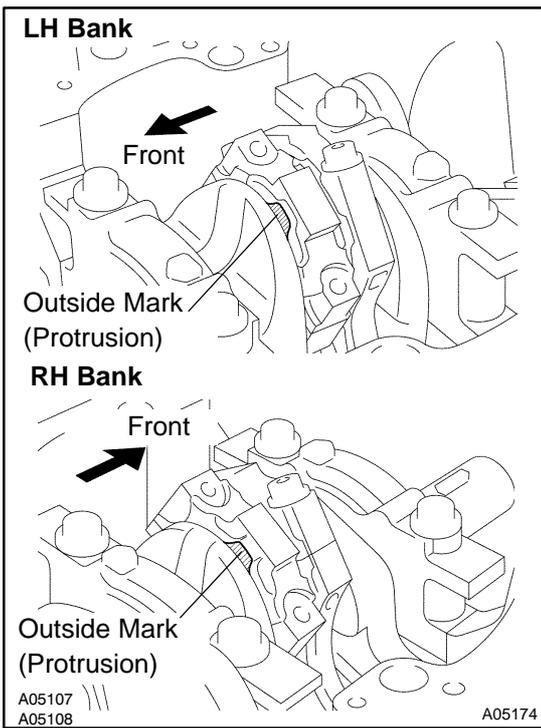


(f) Lay a strip of plastigage across the crank pin.



(g) Match the numbered connecting rod cap with the connecting rod.

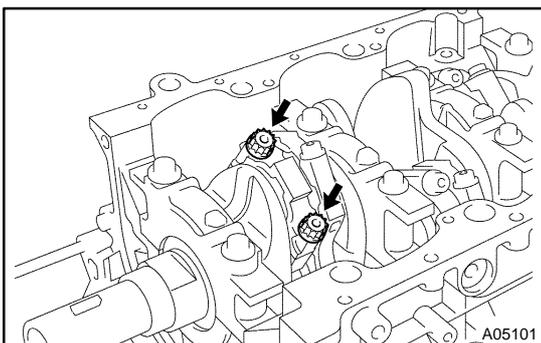
(h) Align the pin groove of the connecting rod cap with the pins of the connecting rod, and install the connecting rod cap.



(i) Check that the outside mark of the connecting rod cap is facing in correct direction.

HINT:

- The connecting rod cap bolts are tightened in 2 progressive steps.
- If any one of the connecting rod cap bolts is broken or deformed, replace it.



(j) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.

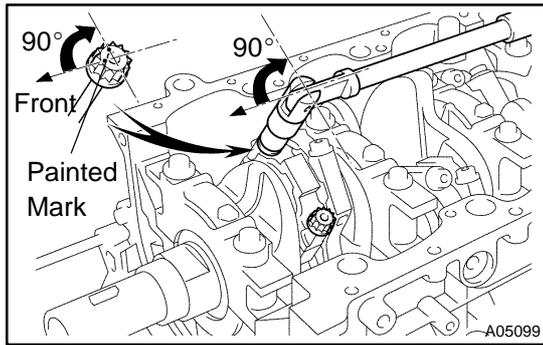
(k) Install and alternately tighten the 2 connecting rod cap bolts in several passes.

**Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)**

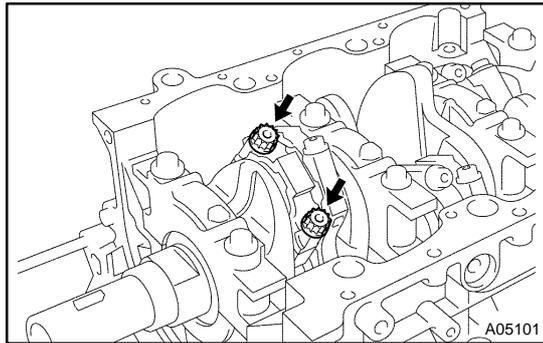
**NOTICE:**

**Do not turn the crankshaft.**

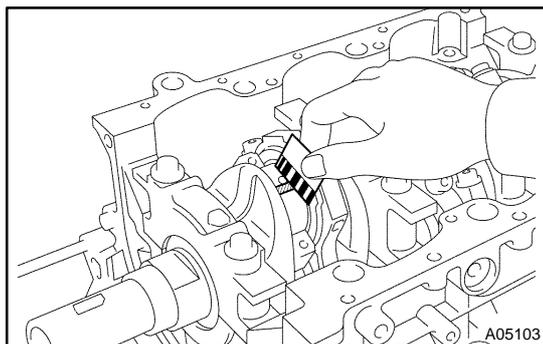
If any one of the connecting rod cap bolts does not meet the torque specification, replace the connecting rod cap bolts.



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



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



- (p) Measure the plastigage at its widest point.

**Standard oil clearance:**

**0.027 - 0.053 mm (0.0011 - 0.0021 in.)**

**Maximum oil clearance: 0.065 mm (0.0026 in.)**

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

**HINT:**

If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the connecting rod cap and crankshaft, then selecting the bearing with the same number as the total. There are 6 sizes of standard bearings, marked "2", "3", "4", "5", "6" and "7".

Item	Number Mark											
	1	1	2	1	2	3	2	3	4	3	4	4
Connecting rod cap	1	1	2	1	2	3	2	3	4	3	4	4
Crankshaft	1	2	1	3	2	1	3	2	1	3	2	3
Use bearing	2	3		4		5		6		7		

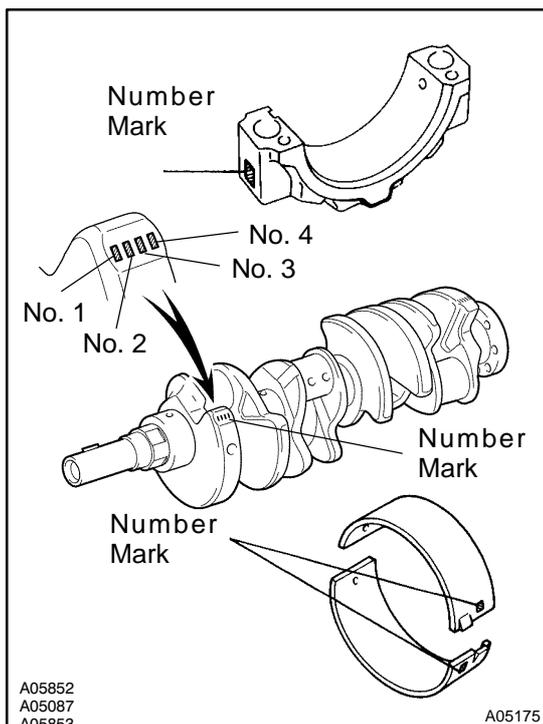
**EXAMPLE:**

Connecting rod cap "3" + Crankshaft "1"  
= Total number 4 (Use bearing "4")

**Reference**

**Connecting rod big end inside diameter:**

Mark "1"	55.000 - 55.006 mm (2.1654 - 2.1656 in.)
Mark "2"	55.006 - 55.012 mm (2.1656 - 2.1658 in.)
Mark "3"	55.012 - 55.018 mm (2.1658 - 2.1661 in.)
Mark "4"	55.018 - 55.024 mm (2.1661 - 2.1663 in.)



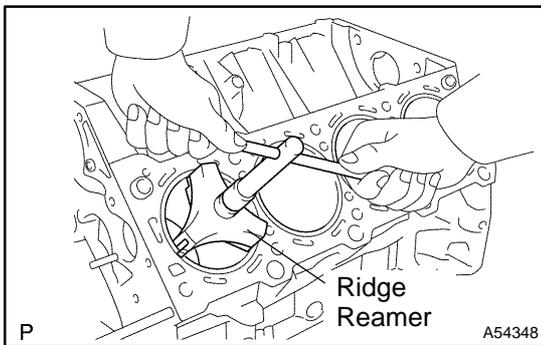
**Crankshaft crank pin diameter:**

Mark "1"	51.994 - 52.000 mm (2.0470 - 2.0472 in.)
Mark "2"	51.988 - 51.994 mm (2.0468 - 2.0470 in.)
Mark "3"	51.982 - 51.988 mm (2.0465 - 2.0468 in.)

**Standard sized bearing center wall thickness:**

Mark "2"	1.484 - 1.487 mm (0.0584 - 0.0585 in.)
Mark "3"	1.487 - 1.490 mm (0.0585 - 0.0587 in.)
Mark "4"	1.490 - 1.493 mm (0.0587 - 0.0588 in.)
Mark "5"	1.493 - 1.496 mm (0.0588 - 0.0589 in.)
Mark "6"	1.496 - 1.499 mm (0.0589 - 0.0590 in.)
Mark "7"	1.499 - 1.502 mm (0.0590 - 0.0591 in.)

(q) Completely remove the plastigage.

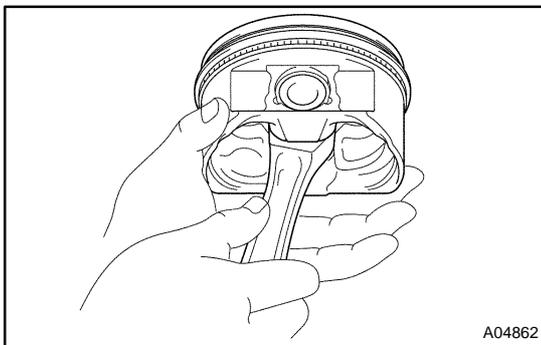


**3. REMOVE PISTON AND CONNECTING ROD**

- (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:**

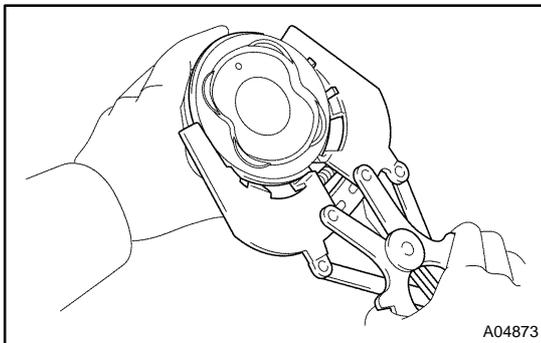
- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.



**4. REMOVE PISTON**

- (a) Check fit between the piston and piston pin.
  - (1) Try to move the piston back and forth on the piston pin.

