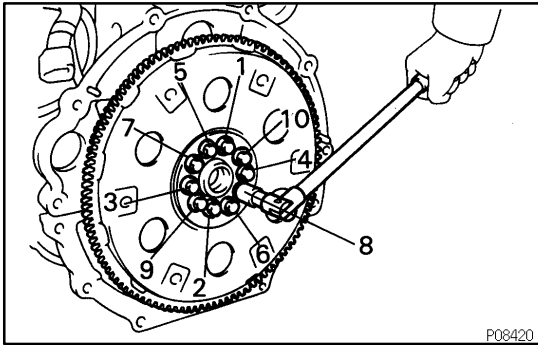




DISASSEMBLY

1. REMOVE DRIVE PLATE

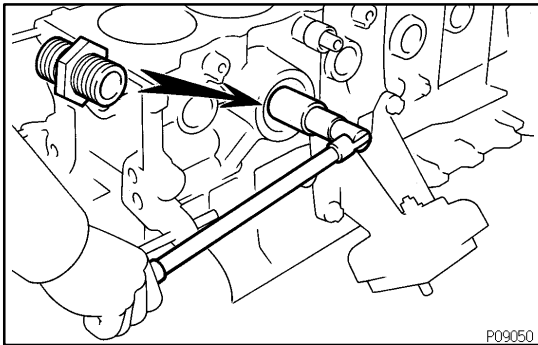
Uniformly loosen and remove the drive plate bolts, in several passes, in the sequence shown.

2. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY

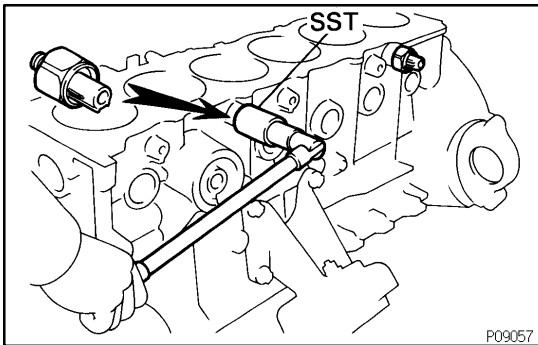
3. REMOVE CYLINDER HEAD (See page [EM-28](#))

4. REMOVE TIMING CHAIN AND GEARS (See page [EM-13](#))

5. REMOVE OIL FILTER (See page [LU-2](#))



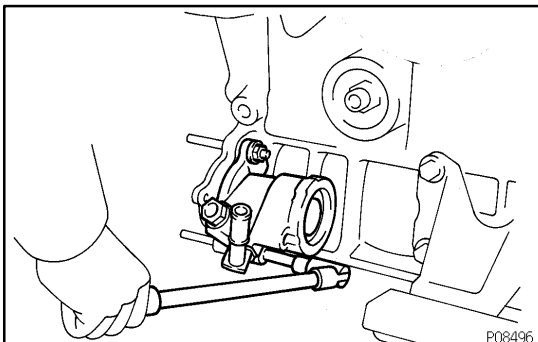
6. REMOVE OIL FILTER UNION



7. REMOVE KNOCK SENSORS

Using SST, remove the 2 knock sensors.

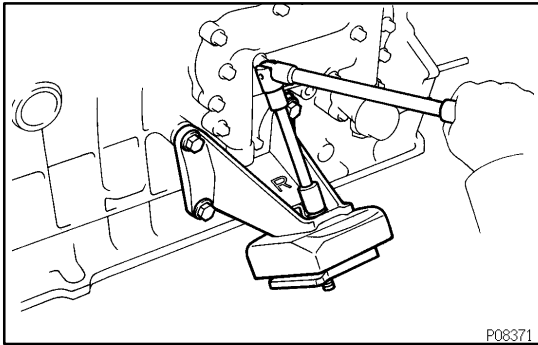
SST 09816-30010



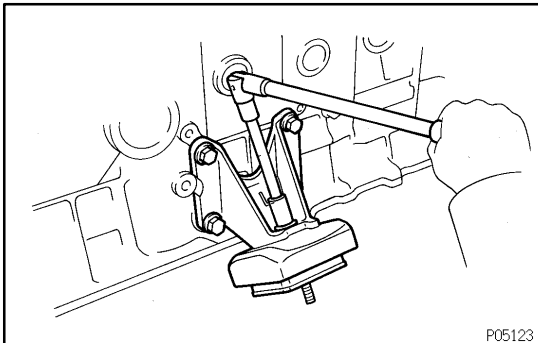
8. REMOVE PS PUMP

(a) Remove the 2 nuts and pump.

