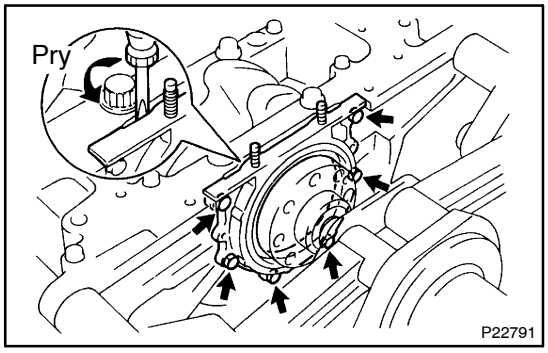
EM0X0–01

DISASSEMBLY

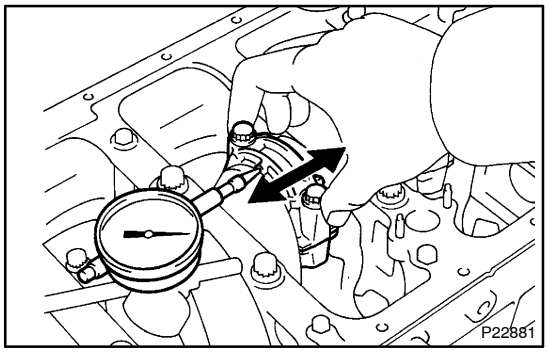
1. M/T:
   REMOVE FLYWHEEL
2. A/T:
   REMOVE REAR PLATE, DRIVE PLATE AND FLYWHEEL
3. REMOVE REAR END PLATE
4. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY
5. REMOVE TIMING BELT AND PULLEYS
   (See page EM–27)
6. REMOVE CYLINDER HEAD
   1HZ, 1HD–T: (See page EM–48)
   1HD–FTE: (See page EM–77)
7. REMOVE TIMING GEARS
   (See page EM–37)
8. REMOVE ALTERNATOR ADJUSTING BAR, TURBO WATER PIPE AND WATER PUMP
   (See page CO–7)
9. REMOVE WATER INLET AND THERMOSTAT
   1HZ, 1HD–T: (See page EM–48)
   1HD–FTE: (See page EM–77)
10. REMOVE ALTERNATOR AND BRACKET ASSEMBLY
11. REMOVE INJECTION PUMP
    1HZ, 1HD–T: (See page FU–51)
    1HD–FTE: (See page FU–117)
12. REMOVE 3 INSULATORS
13. REMOVE INJECTION PUMP STAY
14. REMOVE OIL PAN, OIL PUMP (TIMING GEAR CASE) AND OIL STRAINER
    (See page LU–9)
15. REMOVE OIL DIPSTICK, GUIDE, OIL COOLER ASSEMBLY AND NO.1 CYLINDER BLOCK INSULATOR
    (See page LU–20)
16. REMOVE OIL PRESSURE SENDER
17. REMOVE TURBO OIL HOSE
18. REMOVE ENGINE MOUNTING BRACKETS
19. REMOVE TURBO WATER PIPE
20. 1HD–FTE:
    REMOVE CRANKSHAFT POSITION SENSOR
21. REMOVE DRAIN PLUG



22. REMOVE REAR OIL SEAL RETAINER

(a) Remove the 6 bolts.

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

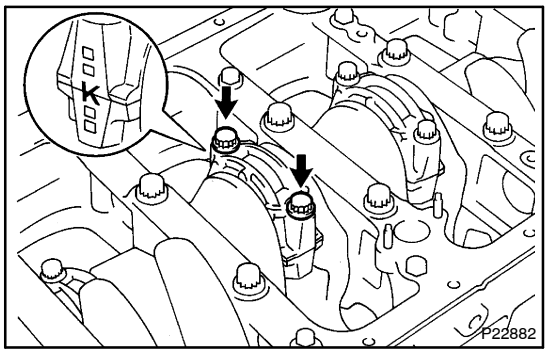


23. CHECK CONNECTING ROD THRUST CLEARANCE

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

Standard thrust clearance:
0.100 – 0.200 mm (0.0039 – 0.0079in.)
Maximum thrust clearance: 0.300 mm(0.0118 in.)