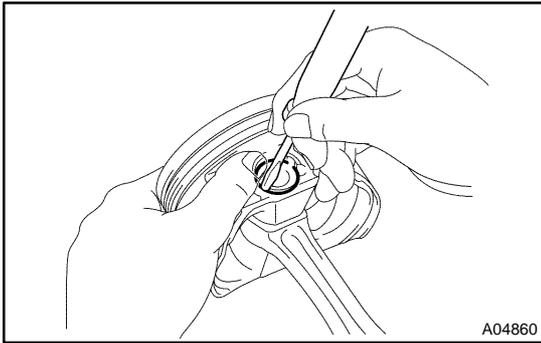
If any movement is felt, replace the piston and pin as a set.



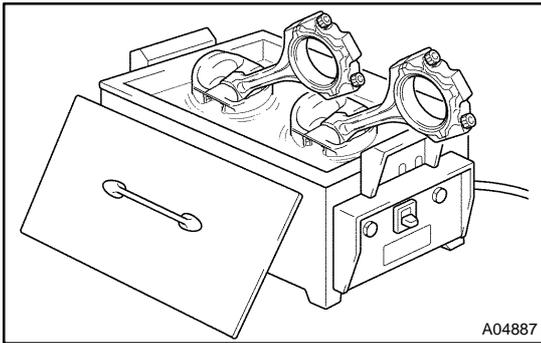
- (b) Using a piston ring expander, remove the 2 compression rings.
- (c) Remove the 2 side rails and oil ring by hand.

**HINT:**

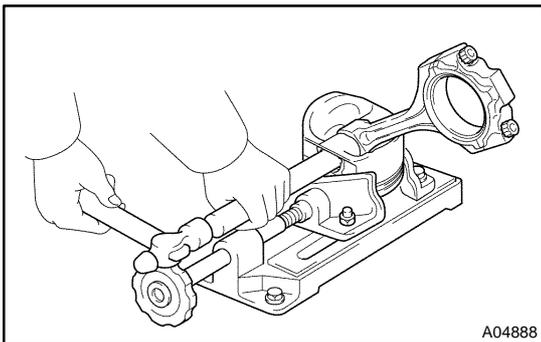
Arrange the piston rings in correct order only.



(d) Using a small screwdriver, pry out the 2 snap rings.



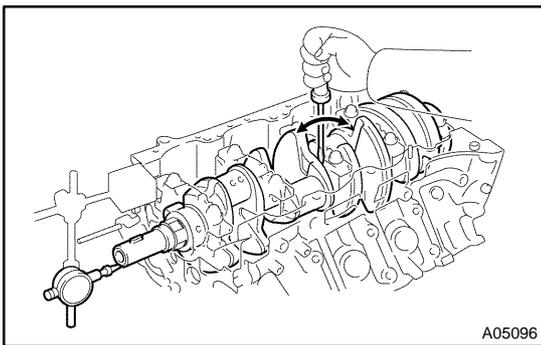
(e) Gradually heat the piston to approx. 60°C (140°F).



(f) 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 correct order.



**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:**

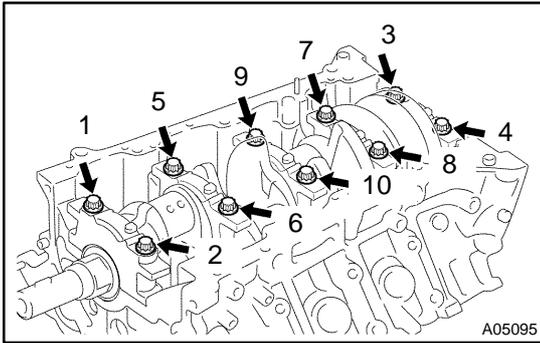
**0.020 - 0.220 mm (0.0008 - 0.0087 in.)**

**Maximum thrust clearance: 0.30 mm (0.0118 in.)**

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

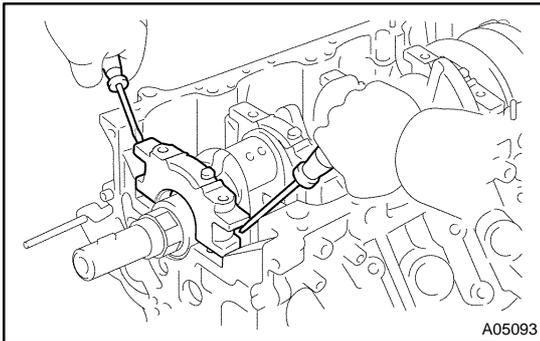
**Thrust washer thickness:**

STD	2.440 - 4.490 mm (0.0961 - 0.0980 in.)
O/S 0.125	2.503 - 2.553 mm (0.0985 - 0.1005 in.)



**6. INSPECT CRANKSHAFT OIL CLEARANCE**

(a) Uniformly loosen and remove the 10 crankshaft bearing cap bolts in several passes, in the sequence shown.



(b) Using 2 screwdrivers, pry out the crankshaft bearing cap, and remove the 5 crankshaft bearing caps, 5 lower bearings and 2 lower thrust washers (No. 3 crankshaft bearing cap only).

**NOTICE:**

**Be careful not to damage the cylinder block.**

**HINT:**

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

(c) Lift out the crankshaft.

(d) Remove the 2 upper thrust washers.

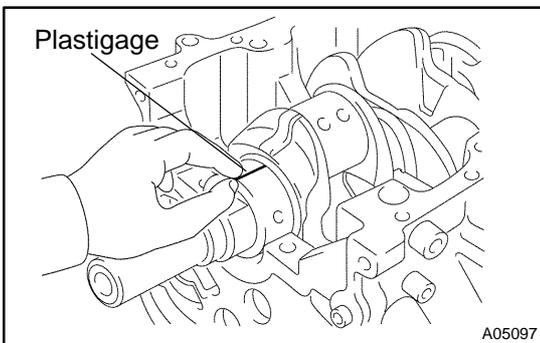
**HINT:**

- Arrange the upper thrust washers in correct order.
- Keep the upper bearings together with the cylinder block.

(e) Clean each crankshaft journal and bearing.

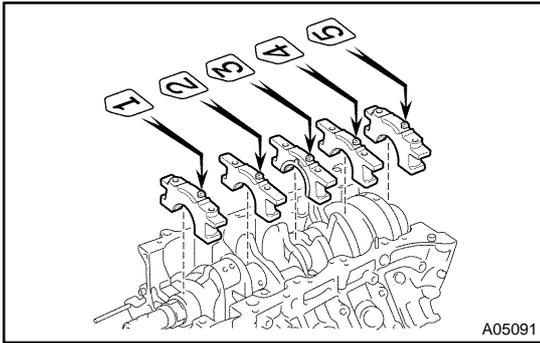
(f) Check each crankshaft journal and bearing for pitting and scratches.

If the journal or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.



(g) Place the crankshaft on the cylinder block.

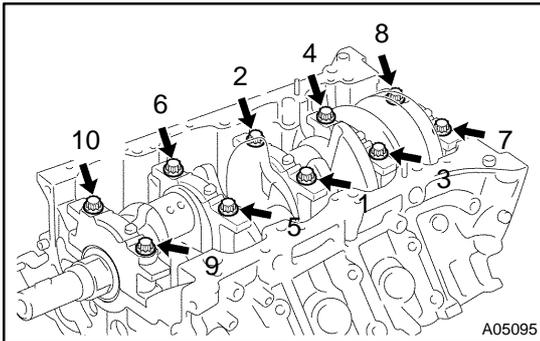
(h) Lay a strip of plastigage across each journal.



- (i) Install the 5 crankshaft bearing caps in their proper locations.

**HINT:**

- The crankshaft bearing cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any one of the main bearing cap bolts is broken or deformed, replace it.



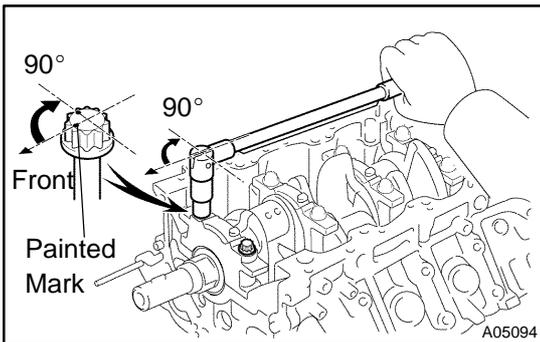
- (j) Apply a light coat of engine oil on the threads and under the crankshaft bearing cap bolts.
- (k) Install and uniformly tighten the 10 crankshaft bearing cap bolts in several passes, in the sequence shown.

**Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)**

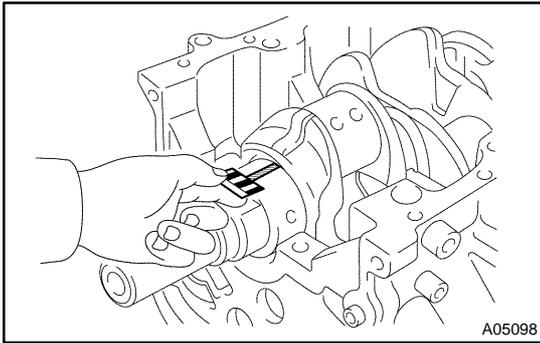
**NOTICE:**

**Do not turn the crankshaft.**

If any one of the crankshaft bearing cap bolts does not meet the torque specification, replace the crankshaft bearing cap bolt.



- (l) Mark the front of the crankshaft bearing cap bolt with paint.
- (m) Retighten the crankshaft bearing cap bolts by 90° in the numerical order shown.
- (n) Check that the painted mark is now at a 90° angle to the front.
- (o) Remove the crankshaft bearing caps.



(p) Measure the plastigage at its widest point.

**Standard clearance:**

No.1 and No.5	0.028 - 0.046 mm (0.0011 - 0.0018 in.)
Others	0.040 - 0.058 mm (0.0016 - 0.0023 in.)

**Maximum clearance:**

No.1 and No.5	0.065 mm (0.0026 in.)
Others	0.065 mm (0.0026 in.)

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

**HINT:**

If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then refer to the table below for the appropriate bearing number. There are 5 sizes of the standard bearings. For No. 1 and No. 5 position bearings, use bearings marked "3", "4", "5", "6" and "7". For others position bearings, use bearings marked "1", "2", "3", "4" and "5".

