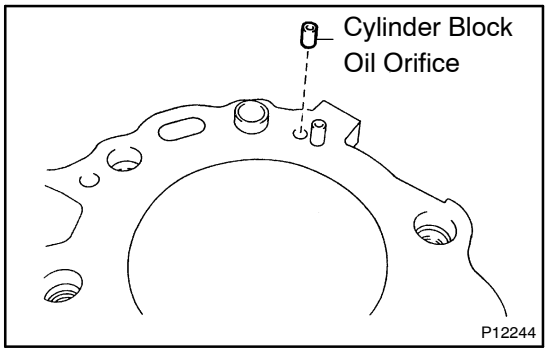
1412D–01

OVERHAUL

HINT:

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

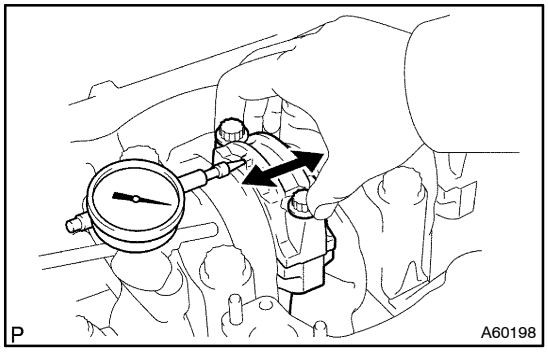


1. REMOVE ORIFICE, CYLINDER BLOCK OIL

2. INSPECT ORIFICE, CYLINDER BLOCK OIL

(a) Check the oil orifice for damage or clogging.

If necessary, replace the oil orifice.

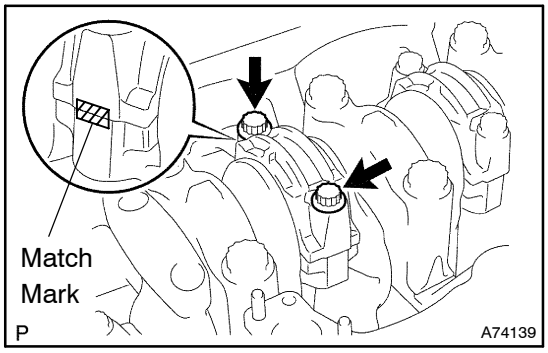


3. INSPECT CONNECTING ROD THRUST CLEARANCE

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

Standard thrust clearance:
0.100 – 0.300 mm (0.0039 – 0.0118 in.)
Maximum thrust clearance: 0.40 mm (0.0157 in.)

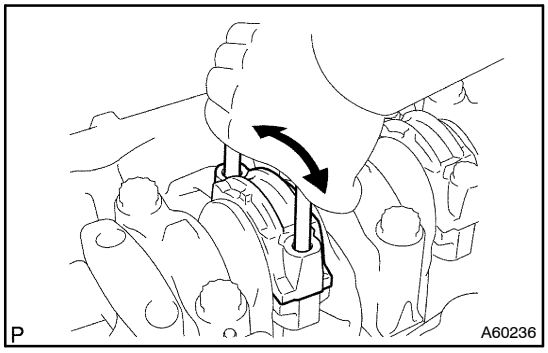
If the thrust clearance is greater than the maximum clearance, replace the connecting rod assembly. If necessary, replace the crankshaft.



4. INSPECT CONNECTING ROD OIL CLEARANCE

(a) Check that the connecting rod and cap are assembled properly by looking over the match marks.

(b) Remove the 2 connecting road cap bolts.



(c) Using the 2 removed connecting rod bolts, pry off the connecting rod cap.

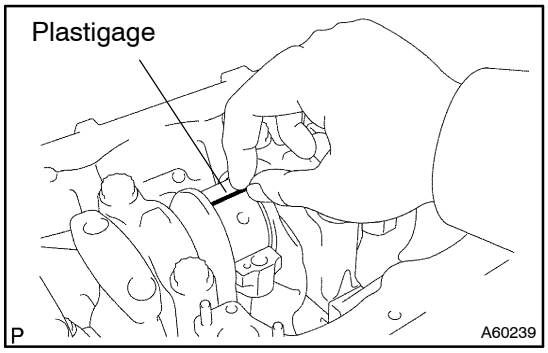
HINT:

Keep the lower bearing inserted in the connecting rod cap.

