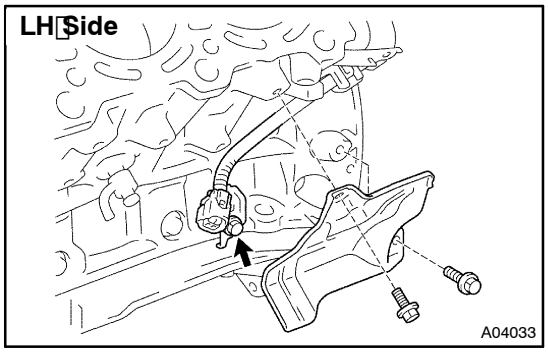
EM0EA–03

DISASSEMBLY

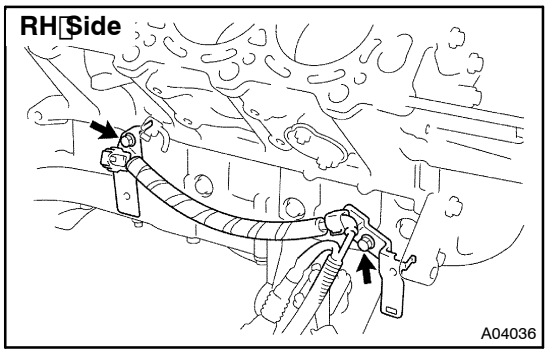
1. INSTALL ENGINE TO ENGINE STAND
2. REMOVE TIMING BELT AND PULLEYS (See page EM–18)
3. REMOVE CYLINDER HEAD (See page EM–40)
4. REMOVE RH ENGINE MOUNTING BRACKET
5. REMOVE LH ENGINE MOUNTING BRACKET
6. REMOVE STARTER (See page ST–5)
7. REMOVE KNOCK SENSORS (See page FI–76)



8. REMOVE ENGINE WIRE

(a) Disconnect the crankshaft position sensor connector.

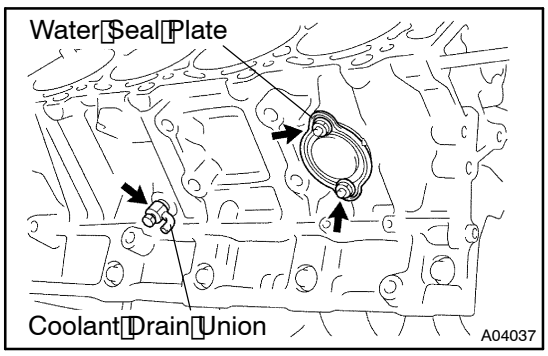
(b) Remove the 2 bolts and engine wire cover from the LH side of the cylinder block.



(c) Remove the 2 bolts, and disconnect the engine wire from the RH side of the cylinder block.

(d) Remove the bolt and engine wire.

9. REMOVE WATER PUMP (See page CO–7)
10. REMOVE NO.2 OIL PAN (See page LU–9)
11. REMOVE OIL PAN BAFFLE PLATE
12. REMOVE NO.1 OIL PAN (See page LU–9)
13. REMOVE OIL STRAINER
14. REMOVE OIL PUMP (See page LU–9)

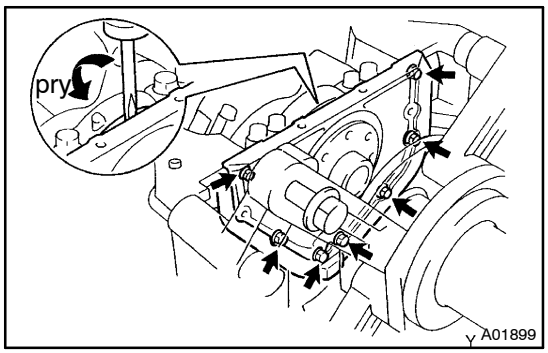


15. REMOVE WATER SEAL PLATE

Remove the 2 nuts and seal plate.

16. REMOVE ENGINE COOLANT DRAIN UNIONS

Remove the RH and LH drain unions.