**No. 1, No. 5:**

—		Use bearing
Cylinder block (A) + Crankshaft (B)	0 - 5	3
	6 - 11	4
	12 - 17	5
	18 - 23	6
	24 - 28	7

**EXAMPLE:**

Cylinder block "08" + Crankshaft "06" =  
Total number 14 (Use bearing "5")

**Others:**

—		Use bearing
Cylinder block (A) + Crankshaft (B)	0 - 5	1
	6 - 11	2
	12 - 17	3
	18 - 23	4
	24 - 28	5

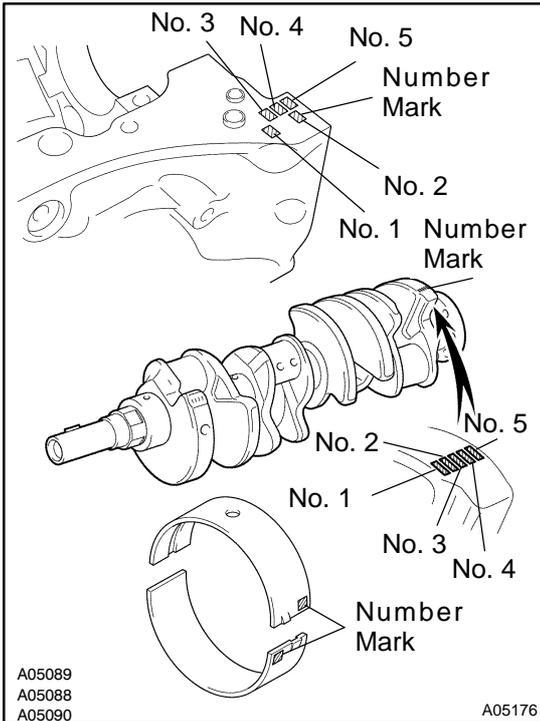
**EXAMPLE:**

Cylinder block "08" + Crankshaft "06" =  
Total number 14 (Use bearing "3")

**Reference**

**Cylinder block crankshaft journal bore diameter (A):**

Mark "00"	72.000 mm (2.8347 in.)
Mark "01"	72.001 mm (2.8347 in.)
Mark "02"	72.002 mm (2.8347 in.)
Mark "03"	72.003 mm (2.8348 in.)
Mark "04"	72.004 mm (2.8348 in.)
Mark "05"	72.005 mm (2.8348 in.)
Mark "06"	72.006 mm (2.8349 in.)
Mark "07"	72.007 mm (2.8349 in.)



A05089  
A05088  
A05090

A05176

Mark "08"	72.008 mm (2.8350 in.)
Mark "09"	72.009 mm (2.8350 in.)
Mark "10"	72.010 mm (2.8350 in.)
Mark "11"	72.011 mm (2.8351 in.)
Mark "12"	72.012 mm (2.8351 in.)
Mark "13"	72.013 mm (2.8352 in.)
Mark "14"	72.014 mm (2.8352 in.)
Mark "15"	72.015 mm (2.8352 in.)
Mark "16"	72.016 mm (2.8353 in.)

**Crankshaft journal diameter (B):**

Mark "00"	67.000 mm (2.6378 in.)
Mark "01"	66.999 mm (2.6378 in.)
Mark "02"	66.998 mm (2.6377 in.)
Mark "03"	66.997 mm (2.6377 in.)
Mark "04"	66.996 mm (2.6376 in.)
Mark "05"	66.995 mm (2.6376 in.)
Mark "06"	66.994 mm (2.6376 in.)
Mark "07"	66.993 mm (2.6375 in.)
Mark "08"	66.992 mm (2.6375 in.)
Mark "09"	66.991 mm (2.6374 in.)
Mark "10"	66.990 mm (2.6374 in.)
Mark "11"	66.989 mm (2.6374 in.)
Mark "12"	66.988 mm (2.6373 in.)

**Standard bearing center wall thickness:  
No. 1 and No. 5**

Mark "3"	2.487 - 2.490 mm (0.0979 - 0.0980 in.)
Mark "4"	2.490 - 2.493 mm (0.0980 - 0.0982 in.)
Mark "5"	2.493 - 2.496 mm (0.0982 - 0.0983 in.)
Mark "6"	2.496 - 2.499 mm (0.0983 - 0.0984 in.)
Mark "7"	2.499 - 2.502 mm (0.0984 - 0.0985 in.)

**Others**

Mark "1"	2.481 - 2.484 mm (0.0977 - 0.0978 in.)
Mark "2"	2.484 - 2.487 mm (0.0978 - 0.0979 in.)
Mark "3"	2.487 - 2.490 mm (0.0979 - 0.0980 in.)
Mark "4"	2.490 - 2.493 mm (0.0980 - 0.0982 in.)
Mark "5"	2.493 - 2.496 mm (0.0982 - 0.0983 in.)

(q) Completely remove the plastigage.

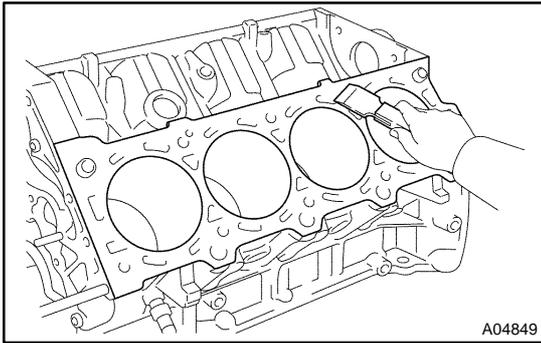
**7. REMOVE CRANKSHAFT**

- (a) Lift up the crankshaft.
- (b) Remove the 5 upper crankshaft bearings and 2 upper thrust washers from the cylinder block.

**HINT:**

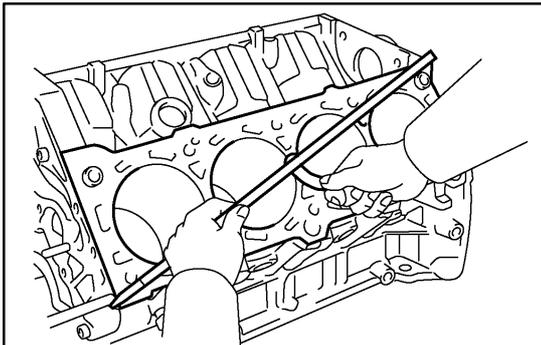
Arrange the crankshaft bearing caps, bearings and thrust washers in correct order.

**8. REMOVE CRANKSHAFT PULLEY SET CRANKSHAFT KEY**



**9. CLEAN CYLINDER BLOCK SUB-ASSY**

- (a) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.
- (b) Using a soft brush and solvent, thoroughly clean the cylinder block.



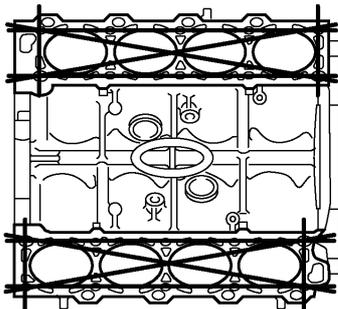
**10. INSPECT BLOCK S/A, W/PIN,PISTON**

- (a) Inspect for flatness.
  - (1) Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head and crankshaft bearing cap for warpage.

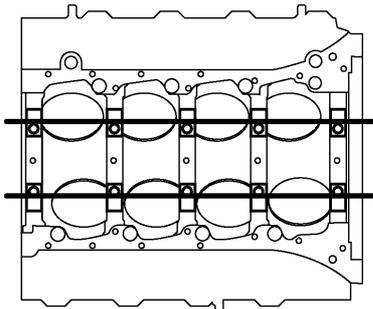
**Maximum warpage: 0.07 mm (0.0028 in.)**

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

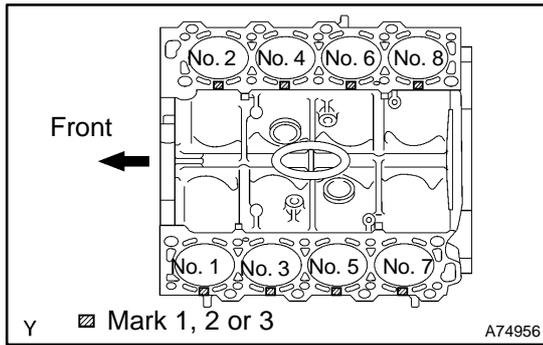
**Cylinder Head Side**



**Crankshaft Bearing Cap Side**



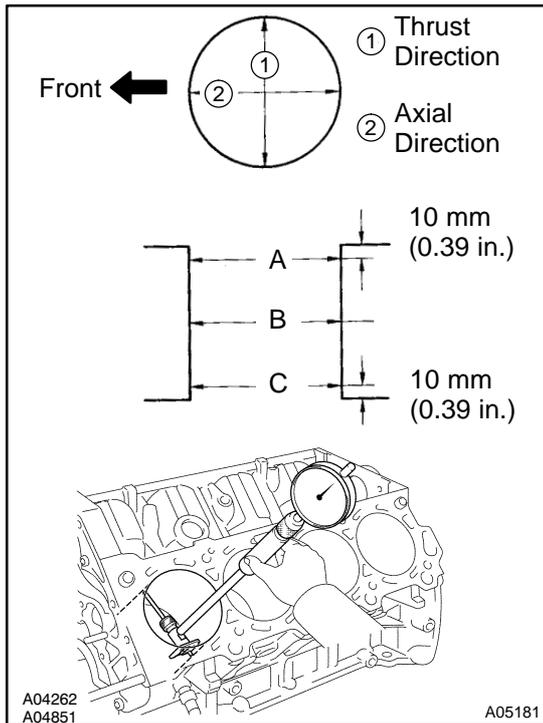
- (b) Visually check the cylinder for vertical scratches. If deep scratches are present, rebore all the 8 cylinders and replace all the 8 pistons. If necessary, replace the cylinder block.



(c) Inspect the cylinder bore diameter.

HINT:

There are 3 sizes of the standard cylinder bore diameter, marked "1", "2" and "3" accordingly. The mark is stamped on the top of the cylinder block.