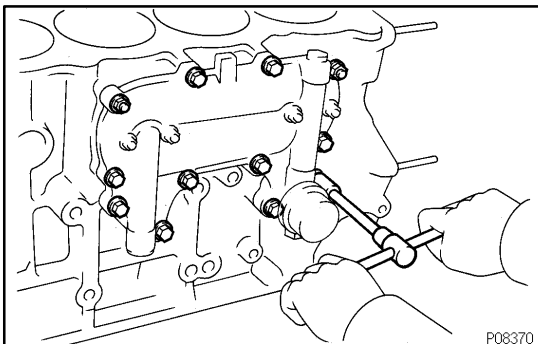
(b) Remove the O-ring from the pump.

**9. REMOVE RH ENGINE MOUNTING BRACKET**

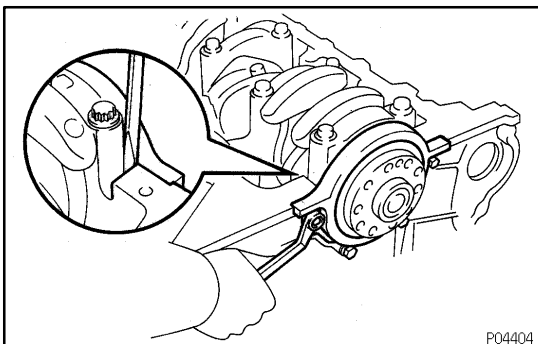
- (a) Remove the nut and insulator.
- (b) Remove the 4 bolts and bracket.

**10. REMOVE LH ENGINE MOUNTING BRACKET**

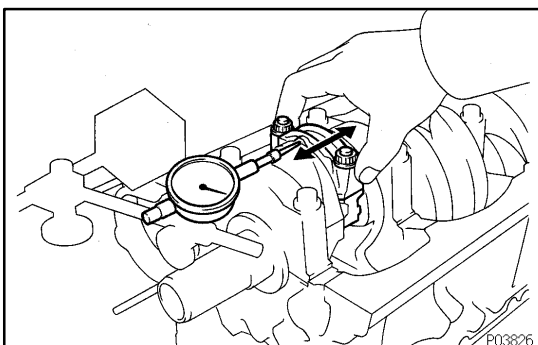
- (a) Remove the nut and insulator.
- (b) Remove the 4 bolts and bracket.

**11. REMOVE OIL COOLER COVER AND OIL COOLER**

Remove the 10 bolts, 2 nuts, oil cooler cover with the oil cooler and gasket.

**12. REMOVE REAR OIL SEAL RETAINER**

Remove the 4 bolts and retainer.

**13. CHECK CONNECTING ROD THRUST CLEARANCE**

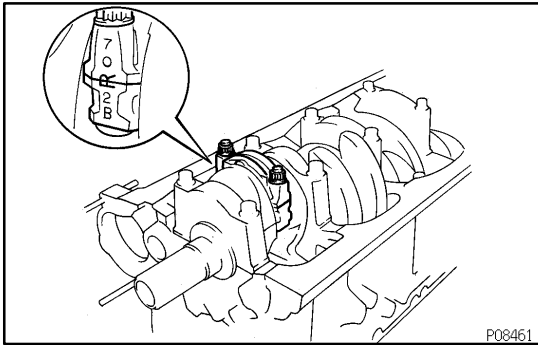
Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:

0.160 - 0.262 mm (0.0063 - 0.0103 in.)

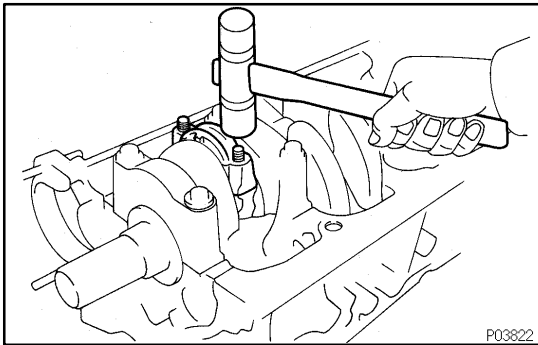
Maximum thrust clearance: 0.362 mm (0.0143 in.)