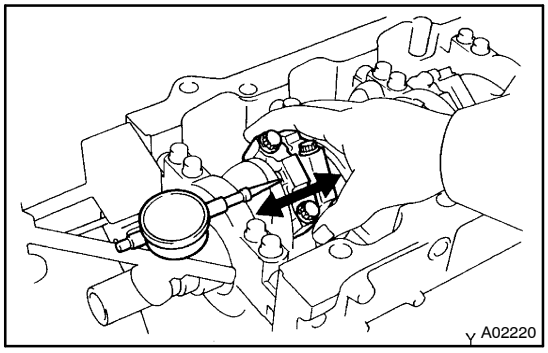


17. REMOVE REAR OIL SEAL RETAINER

(a) Remove the 7 bolts.

(b) Using a screwdriver, remove the oil seal retainer by prying the portions between the oil seal retainer and main bearing cap.

(c) Remove the O–ring.



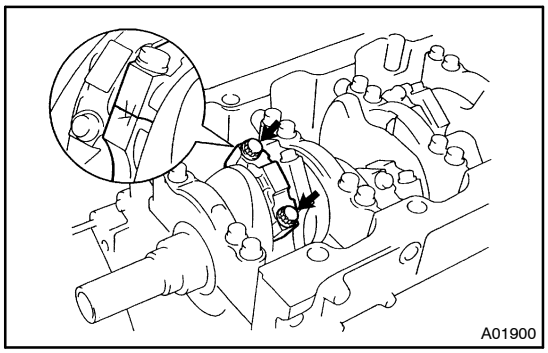
18. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back an forth.

Standard thrust clearance:
0.160 – 0.290 mm (0.0063 – 0.0138 in.)
Maximum thrust clearance: 0.35 mm (0.0138 in.)

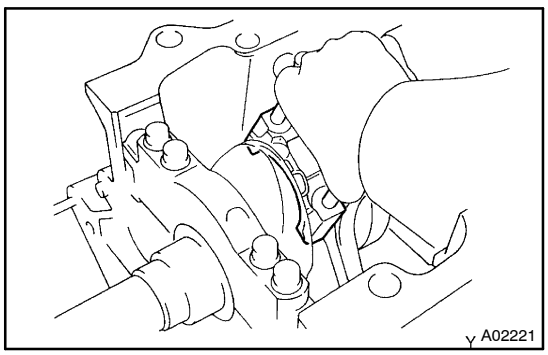
If the thrust clearance is greater than maximum, replace the connecting rod assembly(s). If necessary, replace the crankshaft.

Connecting rod thickness:
22.880 – 22.920 mm (0.9008 – 0.9024 in.)



19. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

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

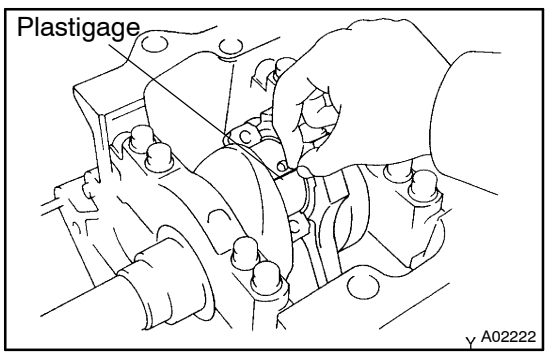


(c) Using the 2 removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

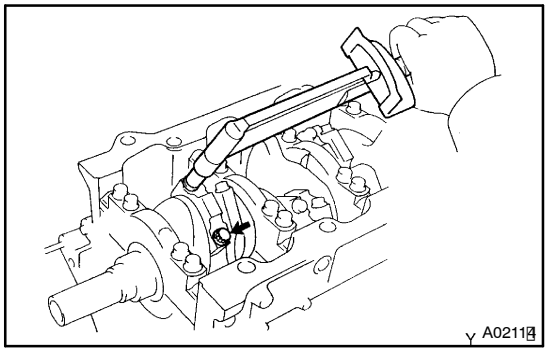
HINT:
Keep the lower bearing inserted with the connecting rod cap.

(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.

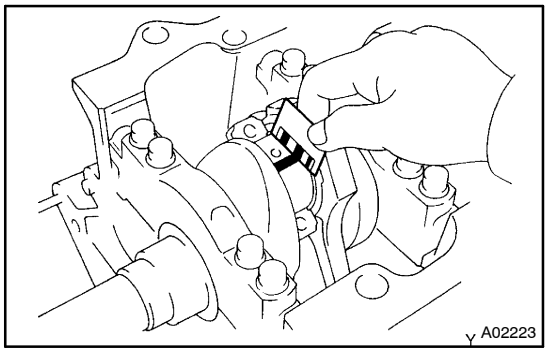


(g) Install the connecting rod cap with the 2 bolts (See page EM–115).