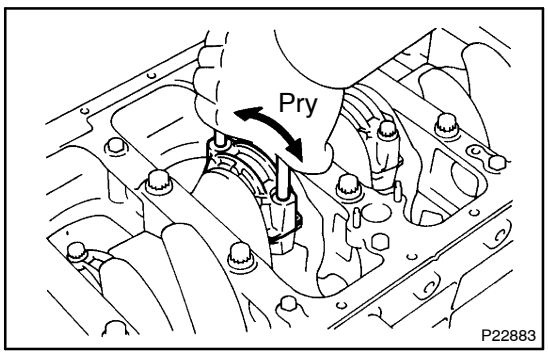
If the thrust clearance in greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.



24. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

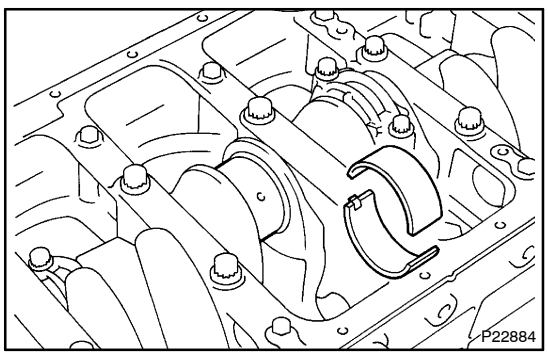
(a) Check the matchmarks on the connecting rod and cap to ensure correct reassembly.

(b) Remove the 2 connecting rod cap bolts.



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

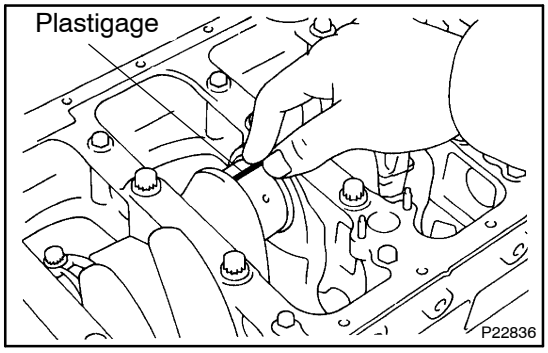
HINT:
Keep the lower bearing inserted with the connecting rod cap.



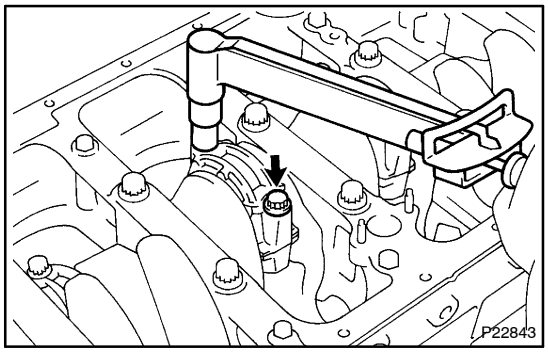
(d) Clean the crank pin and bearing.

(e) Check the crank pin and bearing for pitting and scratches.

If the crank pin or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.



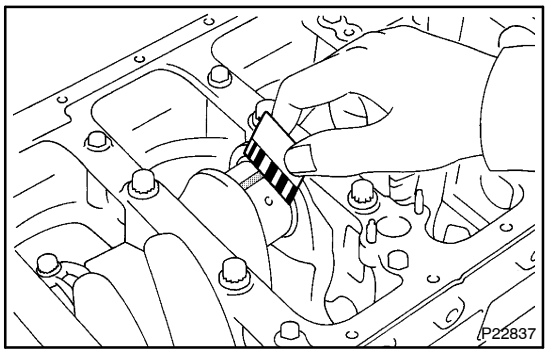
(f) Lay a strip of Plastigage across the crank pin.



(g) Install the connecting rod cap with the 2 bolts.
Torque:
1st 36.8 N·m (375 kgf·cm, 27 ft·lbf)
2nd Turn 90°

NOTICE:
Do not turn the crankshaft.