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



14. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

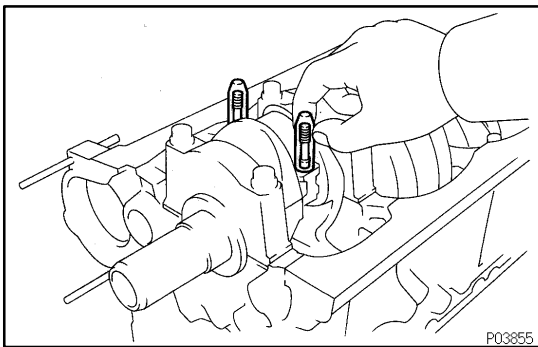
- (a) Check the matchmarks on the connecting rod cap and connecting rod to ensure correct reassembly.
- (b) Remove the connecting rod cap nuts.



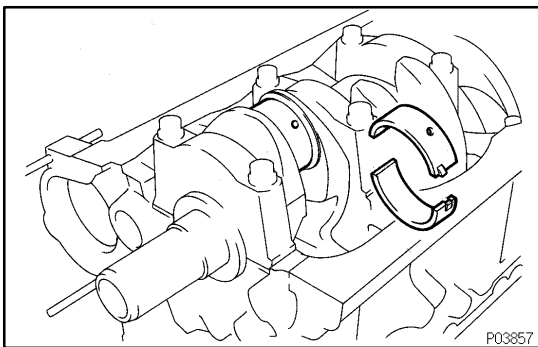
- (c) Using a plastic-faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.

HINT:

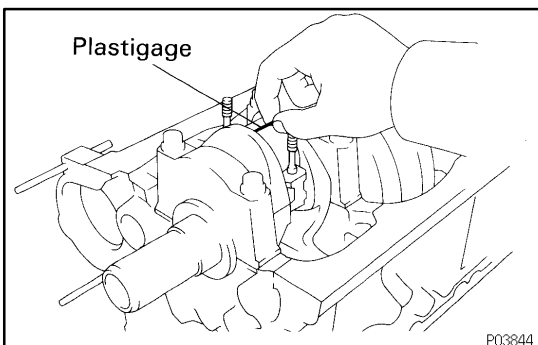
Keep the lower bearing inserted with the connecting rod cap.



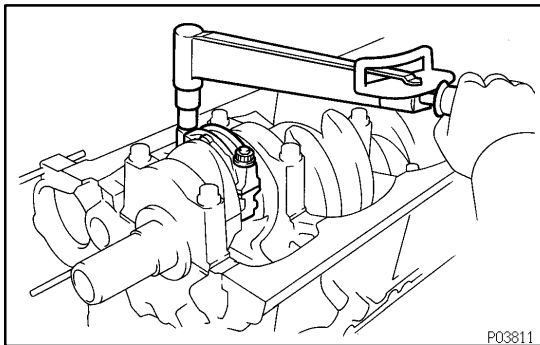
- (d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



- (e) Clean the crank pin and bearing.
- (f) 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.



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

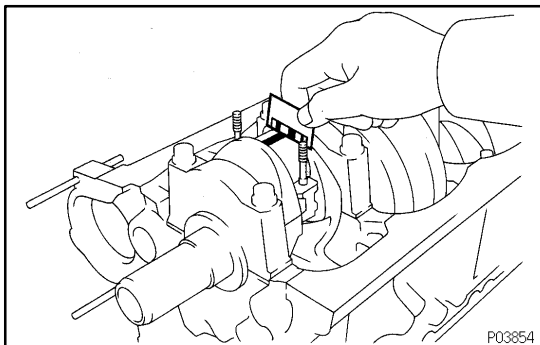


- (h) Install the connecting rod cap with the 2 nuts (See page [EM-103](#)).

NOTICE:

Do not turn the crankshaft.

- (i) Remove the 2 nuts and connecting rod cap (See procedure (b) and (c) above).