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

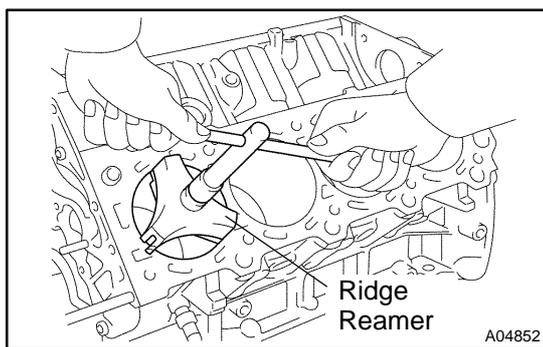
**Standard diameter:**

STD	Mark "1"	94.002 - 94.010 mm (3.7009 - 3.7012 in.)
	Mark "2"	94.010 - 94.023 mm (3.7012 - 3.7017 in.)
	Mark "3"	94.023 - 94.031 mm (3.7017 - 3.7020 in.)

**Maximum diameter: 94.230 mm (3.5917 in.)**

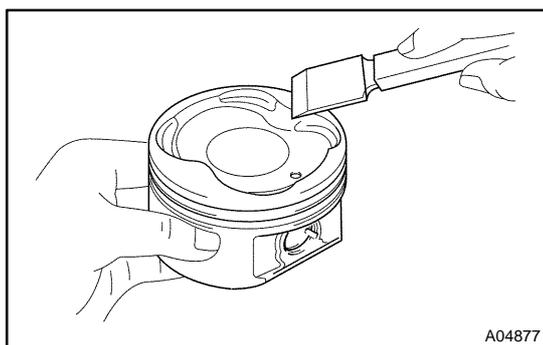
STD	94.231 mm (3.7099 in.)
O/S 0.50	94.731 mm (3.7296 in.)

If the diameter is greater than maximum, rebore all the 8 cylinders and replace all the 8 pistons. If necessary, replace the cylinder block.



(d) Remove the cylinder ridge.

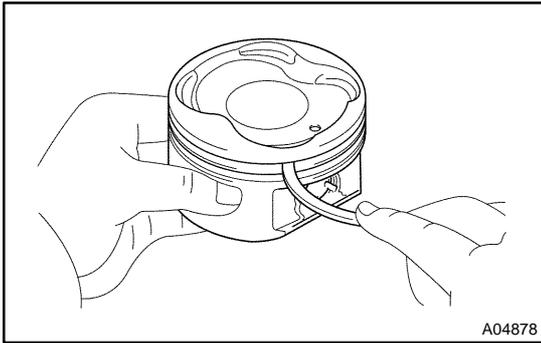
If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.



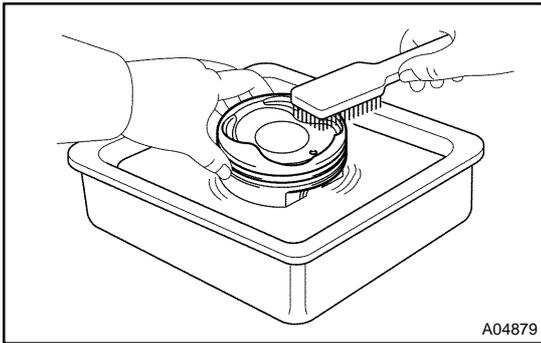
**11. INSPECT PISTON**

(a) Clean the piston.

(1) Using a gasket scraper, remove the carbon from the piston top.

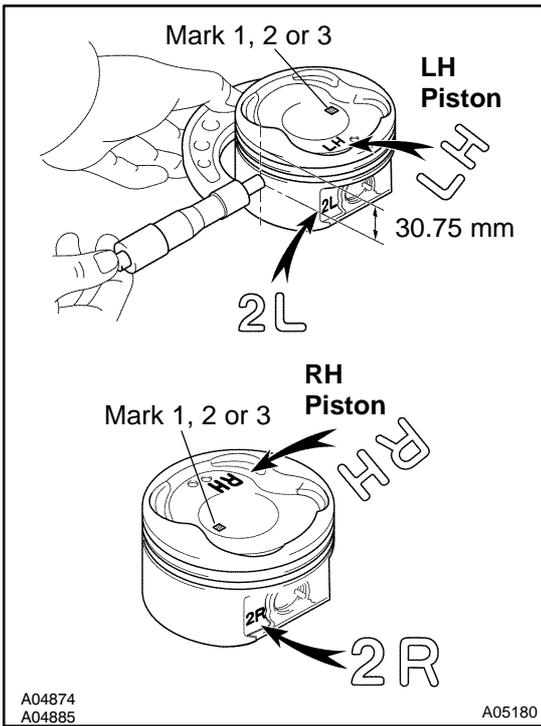


- (2) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



- (3) Using solvent and a brush, thoroughly clean the piston.

**NOTICE:**  
Do not use a wire brush.



- (b) Inspect the piston oil clearance.

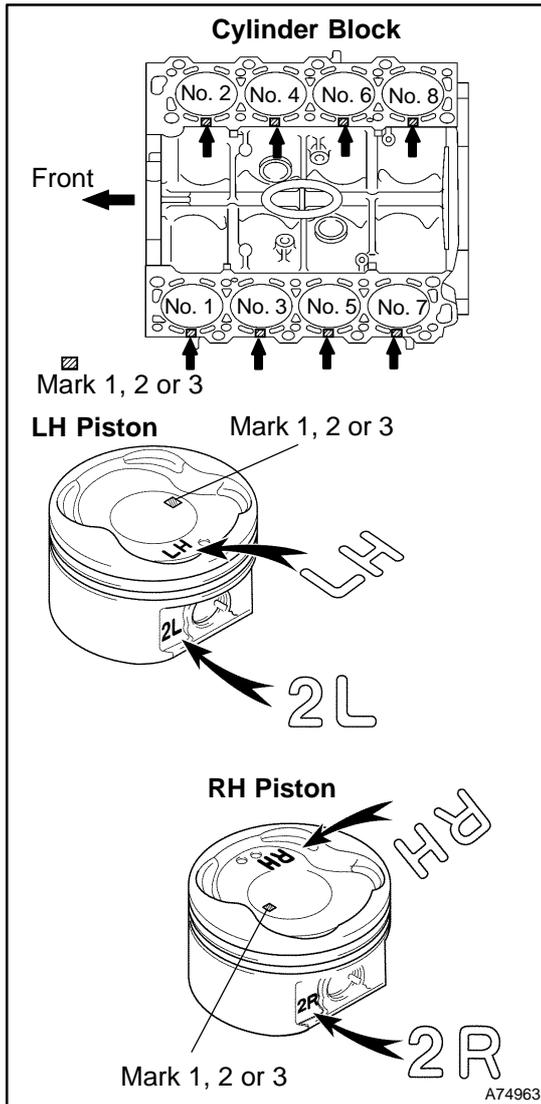
**HINT:**

There are 3 sizes of the standard piston diameter, marked "1", "2" and "3" accordingly. The mark is stamped on the piston top.

- (1) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 30.75 mm (1.2106 in.) from the piston head.

**Piston diameter:**

STD	Mark "1"	93.902 - 93.912 mm (3.6969 - 3.6973 in.)
	Mark "2"	93.912 - 93.920 mm (3.6973 - 3.6976 in.)
	Mark "3"	93.920 - 93.930 mm (3.6976 - 3.6980 in.)
O/S 0.50		94.402 - 94.430 mm (3.7168 - 3.7177 in.)



- (2) Measure the cylinder bore diameter in the thrust directions.
- (3) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

**Standard oil clearance:**

**0.090 - 0.111 mm (0.0035 - 0.0044 in.)**

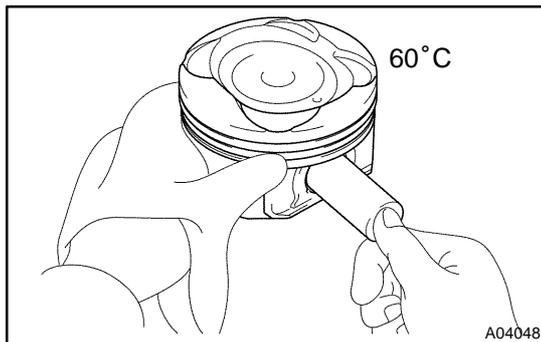
**Maximum oil clearance: 0.13 mm (0.0051 in.)**

If the oil clearance is greater than maximum, replace all the 8 pistons and rebore all the 8 cylinders. If necessary, replace the cylinder block.

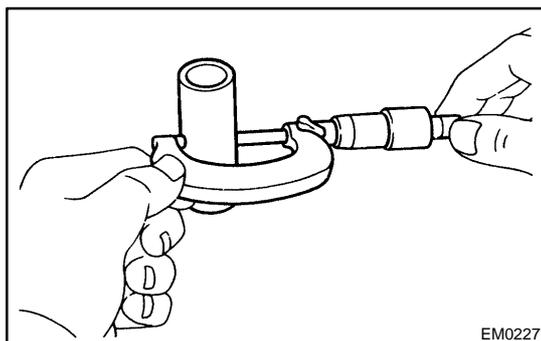
**HINT:**

Use a new cylinder block:

- Use a piston with the same number mark as the cylinder diameter marked on the cylinder block.
- The shape of the piston varies for the LH and RH banks. The LH piston is marked with "LH" and "2L", the RH piston with "RH" and "2R".

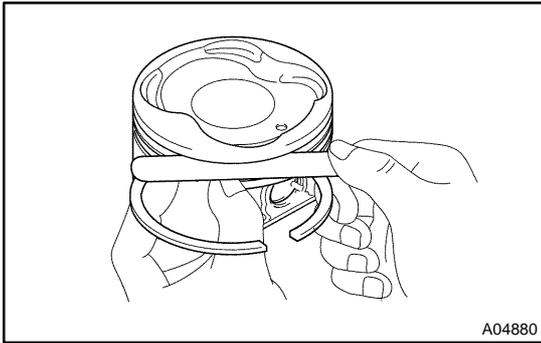


- (c) Inspect the piston pin fit.
  - (1) At 60°C (140°F), you should be able to push the piston pin into the piston pin hole with your thumb.