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

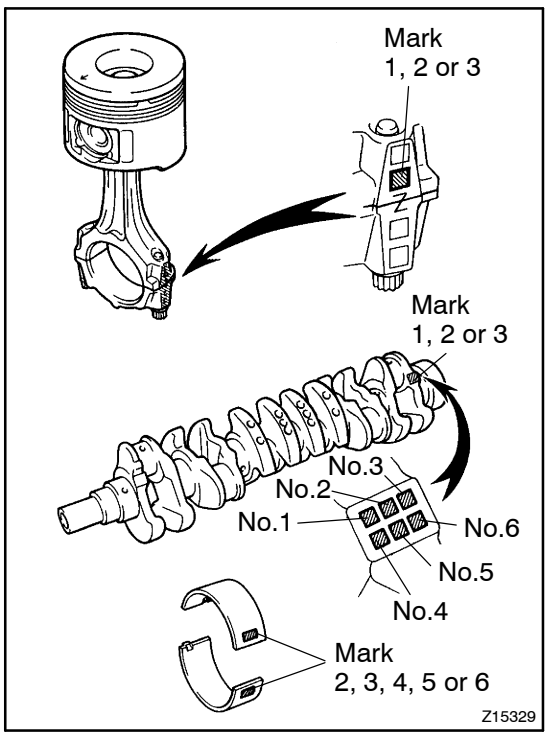


(i) Measure the Plastigage at its widest point.
Standard oil clearance:
STD
0.036 – 0.054 mm (0.0014 – 0.0021 in.)
U/S 0.25 and U/S 0.50
0.037 – 0.077 mm (0.0015 – 0.0030 in.)
Maximum oil clearance: 0.100 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or 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 crankshaft and connecting rod, then selecting the bearing with the same number as the total. There are 5 sizes of standard bearings, marked ”2”, ”3”, ”4”, ”5” and ”6” accordingly.



Reference

Connecting rod big end inside diameter:

Mark ”1”	62.014 – 62.020 mm (2.4415 – 2.4417 in.)
Mark ”2”	62.020 – 62.026 mm (2.4417 – 2.4420 in.)
Mark ”3”	62.026 – 62.032 mm (2.4420 – 2.4422 in.)

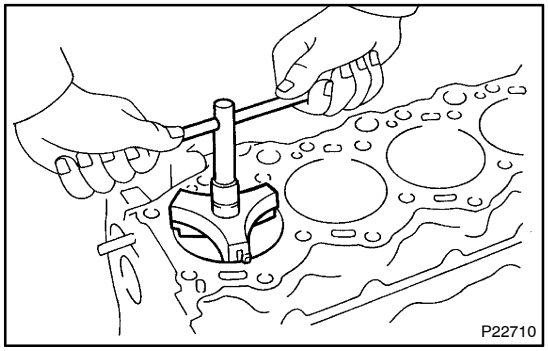
Crankshaft crank pin diameter:

Mark ”1”	58.994 – 59.000 mm (2.3226 – 2.3228 in.)
Mark ”2”	58.988 – 58.994 mm (2.3224 – 2.3226 in.)
Mark ”3”	58.982 – 58.988 mm (2.3221 – 2.3224 in.)

Standard sized bearing center wall thickness:

Mark ”2”	1.486 – 1.489 mm (0.0585 – 0.0586 in.)
Mark ”3”	1.489 – 1.492 mm (0.0586 – 0.0587 in.)
Mark ”4”	1.492 – 1.495 mm (0.0587 – 0.0589 in.)
Mark ”5”	1.495 – 1.498 mm (0.0589 – 0.0590 in.)
Mark ”6”	1.498 – 1.501 mm (0.0590 – 0.0591 in.)

(j) Completely remove the Plastigage.


P22710

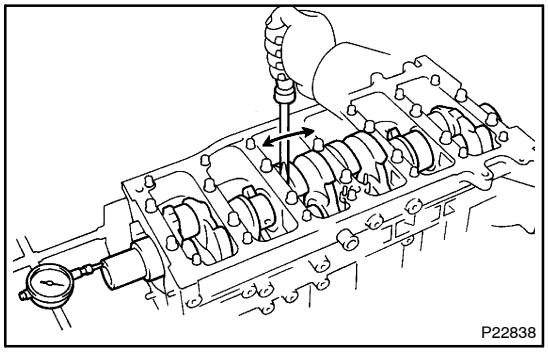
25. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

(a) Using a ridge reamer, remove all the carbon from the top of the cylinder.

(b) Push the piston, connecting rid 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.