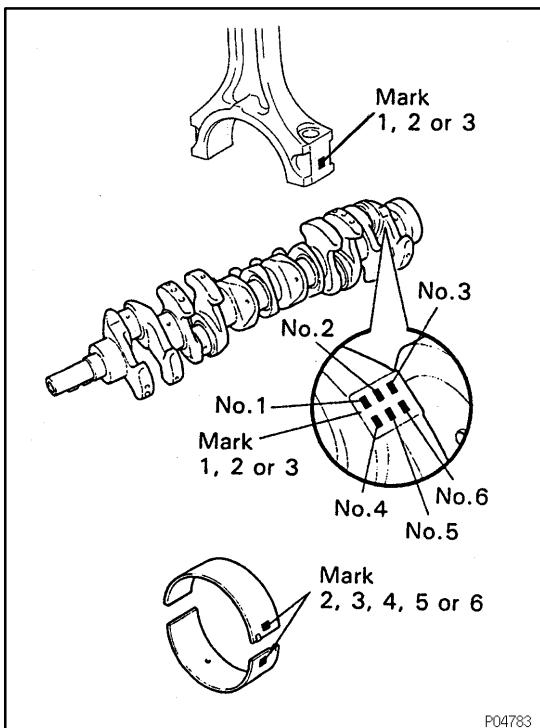
- (j) Measure the Plastigage at its widest point.

Standard oil clearance:

STD	0.032 - 0.050 mm (0.0013 - 0.0020 in.)
U/S 0.25	0.033 - 0.073 mm (0.0013 - 0.0029 in.)

Maximum oil clearance: 0.10 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 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 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.

	Number marked								
Connecting rod	1			2			3		
Crankshaft	1	2	3	1	2	3	1	2	3
Use bearing	2	3	4	3	4	5	4	5	6

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

Reference

Connecting rod big end inside diameter:

Mark "1"	60.526 - 60.532 mm (2.3829 - 2.3831 in.)
Mark "2"	60.532 - 60.538 mm (2.3831 - 2.3834 in.)
Mark "3"	60.538 - 60.544 mm (2.3834 - 2.3836 in.)

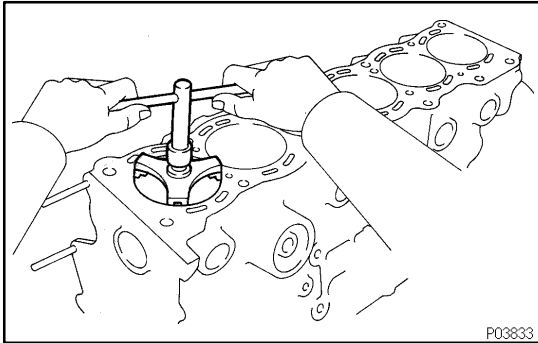
Crankshaft crank pin diameter:

Mark "1"	56.994 - 57.000 mm (2.2439 - 2.2441 in.)
Mark "2"	56.988 - 56.994 mm (2.2436 - 2.2439 in.)
Mark "3"	56.982 - 56.988 mm (2.2434 - 2.2436 in.)

Standard sized bearing center wall thickness:

Mark "2"	1.744 - 1.747 mm (0.0687 - 0.0688 in.)
Mark "3"	1.747 - 1.750 mm (0.0688 - 0.0689 in.)
Mark "4"	1.750 - 1.753 mm (0.0689 - 0.0690 in.)
Mark "5"	1.753 - 1.756 mm (0.0690 - 0.0691 in.)
Mark "6"	1.756 - 1.759 mm (0.0691 - 0.0693 in.)

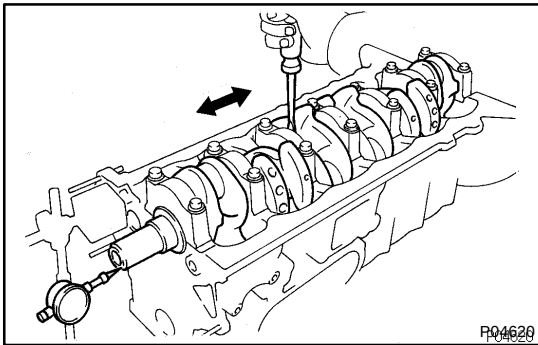
(k) Completely remove the Plastigage.