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

**Piston pin diameter:**  
**21.997 - 22.009 mm (0.8660 - 0.8664 in.)**



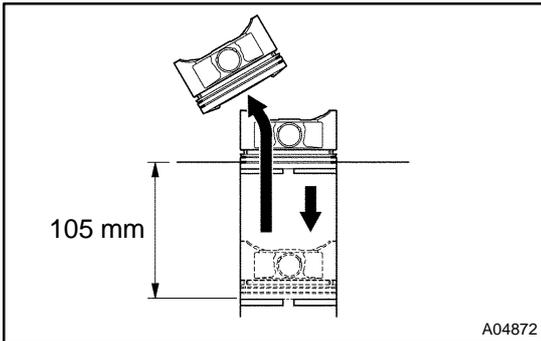
**12. INSPECT PISTON RING SET**

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

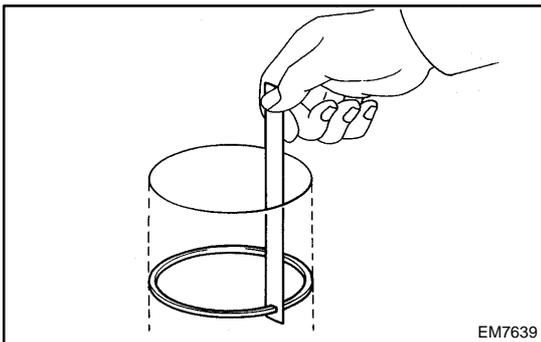
**Ring groove clearance:**

No.1	0.030 - 0.080 mm (0.0012 - 0.0032 in.)
No.2	0.030 - 0.070 mm (0.0012 - 0.0028 in.)

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



- (b) Inspect the piston ring end gap.
  - (1) Insert the piston ring into the cylinder bore.
  - (2) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 105 mm (4.13 in.) from the top of the cylinder block.



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

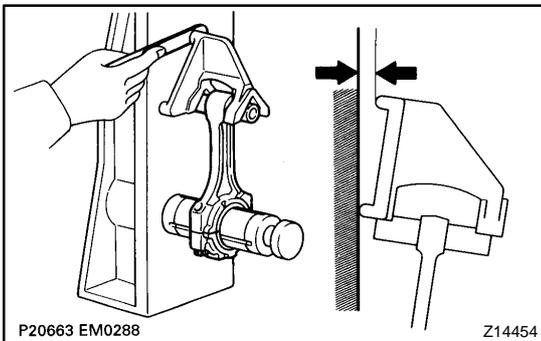
**Standard end gap:**

No. 1	0.300 - 0.400 mm (0.0118 - 0.0158 in.)
No. 2	0.400 - 0.550 mm (0.0158 - 0.0217 in.)
Oil (Side rail)	0.130 - 0.380 mm (0.0051 - 0.0150 in.)

**Maximum end gap:**

No. 1	1.10 mm (0.0433 in.)
No. 2	1.20 mm (0.0472 in.)
Oil (Side rail)	1.15 mm (0.0453 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, rebore all the 8 cylinders or replace the cylinder block sub-assy.



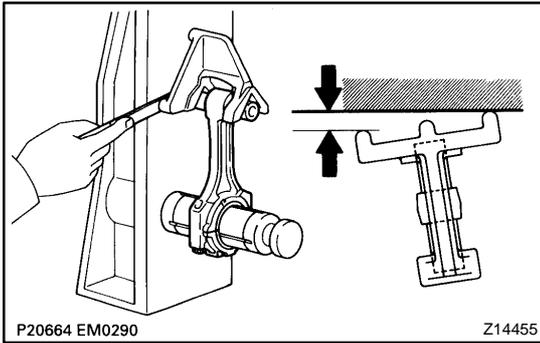
**13. INSPECT CONNECTING ROD SUB-ASSY**

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

**Maximum bend:**

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

If bend is greater than maximum, replace the connecting rod sub-assy .

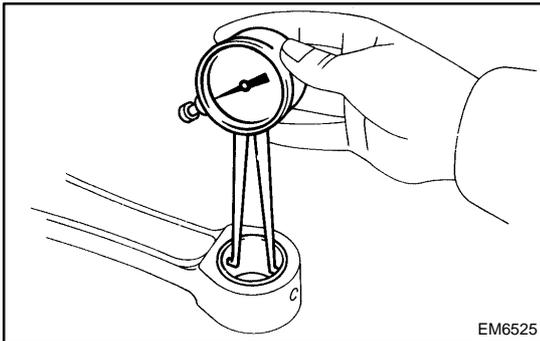


(2) Check for twist

**Maximum twist:**

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

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

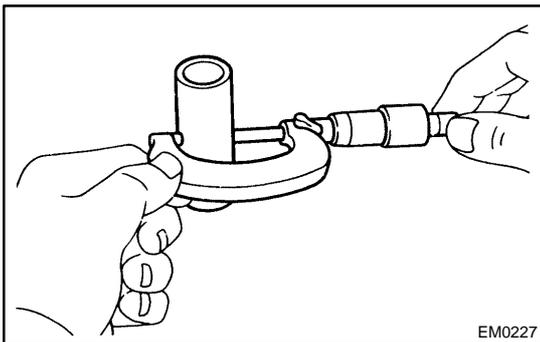


(b) Inspect the piston pin oil clearance.

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

**Bushing inside diameter:**

**22.005 - 22.014 mm (0.8663 - 0.8667 in.)**



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

**Piston pin diameter:**

**21.997 - 22.009 mm (0.8660 - 0.8664 in.)**

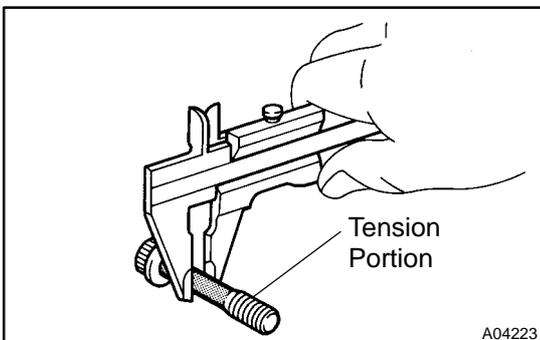
(3) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

**Standard oil clearance:**

**0.005 - 0.011 mm (0.0002 - 0.0004 in.)**

**Maximum oil clearance: 0.05 mm (0.0020 in.)**

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



#### 14. INSPECT CONNECTING ROD BOLT

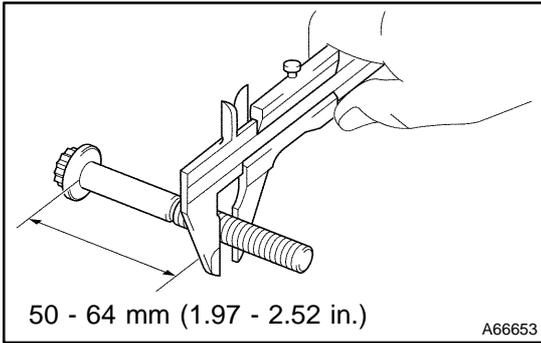
(a) Using vernier calipers, measure the tension portion of the connecting rod bolt.

**Standard diameter:**

**7.200 - 7.300 mm (0.2835 - 0.2874 in.)**

**Minimum diameter: 7.00 mm (0.2756 in.)**

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



**15. INSPECT CRANKSHAFT BEARING CAP BOLT**

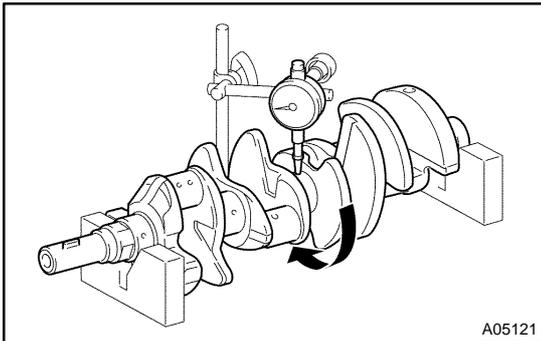
- (a) Using vernier calipers, measure the thread outside diameter of the crankshaft bearing cap bolt.

**Standard diameter:**

**10.760 - 10.970 mm (0.4236 - 0.4319 in.)**

**Minimum diameter: 10.40 mm (0.4094 in.)**

If the diameter is less than minimum, replace the cap bolt.



**16. INSPECT CRANKSHAFT**

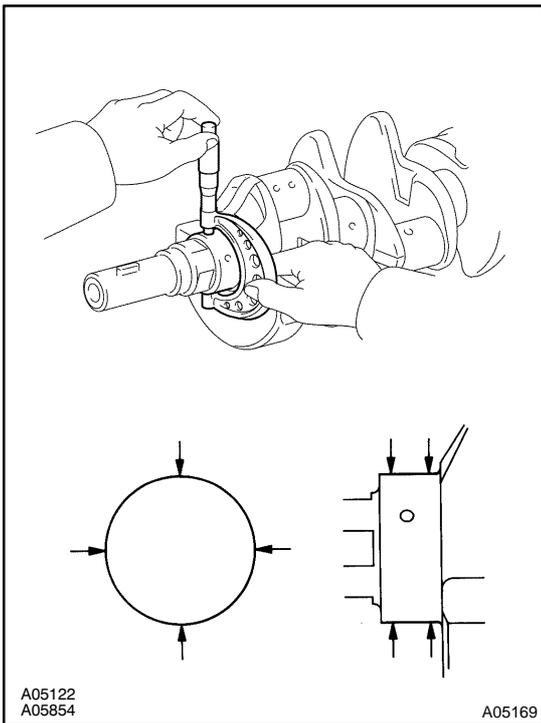
- (a) Inspect for circle runout.

- (1) Place the crankshaft on V-blocks.

- (2) Using a dial indicator, measure the circle runout at the center journal.

**Maximum circle runout: 0.08 mm (0.0031 in.)**

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



- (b) Inspect the crankshaft journals and crank pins.

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

**Crankshaft journal diameter:**

**66.988 - 67.000 mm (2.6373 - 2.6378 in.)**

**Crank pin diameter:**

**51.982 - 52.000 mm (2.0465 - 2.0472 in.)**

If the diameter is not as specified, check the oil clearance. If necessary, replace the crankshaft.