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26. 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:

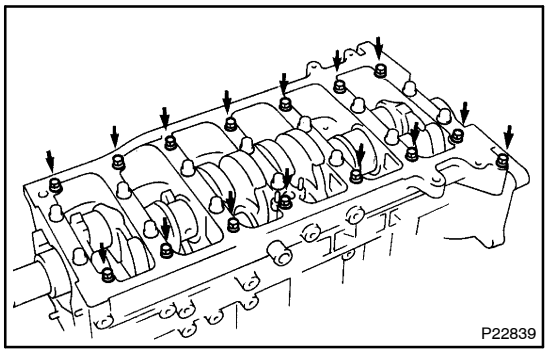
0.040 – 0.240mm (0.0016 – 0.0094 in.)

Maximum thrust clearance: 0.300 mm (0.0118 in.)

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

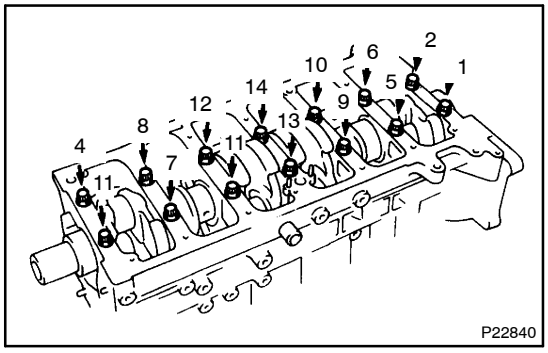
Thrust washer thickness:

2.930–2.980 mm (0.1154–0.1173 in.)

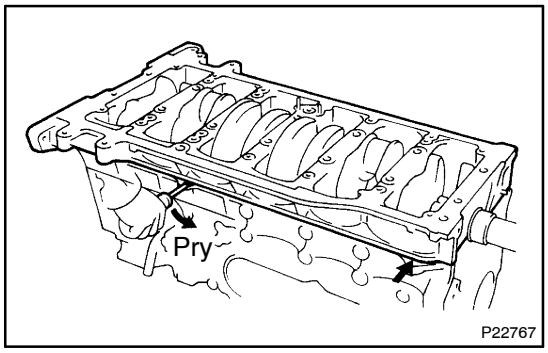

P22839

27. REMOVE MAIN BEARING CAP AND CHECK OIL CLEARANCE

(a) Remove the 15 main bearing cap bolts (6 pointed head).



(b) Uniformly loosen and remove the 14 main bearing cap bolts (12 pointed head) in several passes, in the sequence shown.



(c) Using a screwdriver, remove the main bearing cap by prying the portions between the main bearing cap and cylinder block.

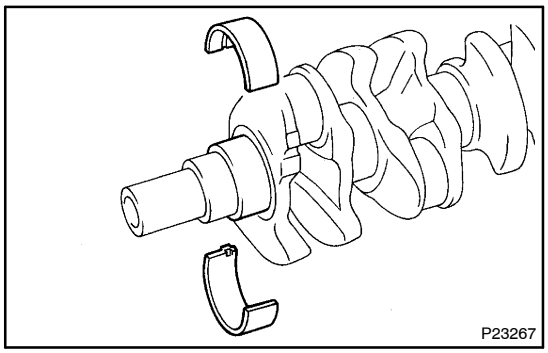
NOTICE:

Be careful not to scratch the surfaces contacting the main bearing cap and cylinder block.

HINT:

Keep the lower bearings inserted with the main bearing cap.

(d) Life out the crankshaft.



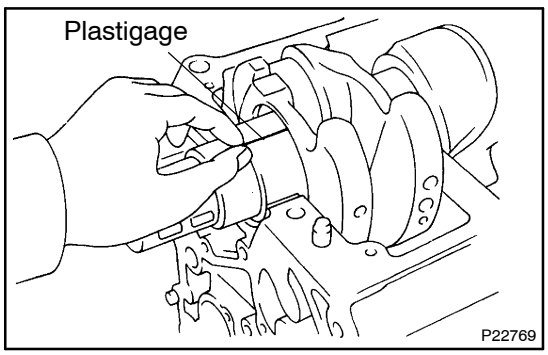
HINT:

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

(e) Clean each main journal and bearing.