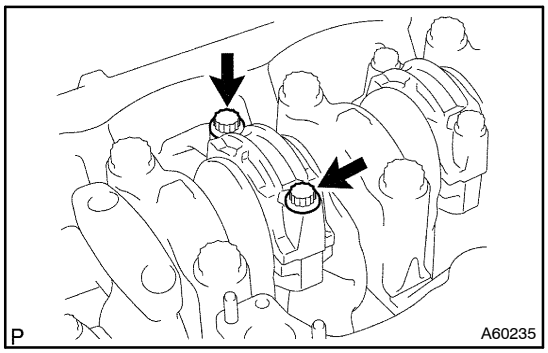
(d) Clean the crank pin and bearing.

(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.

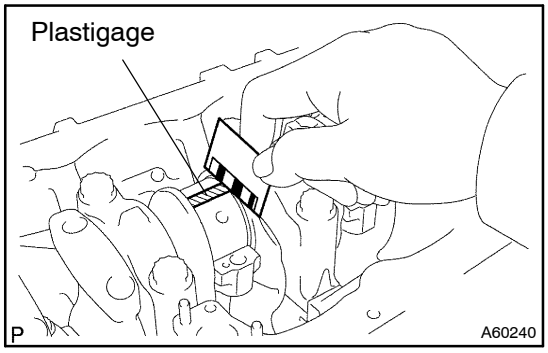


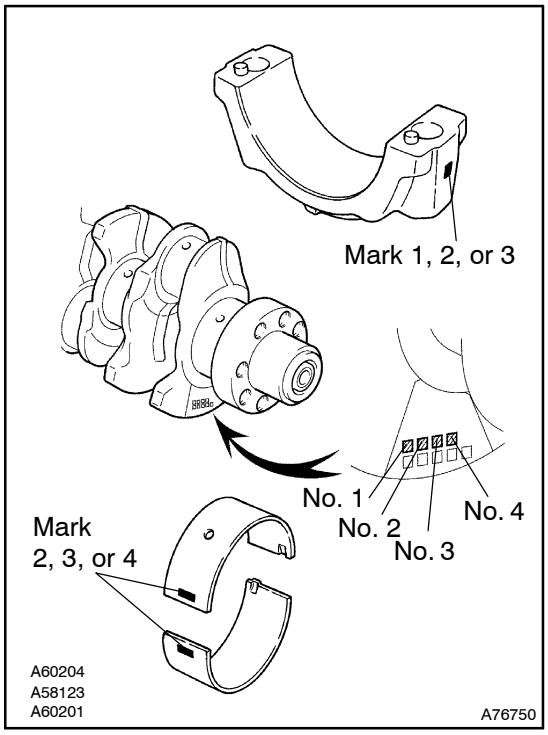
(g) Install the connecting rod cap with the 2 bolts (See step 39).

NOTICE:

Do not turn the crankshaft.

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





(i) Measure the Plastigage at its widest point.

Standard oil clearance:

0.036 – 0.054 mm (0.0014 – 0.0021 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than the maximum clearance, 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, add together the numbers in printed on the crankshaft and connecting rod, then the bearing with the number same as the total. There are 5 sizes of standard bearings, marked 2, 3, 4, 5 and 6 accordingly.

Item	Number Mark								
Connecting rod cap	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 cap ”3” + Crankshaft ”1” =

Total number 4 (Use bearing ”4”)

Reference

Connecting rod big end inner 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.)

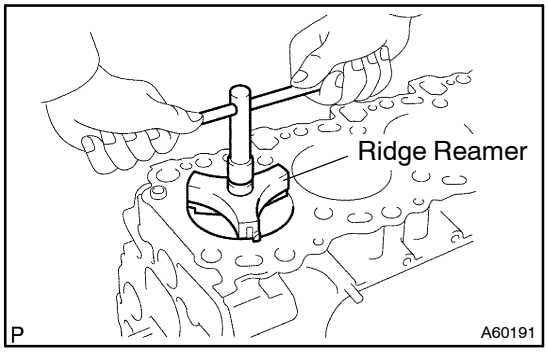
Crankshaft pin diameter:

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.



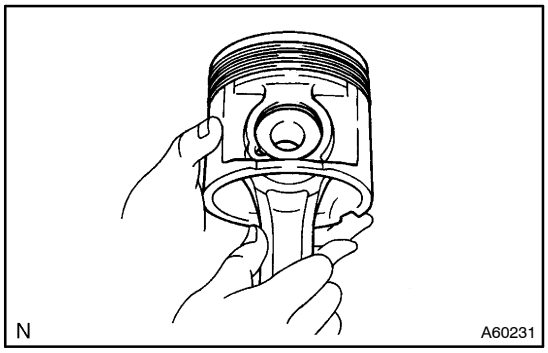
5. REMOVE PISTON AND CONNECTING ROD

(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.