**15. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES**

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

**16. 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:

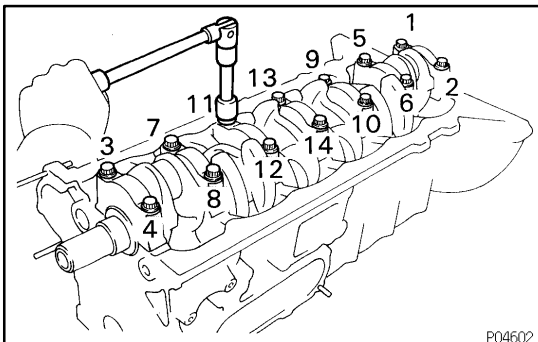
0.020 - 0.220 mm (0.0008 - 0.0087 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

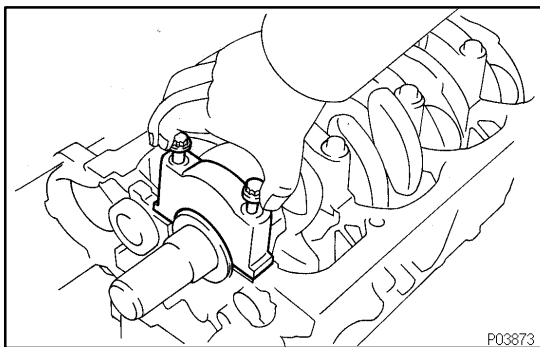
If the thrust clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer thickness:

STD	2.440 - 2.490 mm (0.0961 - 0.0980 in.)
O/S 0.125	2.503 - 2.553 mm (0.0985 - 0.1005 in.)
O/S 0.250	2.565 - 2.615 mm (0.1010 - 0.1030 in.)

**17. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE**

- Uniformly loosen and remove the main bearing cap bolts in several passes, in the sequence shown.



- (b) Using the removed main bearing cap bolts, pry the main bearing cap back and forth, and remove the main bearing caps, lower bearings and (No.4 main bearing cap only) lower thrust washers.

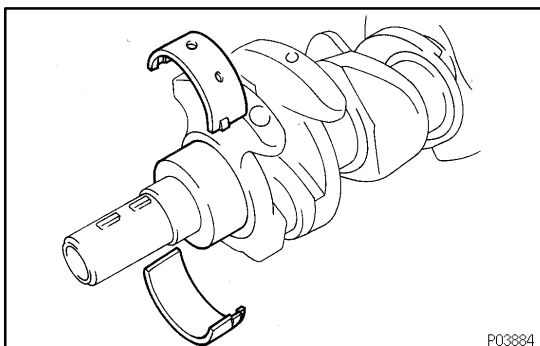
HINT:

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

- (c) Lift out the crankshaft.

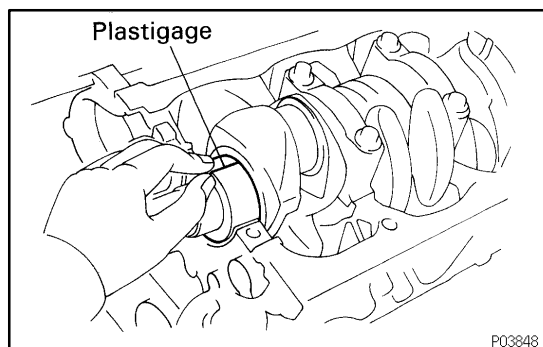
HINT:

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

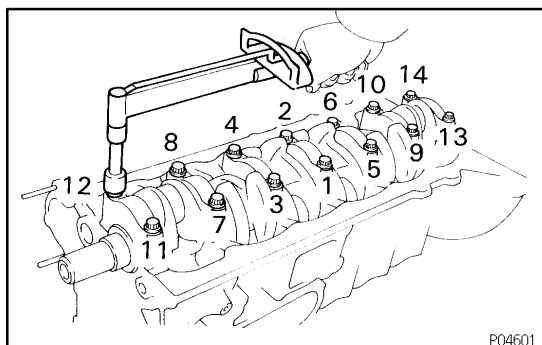


- (d) Clean each main journal and bearing.
 (e) Check each main journal and bearing for pitting and scratches.

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



- (f) Place the crankshaft on the cylinder block.
 (g) Lay a strip of Plastigage across each journal.

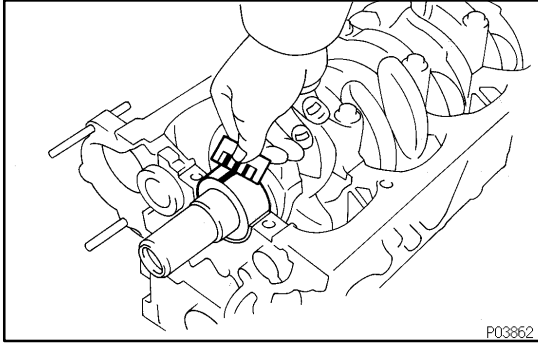


- (h) Install the main bearing caps (See page [EM-103](#)).