NOTICE:

Do not turn the crankshaft.

(h) Remove the 2 bolts, connecting rod cap and lower bearing (See procedure (b) and (c) above).



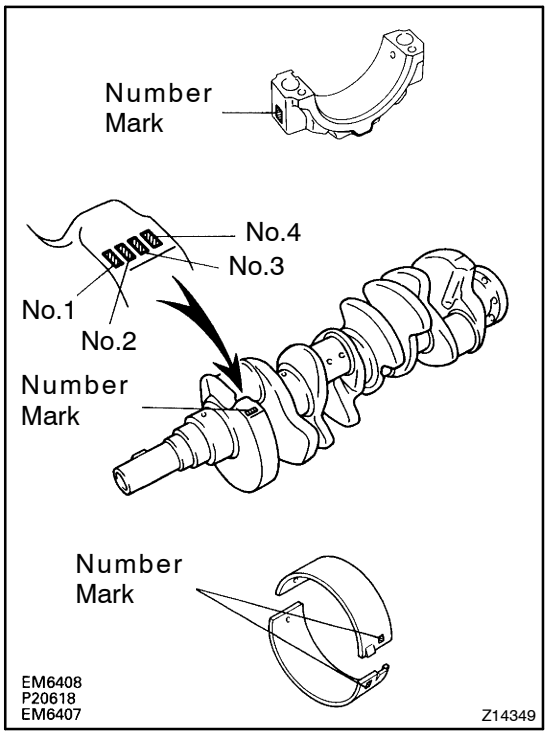
(i) Measure the Plastigage at its widest point.

Standard oil clearance:

0.021 – 0.047 mm (0.0008 – 0.0019 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".

	Number mark											
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.)

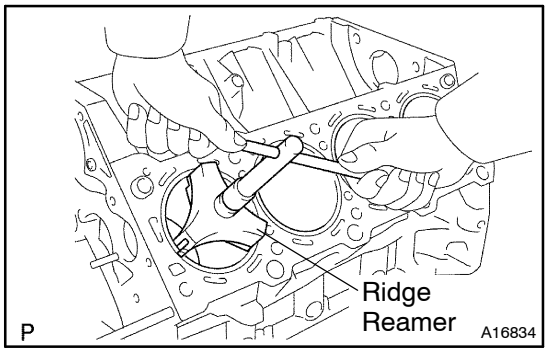
Crankshaft crank pin diameter:

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"	1.487 – 1.490 mm (0.0585 – 0.0587 in.)
Mark "3"	1.490 – 1.493 mm (0.0587 – 0.0588 in.)
Mark "4"	1.493 – 1.496 mm (0.0588 – 0.0589 in.)
Mark "5"	1.496 – 1.499 mm (0.0589 – 0.0590 in.)
Mark "6"	1.499 – 1.502 mm (0.0590 – 0.0591 in.)
Mark "7"	1.502 – 1.505 mm (0.0591 – 0.0593 in.)

(j) Completely remove the Plastigage.



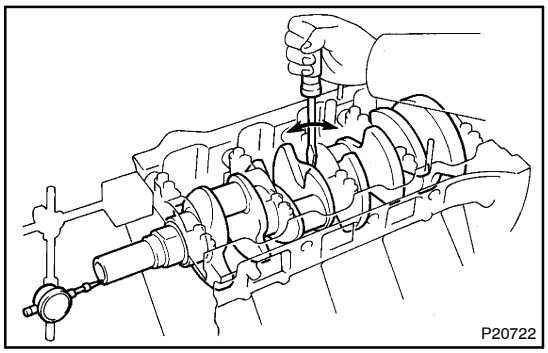
20. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

(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.



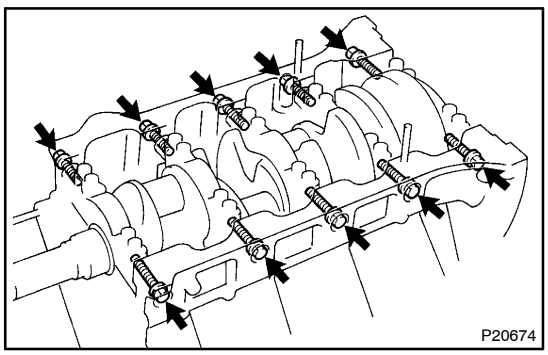
21. CHECK CRANKSHAFT THRUST CLEARANCE

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.)