HINT:

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

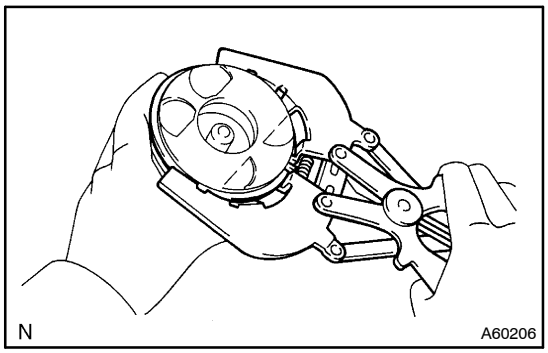


6. REMOVE PISTON SUB–ASSY, W/PIN

(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.



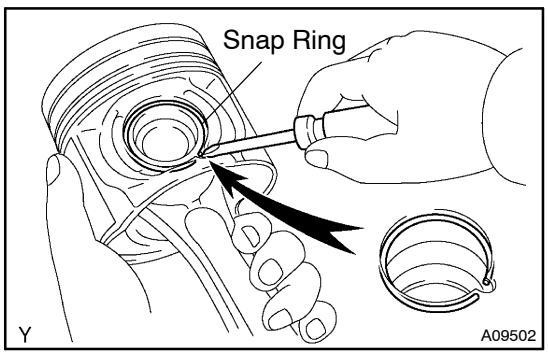
(b) Remove the piston rings.

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

(2) Remove the coil rails and oil ring by hand.

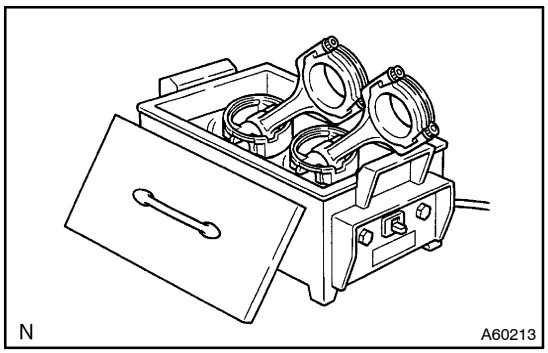
HINT:

Arrange the piston rings in correct order.

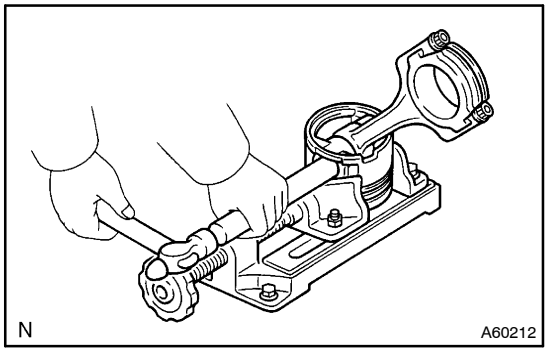


(c) Disconnect the connecting rod from the piston.

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



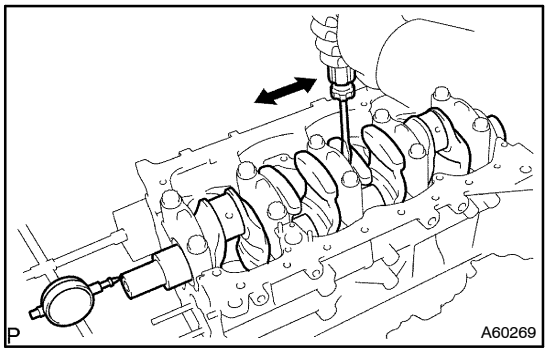
(2) Gradually heat the piston to approx. 80°C (176°F).



(3) 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.