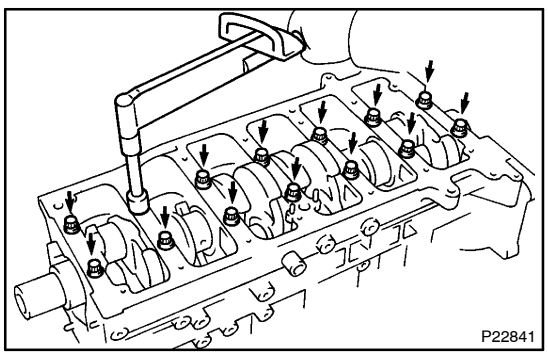
(f) Check each main journal and bearing for pitting and scratches.

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



(g) Place the crankshaft on the cylinder block.

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



(i) Install the main bearing cap with the 14 bolts (12 pointed head).

Torque:

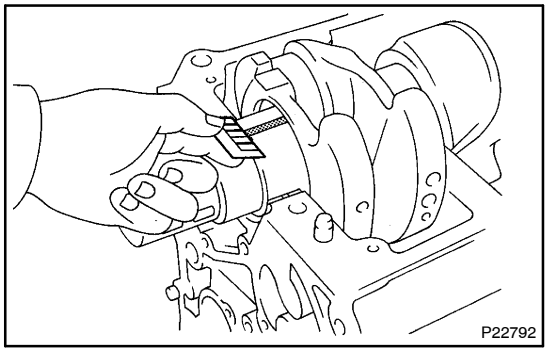
1st 103N·m (1,050 kgf·cm, 76 ft·lbf)

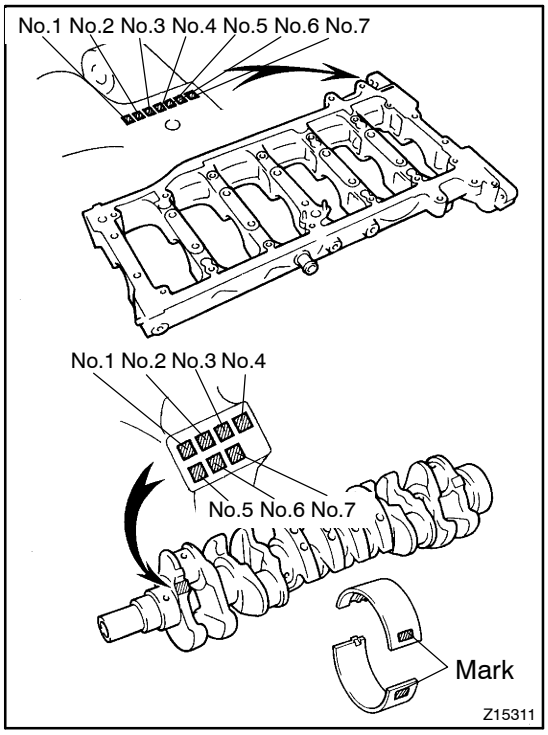
2nd Turn 90°

NOTICE:

Do not turn the crankshaft.

(j) Remove the 14 bolts (12 pointed head) and main bearing cap. (See procedure (b) and (c) above)





(k) Measure the Plastigage at its widest point.

Standard clearance:

STD

0.030 – 0.042 mm (0.00118 – 0.00165 in.)

U/S 0.25 and U/S 0.50

0.031 – 0.053 mm (0.00122 – 0.00208 in.)

Maximum clearance: 0.100 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or 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 main bearing cap and crankshaft, then selecting the bearing with the same number as the total. There are 5 sizes of standard bearings, marked ”2”, ”3”, ”4”, ”5”, and ”6” accordingly.

Reference

Cylinder block main journal bore diameter:

Mark ”A”	70.999 – 71.000 mm (2.79523 – 2.79527 in.)
Mark ”B”	70.998 – 70.999 mm (2.79519 – 2.79523 in.)
Mark ”C”	70.997 – 70.998 mm (2.79515 – 2.79519 in.)
Mark ”D”	70.996 – 70.997 mm (2.79511 – 2.79515 in.)
Mark ”E”	70.995 – 70.996 mm (2.79507 – 2.79511 in.)
Mark ”H”	70.994 – 70.995 mm (2.79503 – 2.79507 in.)
Mark ”4”	70.993 – 70.994 mm (2.79499 – 2.79503 in.)
Mark ”5”	70.992 – 70.993 mm (2.79496 – 2.79499 in.)
Mark ”6”	70.991 – 70.992 mm (2.79492 – 2.79496 in.)
Mark ”7”	70.990 – 70.991 mm (2.79488 – 2.79492 in.)
Mark ”8”	70.989 – 70.990 mm (2.79484 – 2.79488 in.)
Mark ”9”	70.988 – 70.989 mm (2.79480 – 2.79484 in.)
Mark ”L”	70.987 – 70.988 mm (2.79476 – 2.79480 in.)
Mark ”M”	70.986 – 70.987 mm (2.79472 – 2.79476 in.)
Mark ”R”	70.985 – 70.986 mm (2.79468 – 2.79472 in.)
Mark ”S”	70.984 – 70.985 mm (2.79464 – 2.79468 in.)
Mark ”U”	70.983 – 70.984 mm (2.79460 – 2.79464 in.)
Mark ”X”	70.982 – 70.983 mm (2.79456 – 2.79460 in.)

Crankshaft main journal diameter:

Mark ”A”	66.999 – 67.000 mm (2.63775 – 2.63779 in.)
Mark ”B”	66.998 – 66.999 mm (2.63771 – 2.63775 in.)
Mark ”C”	66.997 – 66.998 mm (2.63767 – 2.63771 in.)
Mark ”D”	66.996 – 66.997 mm (2.63763 – 2.63767 in.)
Mark ”E”	66.995 – 66.996 mm (2.63759 – 2.63763 in.)
Mark ”H”	66.994 – 66.995 mm (2.63755 – 2.63759 in.)
Mark ”4”	66.993 – 66.994 mm (2.63751 – 2.63755 in.)
Mark ”5”	66.992 – 66.993 mm (2.63748 – 2.63751 in.)
Mark ”6”	66.991 – 66.992 mm (2.63744 – 2.63748 in.)

Mark ”7”	66.990 – 66.991 mm (2.63740 – 2.63744 in.)
Mark ”8”	66.989 – 66.990 mm (2.63736 – 2.63740 in.)
Mark ”9”	66.988 – 66.989 mm (2.63732 – 2.63736 in.)
Mark ”L”	66.987 – 66.988 mm (2.63728 – 2.63732 in.)
Mark ”M”	66.986 – 66.987 mm (2.63724 – 2.63728 in.)
Mark ”R”	66.985 – 66.986 mm (2.63720 – 2.63724 in.)
Mark ”S”	66.984 – 66.985 mm (2.63716 – 2.63720 in.)
Mark ”U”	66.983 – 66.984 mm (2.63712 – 2.63716 in.)
Mark ”X”	66.982 – 66.983 mm (2.63708 – 2.63712 in.)

Standard sized bearing center wall thickness:

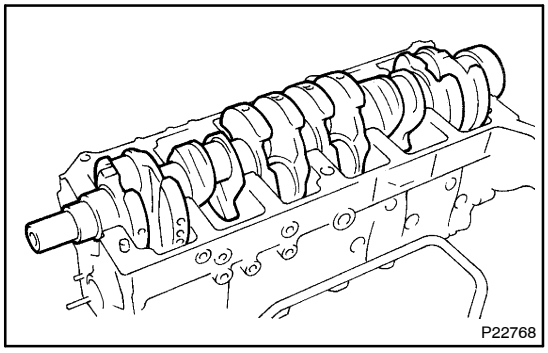
Mark ”2”	1.982 – 1.985 mm (0.07803 – 0.07815 in.)
Mark ”3”	1.985 – 1.988 mm (0.07815 – 0.07827 in.)
Mark ”4”	1.988 – 1.991 mm (0.07827 – 0.07839 in.)
Mark ”5”	1.991 – 1.994 mm (0.07839 – 0.07850 in.)
Mark ”6”	1.994 – 1.997 mm (0.07850 – 0.07862 in.)
Mark ”7”	1.997 – 2.000 mm (0.07862 – 0.07874 in.)