NOTICE:

Do not turn the crankshaft.

- (i) Remove the main bearing caps (See procedure (a) and (b) above).



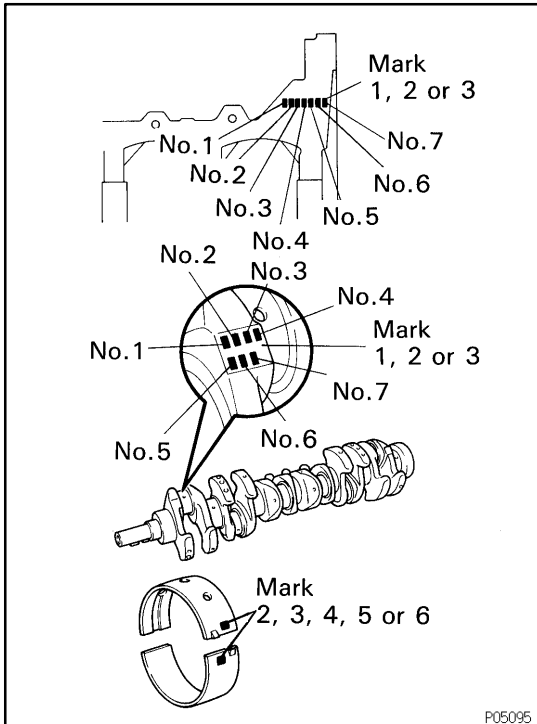
- (j) Measure the Plastigage at its widest point.

Standard clearance:

STD	0.042 - 0.060 mm (0.0017 - 0.0024 in.)
U/S 0.25	0.041 - 0.081 mm (0.0016 - 0.0032 in.)

Maximum clearance: 0.10 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 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 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.

	Number marked								
Cylinder block	1			2			3		
Crankshaft	1	2	3	1	2	3	1	2	3
Use bearing	2	3	4	3	4	5	4	5	6

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

Reference

Cylinder block main journal bore diameter:

Mark "1"	74.026 - 74.032 mm (2.9144 - 2.9146 in.)
Mark "2"	74.032 - 74.038 mm (2.9146 - 2.9149 in.)
Mark "3"	74.038 - 74.044 mm (2.9149 - 2.9151 in.)

Crankshaft main journal diameter:

Mark "1"	68.994 - 69.000 mm (2.7163 - 2.7165 in.)
Mark "2"	68.988 - 68.994 mm (2.7161 - 2.7163 in.)
Mark "3"	68.982 - 68.988 mm (2.7158 - 2.7161 in.)

Standard bearing center wall thickness:

Mark "2"	2.489 - 2.492 mm (0.0980 - 0.0981 in.)
Mark "2"	2.492 - 2.495 mm (0.0981 - 0.0982 in.)
Mark "3"	2.495 - 2.498 mm (0.0982 - 0.0983 in.)
Mark "4"	2.498 - 2.501 mm (0.0983 - 0.0985 in.)
Mark "5"	2.501 - 2.504 mm (0.0985 - 0.0986 in.)

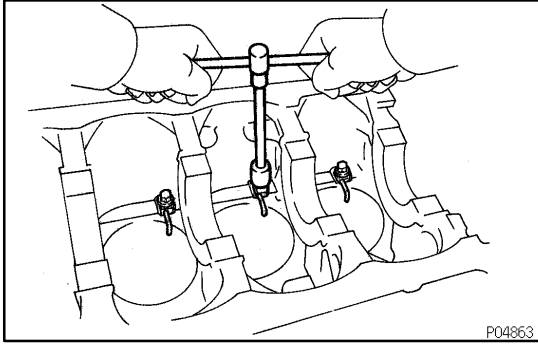
- (k) Completely remove the Plastigage.