7. INSPECT CRANKSHAFT THRUST CLEARANCE

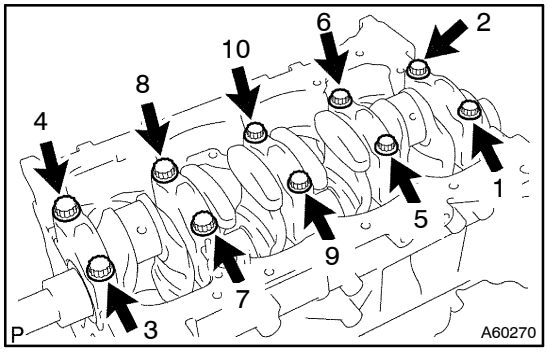
(a) Using a dial indicator, measure the thrust clearance while prying the crankshaft with a screwdriver.

Standard thrust clearance:
0.040 – 0.240 mm (0.0016 – 0.0094 in.)
Maximum thrust clearance: 0.30 mm (0.0118 in.)

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

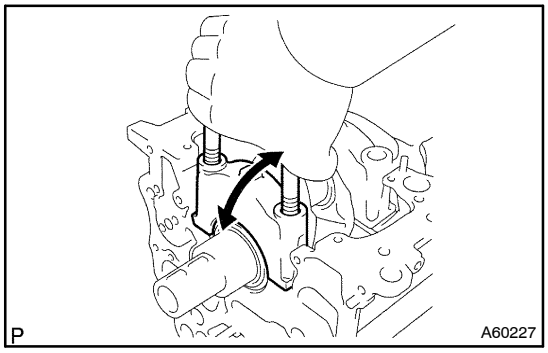
Thrust washer thickness:

STD	2.430 – 2.480 mm (0.0957 – 0.0976 in.)
U/S 0.125	2.555 – 2.605 mm (0.1006 – 0.1026 in.)
U/S 0.250	2.493 – 2.543 mm (0.0981 – 0.1001 in.)



8. INSPECT CRANKSHAFT OIL CLEARANCE

(a) Uniformly loosen the 10 main bearing cap bolts in order described in the illustration, and remove the bolts in the same order.



(b) Using the removed crankshaft bearing cap bolts, pry the cap, and remove the crankshaft bearing caps, lower crankshaft bearings and lower thrust washers (No. 5 crankshaft bearing cap only).

HINT:

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

(c) Lift out the crankshaft.

HINT:

Keep the upper crankshaft bearings and upper thrust washers together with the cylinder block.

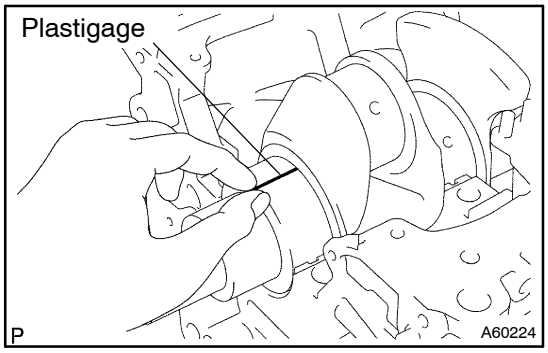
(d) Clean each main journal and bearing.

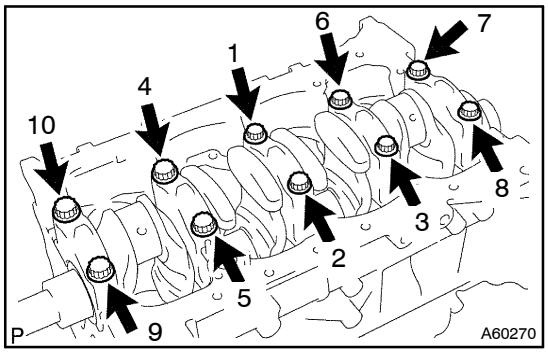
(e) Check that there is no pitts and scratches for main journal bearing.

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.