Journal standard bearings selection chart

Cylinder block number mark \ Crankshaft number mark	A	B	C	D	E	H	4	5	6	7	8	9	L	M	R	S	U	X
A	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4
B	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5
C	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5
D	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5
E	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5
H	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5
4	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5
5	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6
6	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6
7	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6
8	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6
9	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6
L	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	6
M	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	6	7
R	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	6	7	7
S	4	4	4	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7
U	4	4	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7	7
X	4	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7	7	7

EXAMPLE: Cylinder block ”B”, Crankshaft ”D” = Using bearing ”2”

(l) Completely remove the Plastigage.



28. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

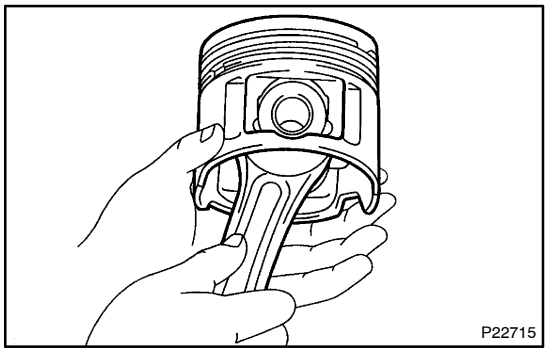
(b) Remove the upper bearings and thrust washers from the cylinder block.

HINT:

Arrange the main bearings and thrust washers in correct order.

29. REMOVE CHECK VALVES AND OIL NOZZLES

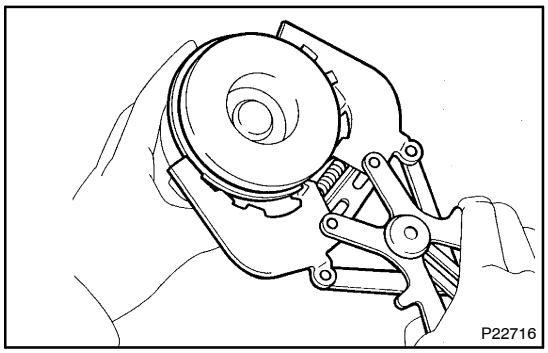
(See page LU–26)



30. 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.



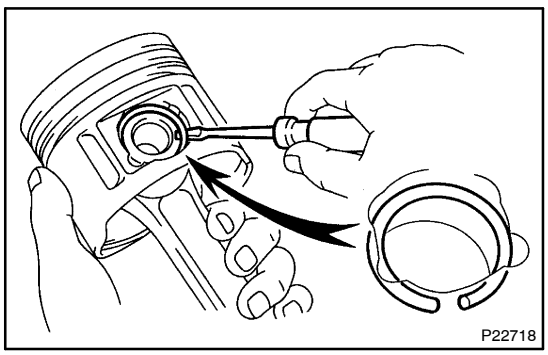
31. REMOVE PISTON RINGS

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

(b) Remove the coil by hand.

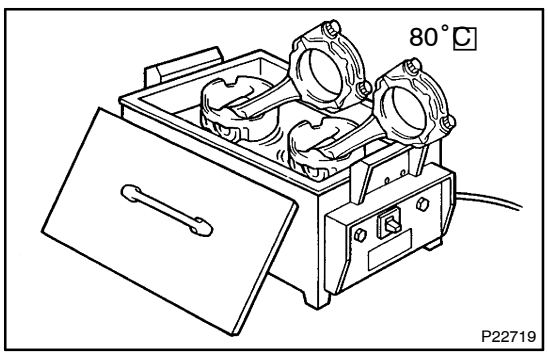
HINT:

Arrange the rings in correct order only.

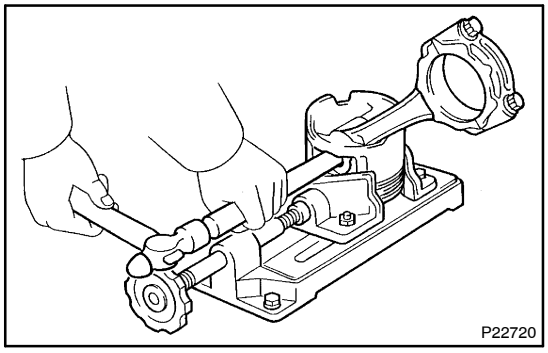


32. DISCONNECT CONNECTING ROD FROM PISTON

(a) Using a small screwdriver, pry off the snap ring from the piston.



(b) Gradually heat the piston to approx. 80°C (176°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 correct order.