18. REMOVE CRANKSHAFT

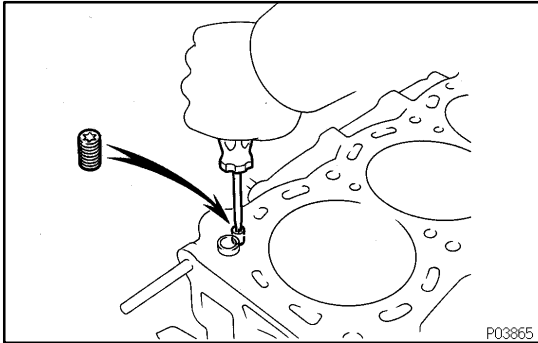
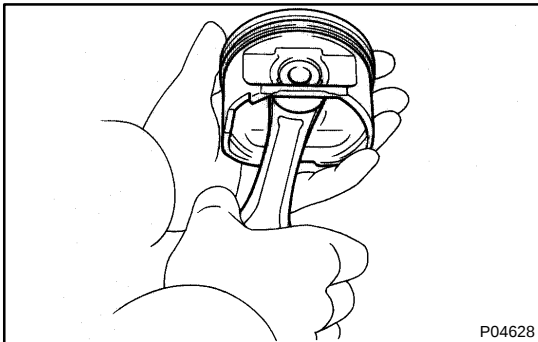
- (a) Lift out the crankshaft.
(b) Remove the upper main bearings and upper thrust washers from the cylinder block.

HINT:

Arrange the main bearings and thrust washers in correct order.

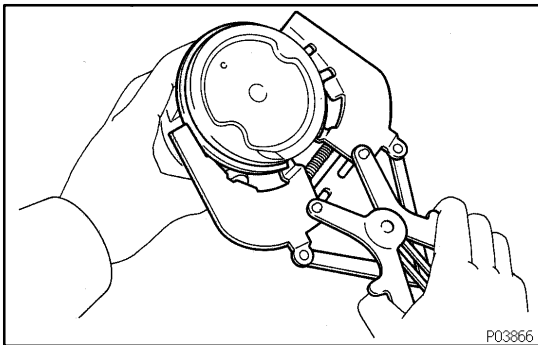
**19. REMOVE CHECK VALVES AND OIL NOZZLES**

Remove the 6 check valves and oil nozzles.

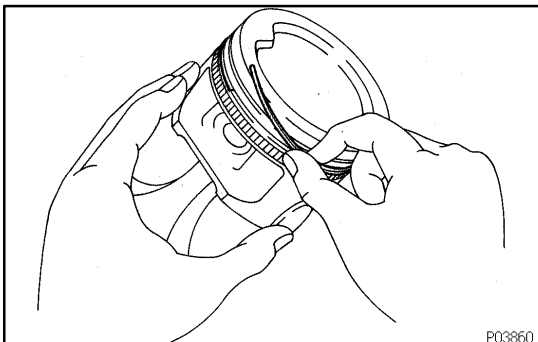
**20. REMOVE CYLINDER BLOCK ORIFICE****21. CHECK FIT BETWEEN PISTON AND PISTON PIN**

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.

**22. REMOVE PISTON RINGS**

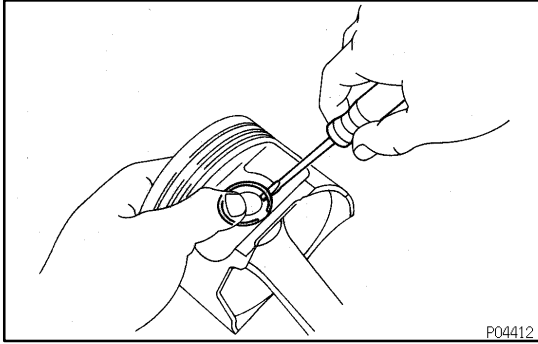
- (a) Using a piston ring expander, remove the 2 compression rings.



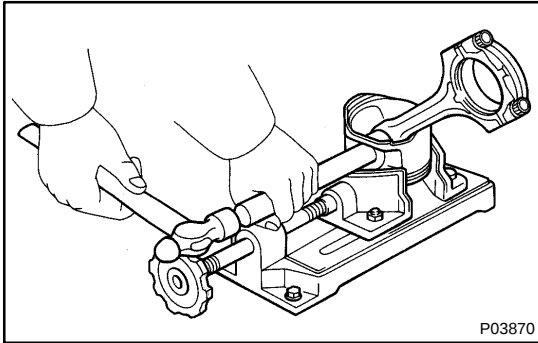
- (b) Remove the 2 side rails and oil ring by hand.

HINT:

Arrange the rings in correct order only.

**23. DISCONNECT CONNECTING ROD FROM PISTON**

- (a) Using a small screwdriver, pry out the 2 snap rings.
- (b) Gradually heat the piston to 80 - 90°C (176 - 194°F).



- (c) Using 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.