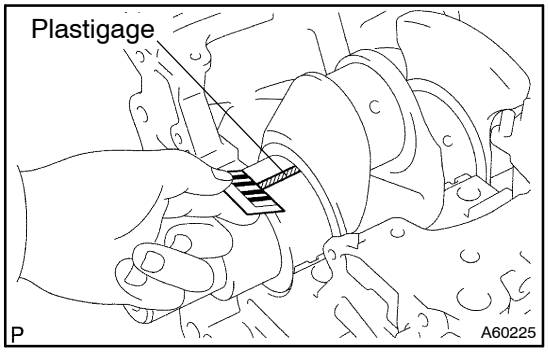


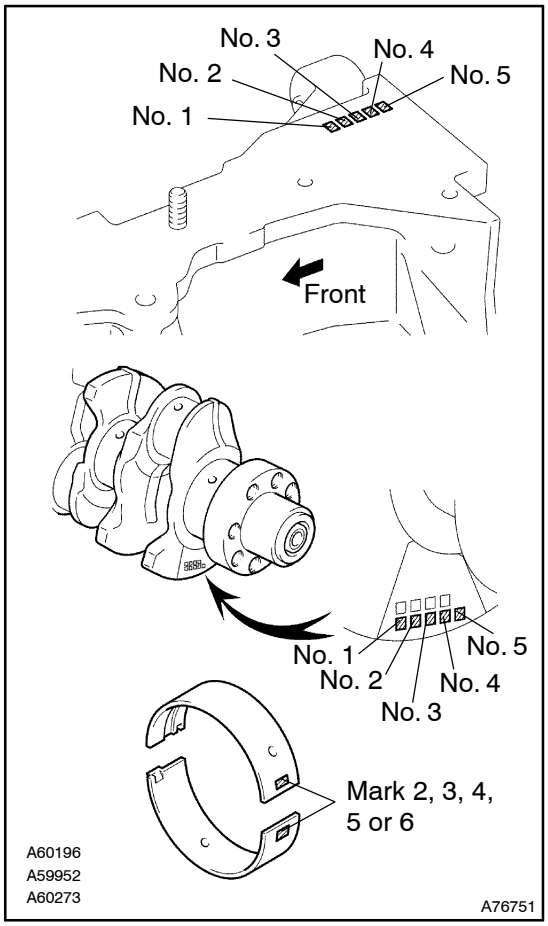
(h) Install the 5 crankshaft bearing caps with the 10 bolts (See step 38).

NOTICE:

Do not turn the crankshaft.

(i) Remove the 10 bolts and 5 crankshaft bearing caps (See the procedure (a) and (b) mentioned above).





(j) Measure the plastigage at its widest point.

Standard oil clearance:

0.030 – 0.048 mm (0.0012 – 0.0019 in.)

Maximum clearance: 0.10 mm (0.0039 in.)

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

HINT:

If replacing the cylinder block subassembly, the bearing standard clearance will be:

0.030 – 0.048 mm (0.0012 – 0.0019 in.)

HINT:

If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, add together the numbers imprinted on the cylinder block and crankshaft, then selecting the bearing with the number same as the total. There are 5 sizes of standard bearings, marked 2, 3, 4, 5 and 6 accordingly.

Item	Number Mark								
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

HINT:

EXAMPLE: Cylinder block ”2” + crankshaft ”1”

= Total number 3 (Use bearing ”3”)

Reference

Cylinder block main journal bore diameter:

Mark 1	75.000 – 75.006 mm (2.9528 – 2.9530 in.)
Mark 2	75.006 – 75.012 mm (2.9530 – 2.9532 in.)
Mark 3	75.012 – 75. 018 mm (2.9532 – 2.9535 in.)

Crankshaft journal diameter:

Mark 1	69.994 – 70.000 mm (2.7557 – 2.7559 in.)
Mark 2	69.988 – 69.994 mm (2.7554 – 2.7557 in.)
Mark 3	69.982 – 69.988 mm (2.7552 – 2.7554 in.)

Standard sized bearing center wall thickness:

Mark 2	2.482 – 2.485 mm (0.0977 – 0.0978 in.)
Mark 3	2.485 – 2.488 mm (0.0978 – 0.0980 in.)
Mark 4	2.488 – 2.491 mm (0.0980 – 0.0981 in.)
Mark 5	2.491 – 2.494 mm (0.0981 – 0.0982 in.)
Mark 6	2.494 – 2.497 mm (0.0982 – 0.0983 in.)

(k) Completely remove the plastigage.

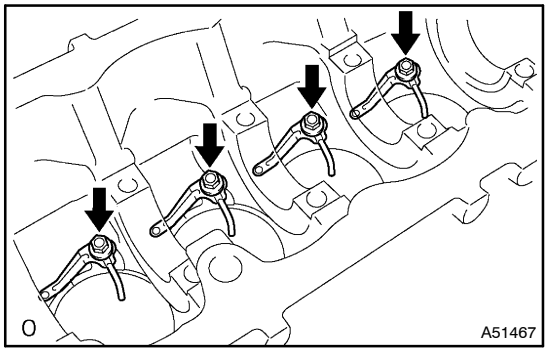
9. REMOVE CRANKSHAFT SUB–ASSY

(a) Lift out the crankshaft.