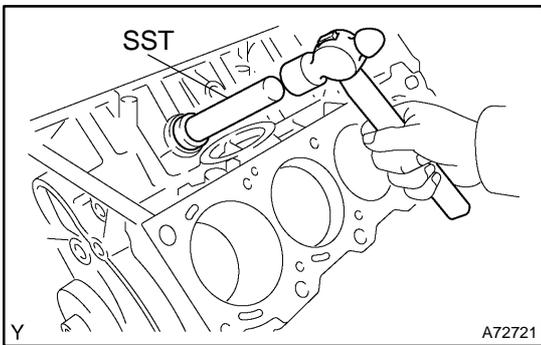
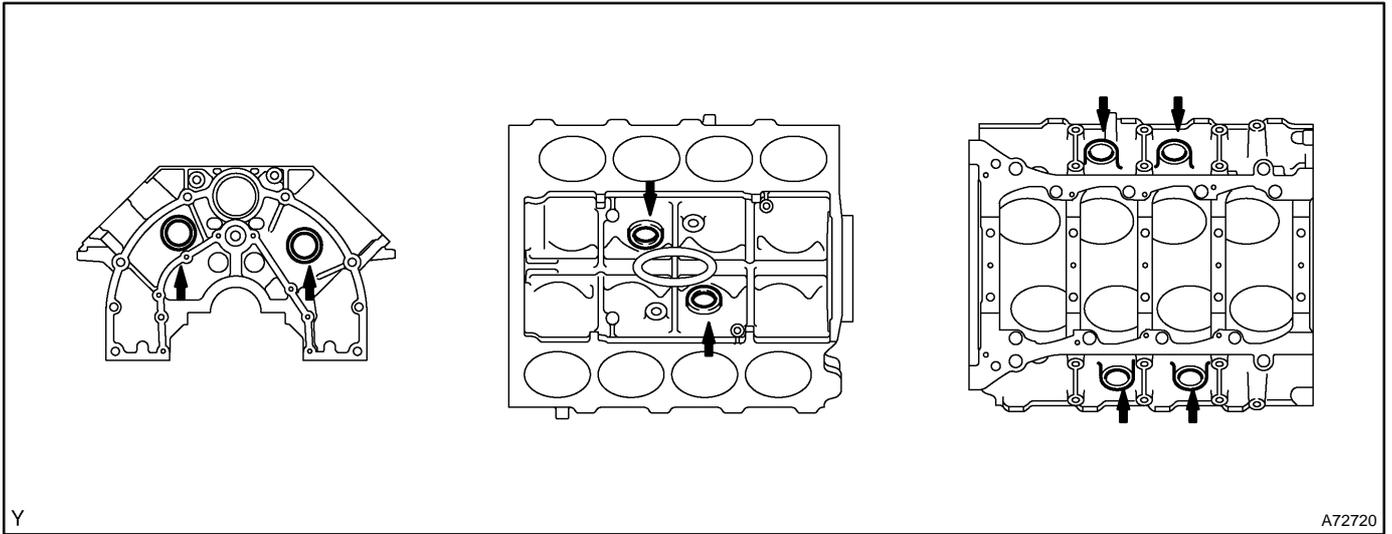
- (2) Check each crankshaft journal and crank pin for taper and out-of-round as shown.

**Maximum taper and out-of-round:**

**0.02 mm (0.0008 in.)**

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

17. INSTALL TIGHT PLUG



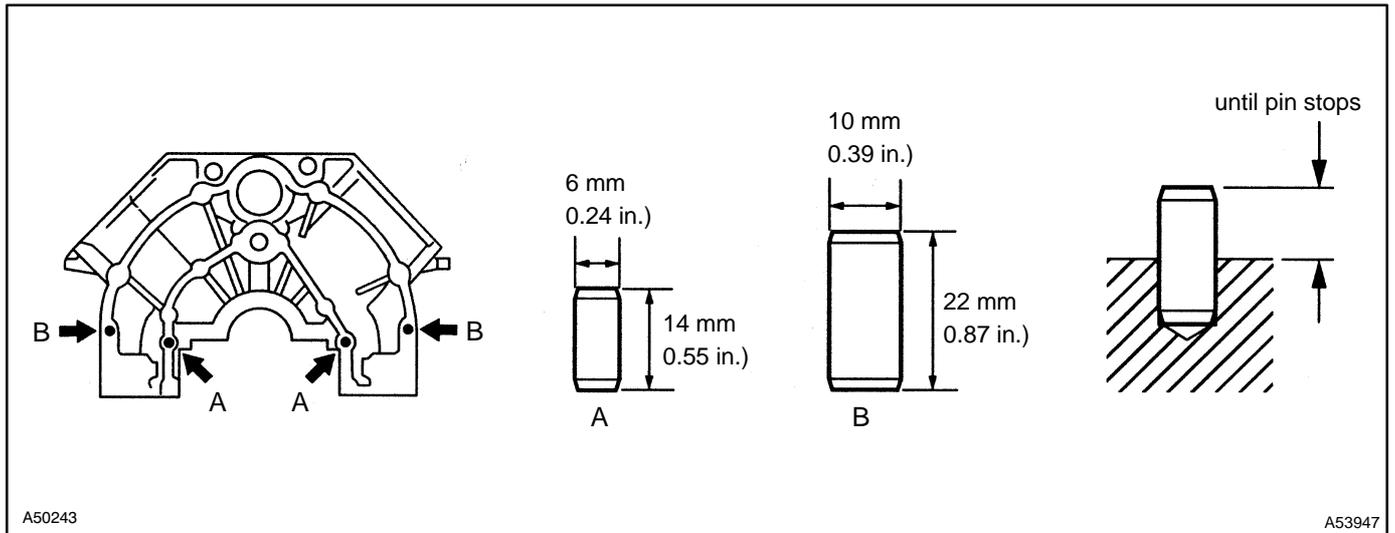
- (a) Apply adhesive to the tight plug.  
**Adhesive:**  
**Part No. 08833-00070, THREE BOND 1324 or equivalent**
- (b) Using SST and a hammer, tap in a new tight plug as shown in the illustration.  
SST 09950-60010 (09951-00350), 09950-70010 (09951-07100)

18. INSTALL STUD BOLT

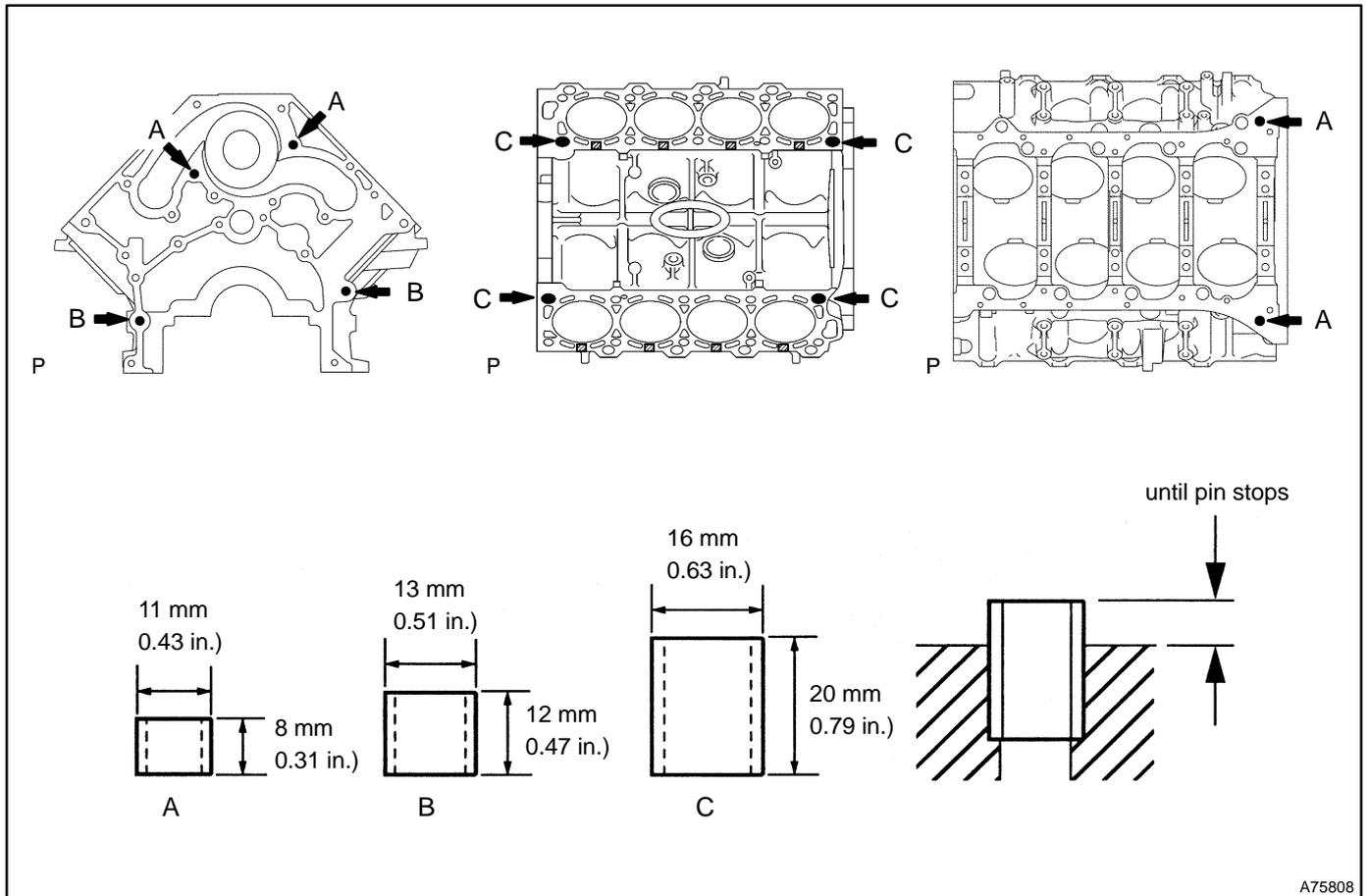
**Torque:**  
 8.0 N·m (80 kgf·cm, 71 in.-lbf) for A  
 20 N·m (200 kgf·cm, 14 ft·lbf) for B  
 20 N·m (200 kgf·cm, 14 in.-lbf) for C  
 12 N·m (120 kgf·cm, 9 ft·lbf) for D  
 14 N·m (145 kgf·cm, 10 ft·lbf) for E

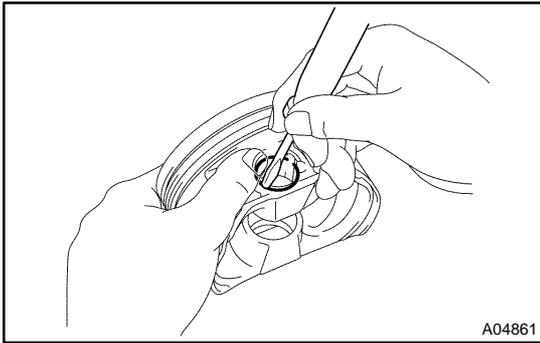
**Stud Bolt A:** 15 mm (0.59 in.) top section, 120 mm (4.72 in.) total length, 15 mm (0.59 in.) bottom section. (Thread diameter: 8 mm)  
**Stud Bolt B and C:** 16 mm (0.63 in.) top section, 116 mm (4.57 in.) total length, 35 mm (1.38 in.) bottom section. (Thread diameter: 10 mm)  
**Stud Bolt D:** 12 mm (0.47 in.) top section, 20 mm (0.79 in.) middle section, 37 mm (1.46 in.) total length. (Thread diameter: 8 mm)  
**Stud Bolt E:** 14 mm (0.55 in.) top section, 32 mm (1.26 in.) middle section, 15 mm (0.59 in.) bottom section. (Thread diameter: 8 mm)