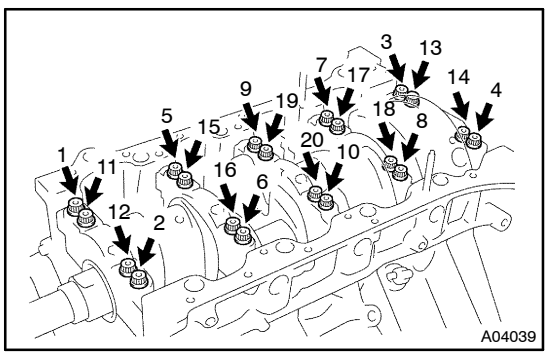
If the thrust clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer thickness:
2.440 – 2.490 mm (0.0961 – 0.0980 in.)

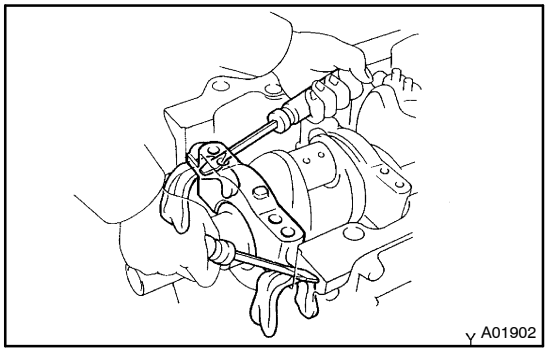


22. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

(a) Remove the 10 main bearing cap bolts.



(b) Uniformly loosen and remove the 20 main bearing cap bolts in several passes, in the sequence shown.



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

NOTICE:

Be careful not to damage the cylinder block.

HINT:

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

(d) Lift out the crankshaft.

(e) Remove the 2 upper thrust washers.

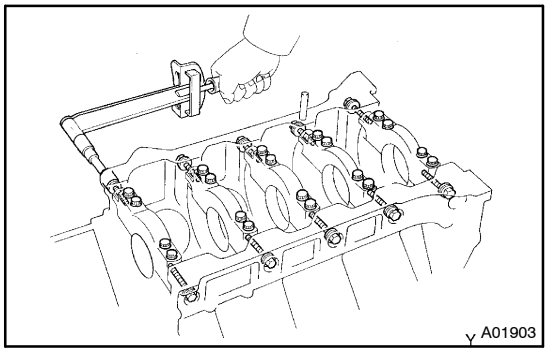
HINT:

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

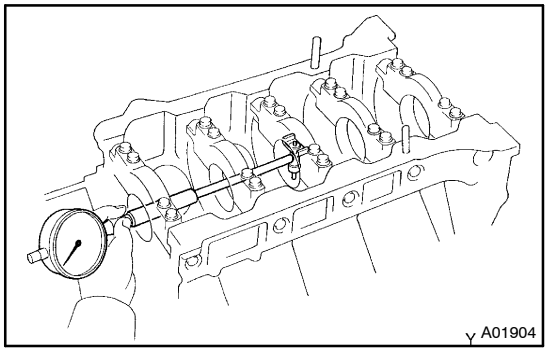
(f) Clean each main journal and bearing.

(g) Check each main journal and bearing for pitting and scratches.

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



(h) Install the 10 main bearings and 5 main bearing caps with the 30 bolts. Do not install the crankshaft (See page EM–115).



(i) Using a cylinder gauge, measure the inside diameter of the main bearing.

Bearing inside diameter:

66.986 – 67.000 mm (2.6372 – 2.6378 in.)