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

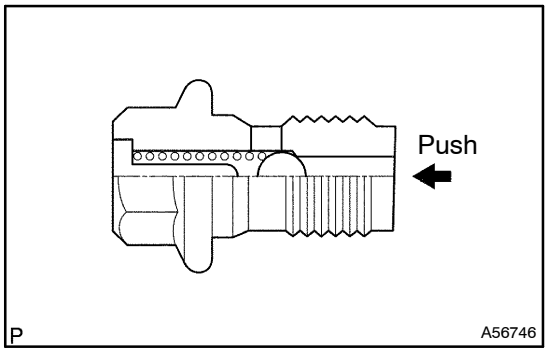
HINT:

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



10. REMOVE NOZZLE SUB–ASSY, OIL, NO.1

(a) Remove the 4 check valves and oil nozzles.



11. INSPECT VALVE SUB–ASSY, OIL CHECK

(a) Push the valve withe a wooden stick to check if it is stuck.

If stuck, replace the check valve.

12. INSPECT NOZZLE SUB–ASSY, OIL, NO.1

(a) Check the oil nozzles for damage or clogging.

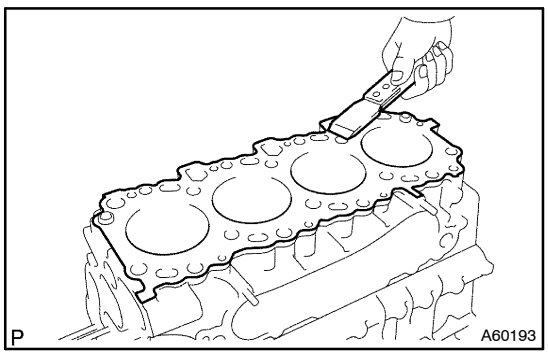
If necessary, replace the oil nozzle.

13. REMOVE STUD BOLT

14. REMOVE STRAIGHT PIN

15. REMOVE RING PIN

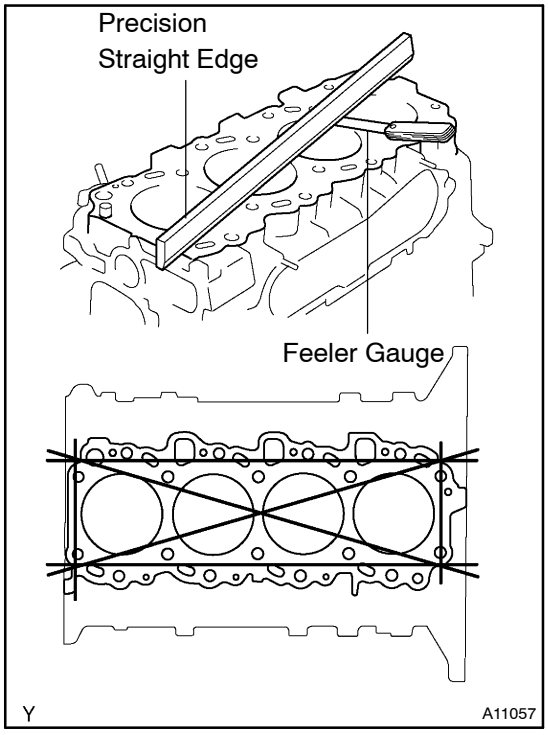
16. REMOVE TIGHT PLUG



17. CLEAN CYLINDER BLOCK 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, clean the cylinder block thoroughly.



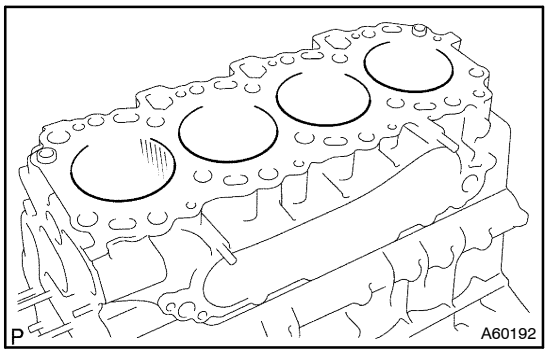
18. INSPECT CYLINDER BLOCK ASSY

(a) Inspect for flatness.

(1) Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head cap for warpage.