19. INSTALL STRAIGHT PIN

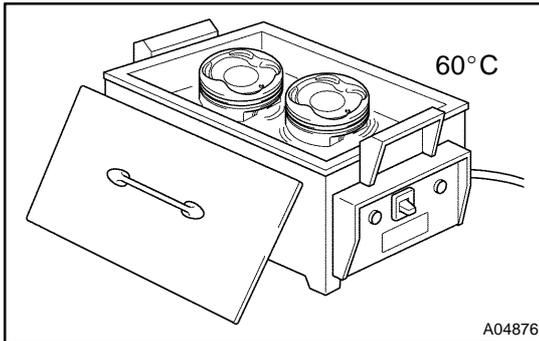


20. INSTALL RING PIN

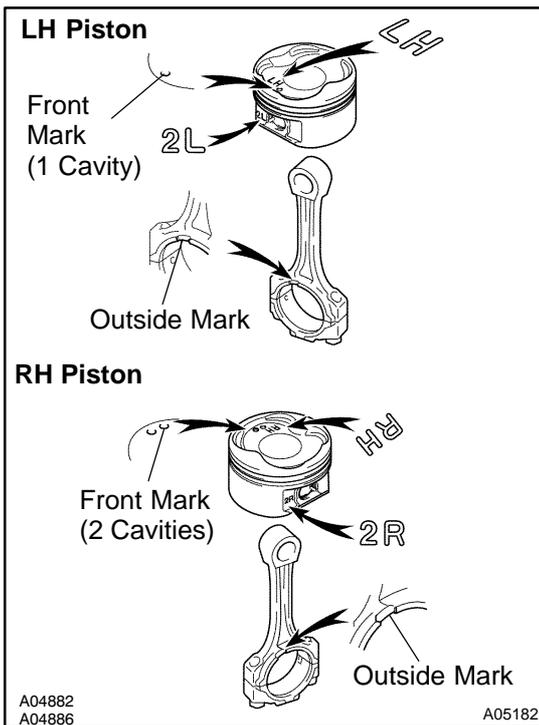


**21. INSTALL PISTON**

- (a) Using a small screwdriver, install a new snap ring on one side of the piston pin hole.



- (b) Gradually heat the piston to about 60°C (140°F).



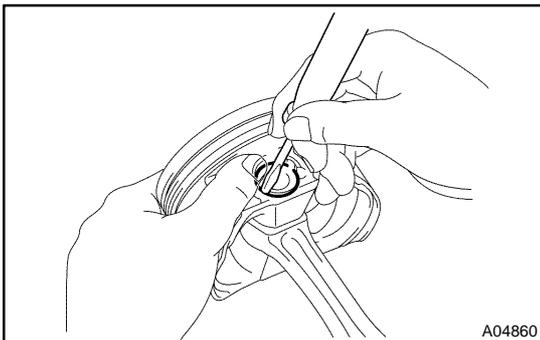
- (c) Coat the piston pin with engine oil.

- (d) Position the piston front mark with respect to the outside mark on the connecting rod as shown in the illustration.

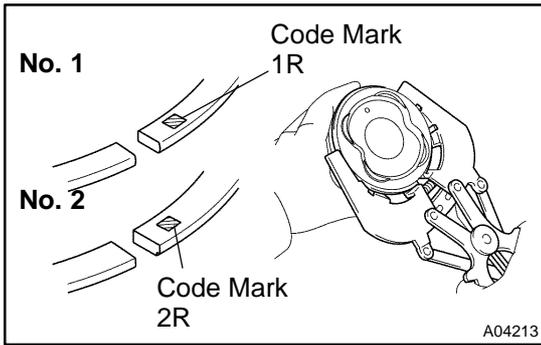
**NOTICE:**

The installation directions of the piston and connecting rod are different for the LH and RH banks. The LH piston is marked with "LH" and "2L", the RH piston with "RH" and "2R".

- (e) Align the piston pin holes of the piston and connecting rod, and push in the piston pin with your thumb.



- (f) Using a small screwdriver, install a new snap ring on the other side of the piston pin hole.

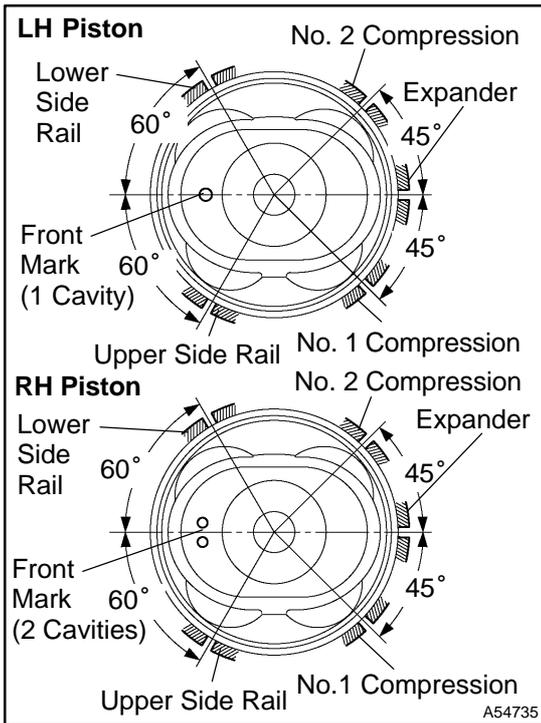


**22. INSTALL PISTON RING SET**

- (a) Install the oil ring expander and 2 side rails by hand.
- (b) Using a piston ring expander, install the 2 compression rings with the code mark facing upward.

**Code mark:**

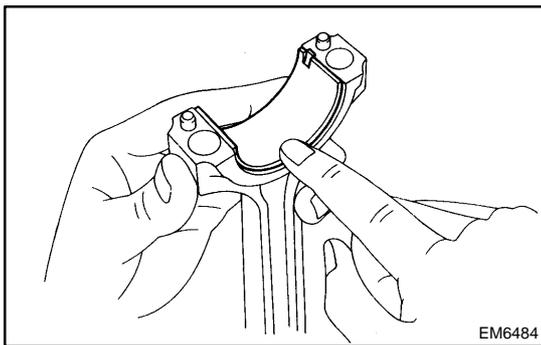
No. 1	1R
No. 2	2R



- (c) Position the piston rings so that the ring ends are as shown.

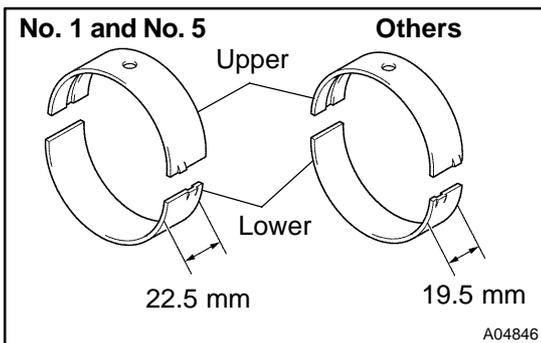
**NOTICE:**

**Do not align the ring ends.**



**23. INSTALL CONNECTING ROD BEARING**

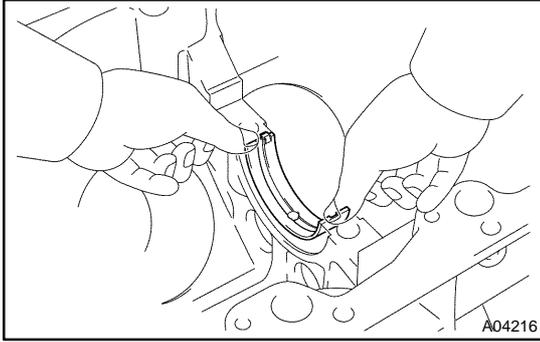
- (a) Align the bearing claw with the groove of the connecting rod or connecting cap.
- (b) Install the bearings in the connecting rod and connecting rod cap.



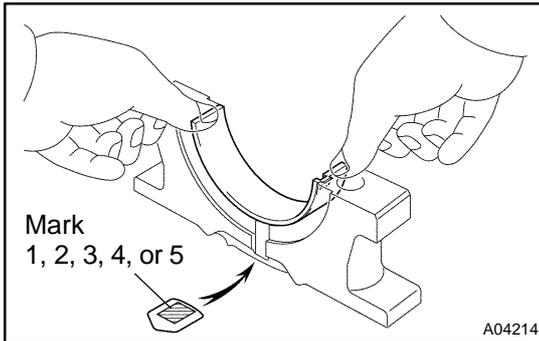
**24. INSTALL CRANKSHAFT BEARING**

**HINT:**

- Main bearings come in widths of 19.5 mm (0.768 in.) and 22.5 mm (0.886 in.). Install the 22.5 mm (0.886 in.) bearings in the No. 1 and No. 5 cylinder block journal positions with the crankshaft bearing cap. Install the 19.5 mm (0.768 in.) bearings in the other positions.
- Upper bearings have an oil groove and oil holes; lower bearings do not.



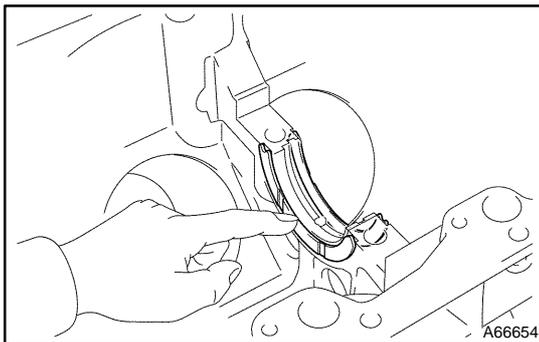
- (a) Align the bearing claw with the claw groove of the cylinder block, and push in the 5 upper bearings.



- (b) Align the bearing claw with the claw groove of the crankshaft bearing cap, and push in the 5 lower bearings.