(j) Measure the diameter of the main journal (See page EM–105)

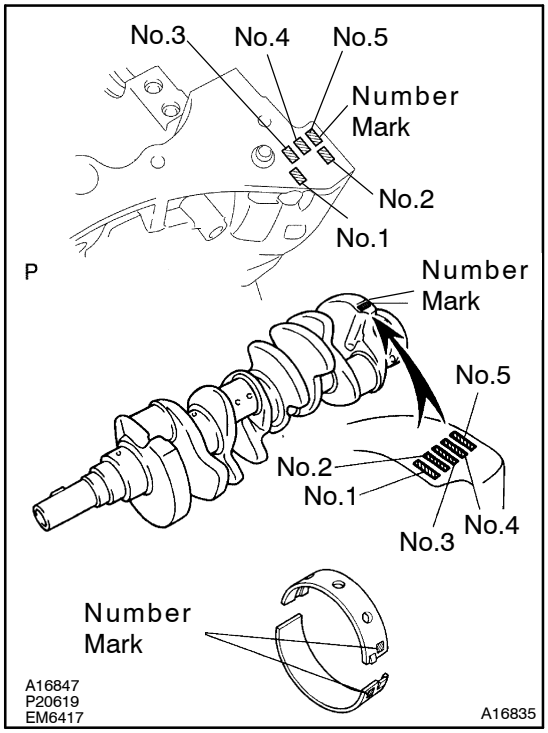
(k) Subtract the main journal diameter measurement from the main bearing inside diameter measurement.

Standard clearance:

No.1 and No.5	0.017 – 0.033 mm (0.0007 – 0.0013 in.)
Others	0.029 – 0.045 mm (0.0011 – 0.0018 in.)

Maximum clearance:

No.1 and No.5	0.043 mm (0.0017 in.)
Others	0.055 mm (0.0022 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	
		Upper	Lower
Cylinder block (A) + Crankshaft (B)	0 – 5	3	3
	6 – 8	3	4
	9 – 11	4	4
	12 – 14	4	5
	15 – 17	5	5
	18 – 20	5	6
	21 – 23	6	6
	24 – 26	6	7
	27 – 28	7	7

EXAMPLE:
Cylinder block ”08” + Crankshaft ”06”
= Total number 14 (Use bearing ”4” (Upper), ”5” (Lower))

Others:

		Use bearing	
		Upper	Lower
Cylinder block (A) + Crankshaft (B)	0 – 5	1	1
	6 – 8	1	2
	9 – 11	2	2
	12 – 14	2	3
	15 – 17	3	3
	18 – 20	3	4
	21 – 23	4	4
	24 – 26	4	5
	27 – 28	5	5

EXAMPLE:
Cylinder block ”08” + Crankshaft ”06”
= Total number 14 (Use bearing ”2” (Upper), ”3” (Lower))

Reference

Cylinder block main journal bore diameter (A):

Mark ”00”	72.000 mm (2.8346 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.)
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 main journal diameter (B):

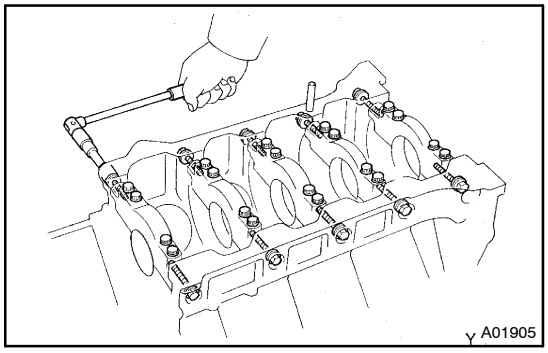
Mark ”00”	67.000 mm (2.6378 in.)
Mark ”01”	66.999 mm (2.6378 in.)
Mark ”02”	66.998 mm (2.6377 in.)
Mark ”03”	66.997 mm (2.6377 in.)
Mark ”04”	66.996 mm (2.6376 in.)
Mark ”05”	66.995 mm (2.6376 in.)
Mark ”06”	66.994 mm (2.6376 in.)
Mark ”07”	66.993 mm (2.6375 in.)
Mark ”08”	66.992 mm (2.6375 in.)
Mark ”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”	2.492 – 2.495 mm (0.0981 – 0.0982 in.)
Mark ”4”	2.495 – 2.498 mm (0.0982 – 0.0983 in.)
Mark ”5”	2.498 – 2.501 mm (0.0983 – 0.0985 in.)
Mark ”6”	2.501 – 2.504 mm (0.0985 – 0.0986 in.)
Mark ”7”	2.504 – 2.507 mm (0.0986 – 0.0987 in.)