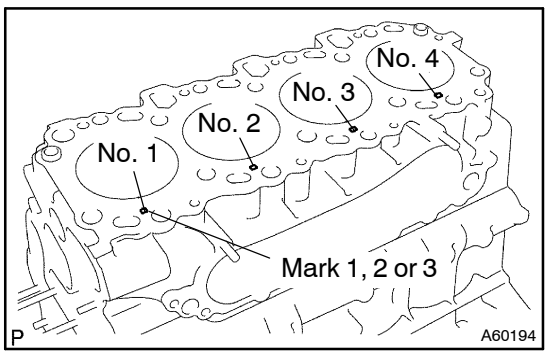
Maximum warpage: 0.10 mm (0.0039 in.)

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



(b) Visually check the cylinder for vertical scratches.

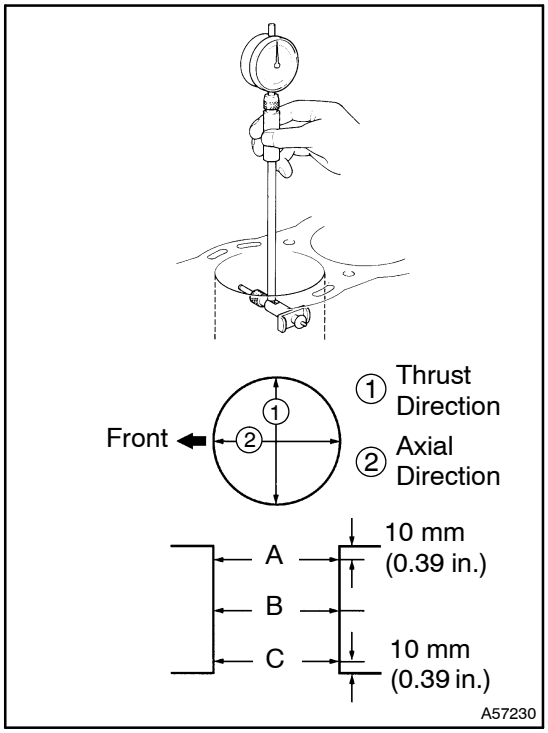
If deep scratches are present, rebore all the 4 cylinders. If necessary, replace the cylinder block.



(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 lower left rear 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.

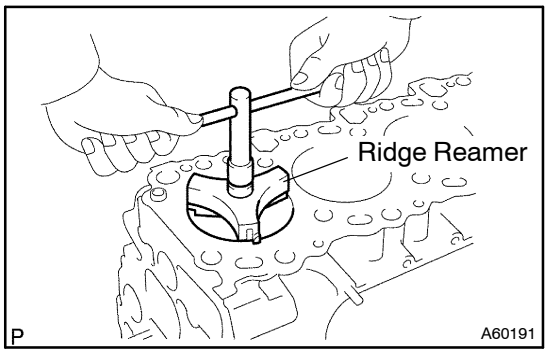
Standard diameter:

Mark 1	96.000 – 96.010 mm (3.7795 – 3.7799 in.)
Mark 2	96.010 – 96.020 mm (3.7799 – 3.7803 in.)
Mark 3	96.020 – 96.030 mm (3.7803 – 3.7807 in.)

Maximum diameter:

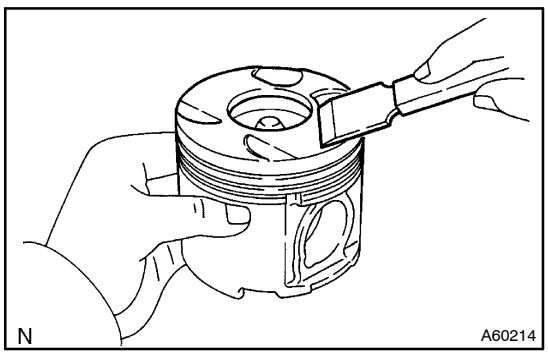
STD	96.23 mm (3.7886 in.)

If the diameter is greater than maximum, rebore all the 4 cylinders. If necessary, replace the cylinder block.



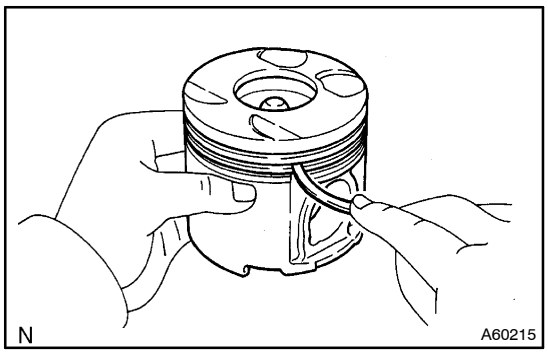
(d) Remove the cylinder ridge.