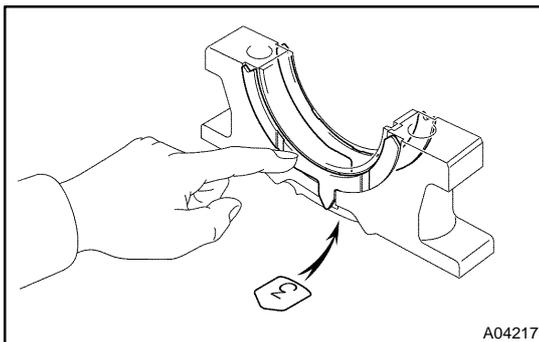
**HINT:**

A number is marked on each bearing cap to indicate the installation position.



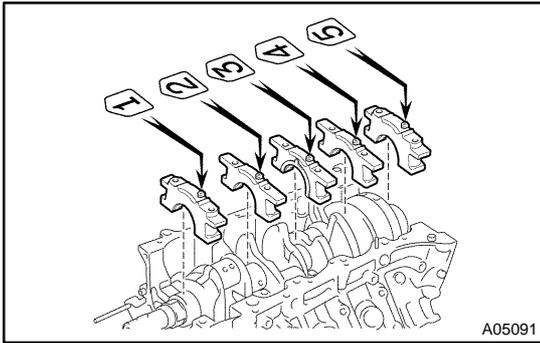
**25. INSTALL CRANKSHAFT THRUST WASHER SET**

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



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

**26. INSTALL CRANKSHAFT PULLEY SET CRANKSHAFT KEY**



**27. INSTALL CRANKSHAFT**

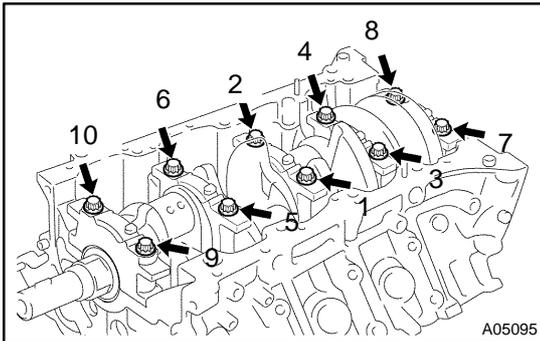
- (a) Place the crankshaft on the cylinder block.
- (b) Install the 5 crankshaft bearing caps in their proper locations.

**HINT:**

Place the bearing caps level and let them return to their original position by their own weight.

**NOTICE:**

**Do not install the bearing cap by tapping it.**



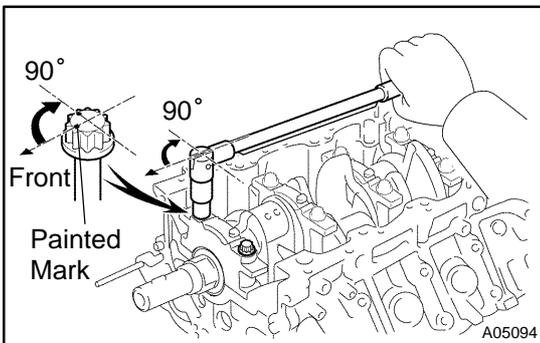
- (c) Install the crankshaft bearing cap bolts.

**HINT:**

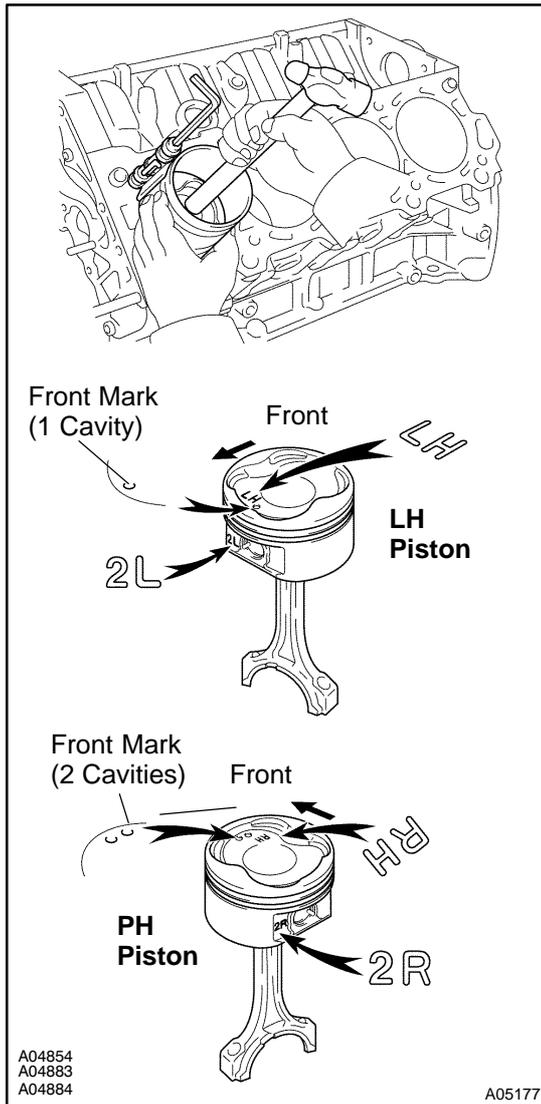
- The bearing cap bolts are tightened in 2 progressive steps.
  - If any one of the bearing cap bolts is broken or deformed, replace it.
- (1) Apply a light coat of engine oil on the threads and under the crankshaft bearing cap bolts.
  - (2) Install and uniformly tighten the 10 crankshaft bearing cap bolts in several passes, in the sequence shown.

**Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)**

If any one of the bearing cap bolts does not meet the torque specification, replace the bearing cap bolt.



- (3) Mark the front of the crankshaft bearing cap bolt with paint.
- (4) Retighten the crankshaft bearing cap bolts by 90° in the numerical order shown.
- (5) Check that the painted mark is now at a 90° angle to the front.
- (6) Install a new seal washer to the crankshaft bearing cap bolt.
- (7) Check that the crankshaft turns smoothly.

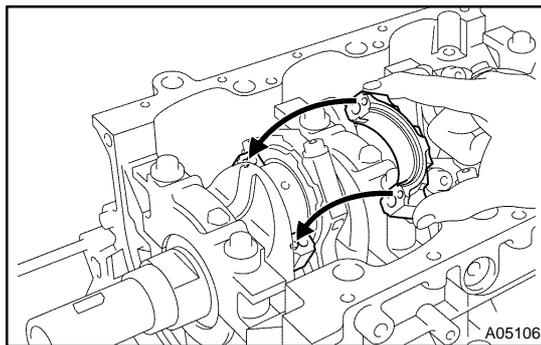


## 28. INSTALL PISTON AND CONNECTING ROD

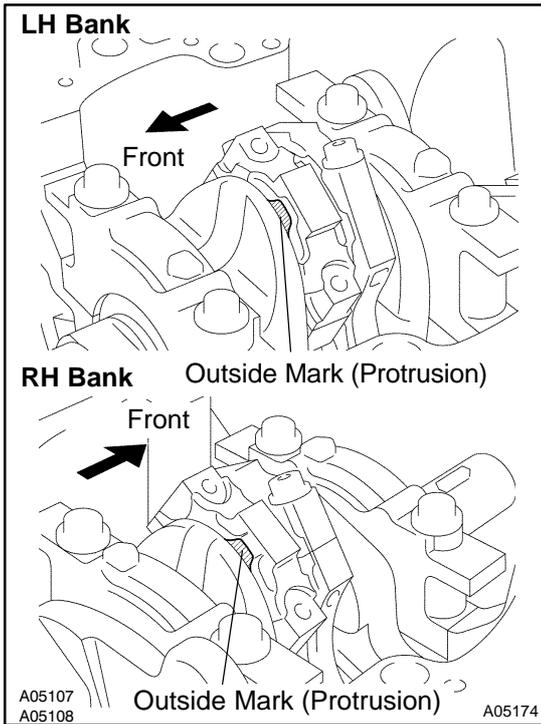
- (a) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.

### NOTICE:

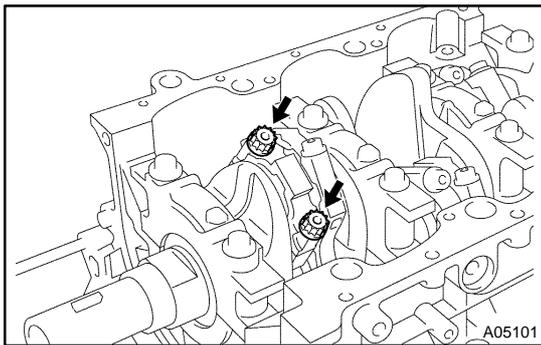
The shape of the piston varies for the LH and RH banks. The LH piston is marked with "LH" and "2L", the RH piston with "RH" and "2R".



- (b) Place the connecting rod cap on the connecting rod.
- (1) Match the numbered connecting rod cap with the connecting rod.
  - (2) Align the pin groove of the connecting rod cap with the pins of the connecting rod, and install the connecting rod cap.



- (3) Check that the outside mark of the connecting rod cap is facing in correct direction.



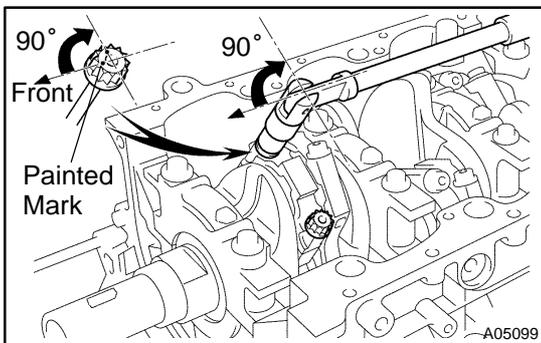
- (c) Install the connecting rod cap bolts.

**HINT:**

- The connecting rod cap bolts are tightened in 2 progressive steps.
  - If any one of the connecting rod cap bolts is broken or deformed, replace it.
- (1) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.
  - (2) Install and alternately tighten the 2 connecting rod cap bolts in several passes.

**Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)**

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



- (3) Mark the front of the connecting cap bolt with paint.
  - (4) Retighten the cap bolts 90° as shown.
  - (5) Check that the painted mark is now at a 90° angle to the front.
- (d) Check that the crankshaft turns smoothly.