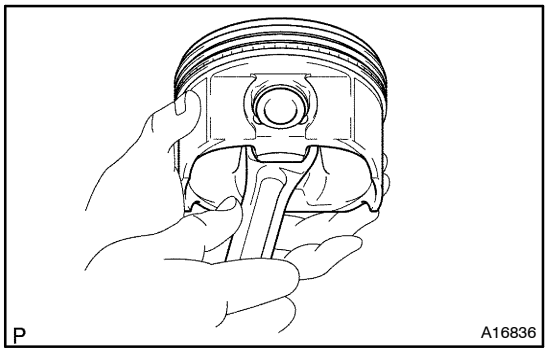
Others

Mark ”1”	2.486 – 2.489 mm (0.0979 – 0.0980 in.)
Mark ”2”	2.489 – 2.492 mm (0.0980 – 0.0981 in.)
Mark ”3”	2.492 – 2.495 mm (0.0981 – 0.0982 in.)
Mark ”4”	2.495 – 2.498 mm (0.0982 – 0.0983 in.)
Mark ”5”	2.498 – 2.501 mm (0.0983 – 0.0985 in.)



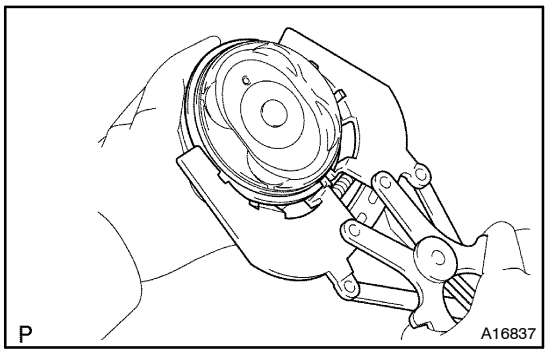
(l) Remove the 10 bolts, 20 nuts, 5 main bearing caps and 5 lower main bearing. (See procedure (a) to (c) above)
(m) Remove the 5 upper main bearings from the cylinder block.

HINT:
Arrange the main bearing caps, bearings and thrust washers in correct order.



23. CHECK FIT BETWEEN PISTON AND PISTON PIN

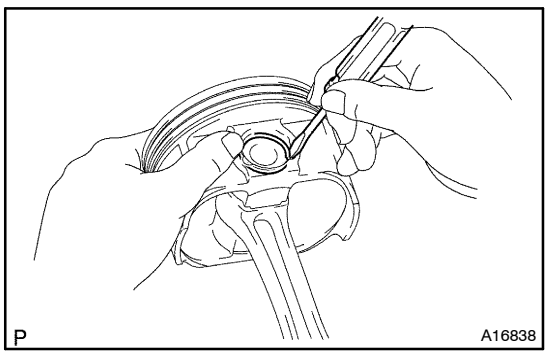
Try to move the piston back and forth on the piston pin.
If any movement is felt, replace the piston and pin as a set.



24. REMOVE PISTON RINGS

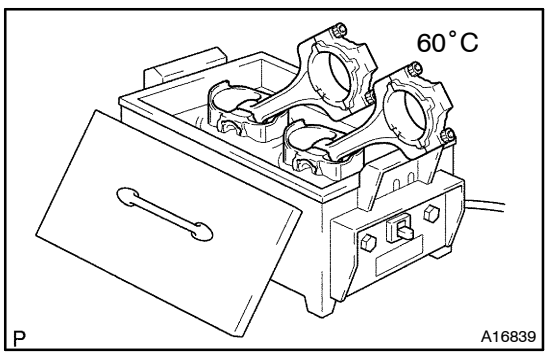
(a) Using a piston ring expander, remove the 2 compression rings.
(b) Remove the 2 side rails and oil ring by hand.

HINT:
Arrange the piston rings in correct order only.

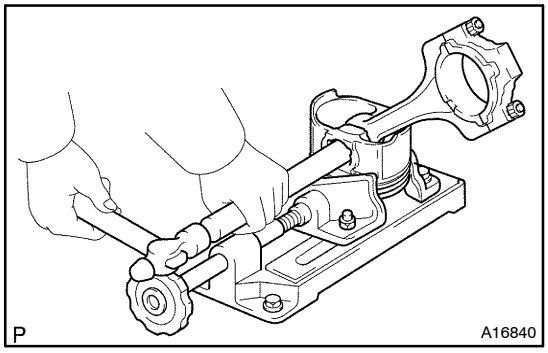


25. DISCONNECT CONNECTING ROD FROM PISTON

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



(b) Gradually heat the piston to approx. 60˚C (140˚F).



(c) Using a plastic–faced hammer and brass bar, lightly tap out the piston pin and 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.