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

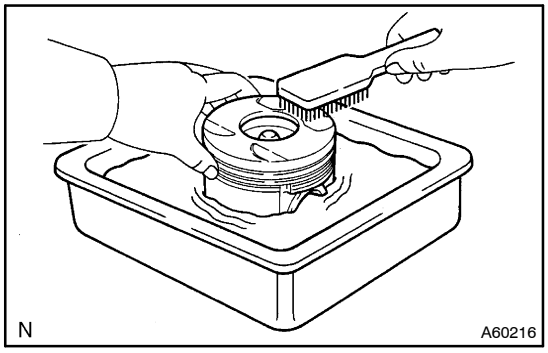


19. CLEAN PISTON SUB–ASSY, W/PIN

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



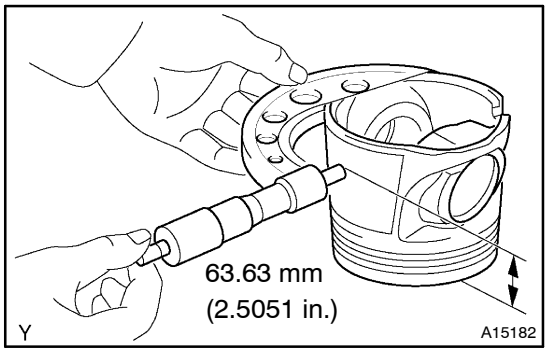
(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



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

NOTICE:

Do not use a wire brush.



20. INSPECT PISTON SUB–ASSY, W/PIN

(a) Inspect the piston oil clearance.

HINT:

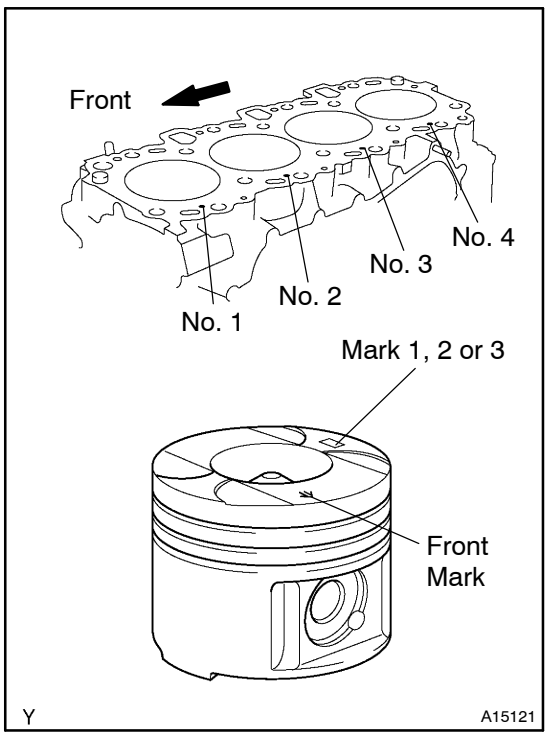
There are 3 sizes of the standard piston diameter, marked ”1”, ”2” and ”3” accordingly. The mark is stamped on the piston top.

(1) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 63.63 mm (2.5051 in.) from the piston head.

Piston diameter:

STD	Mark 1	95.920 – 95.930 mm (3.77637 – 3.77676 in.)
	Mark 2	95.930 – 95.940 mm (3.77676 – 3.77715 in.)
	Mark 3	95.940 – 95.950 mm (3.77716 – 3.77755 in.)

(2) Measure the cylinder bore diameter in the thrust directions (See step 18).



(3) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

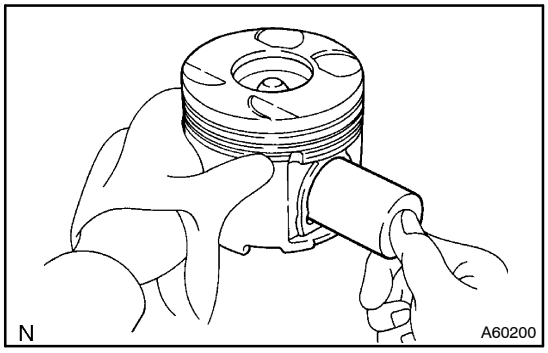
0.070 – 0.090 mm (0.0028 – 0.0035 in.)

Maximum oil clearance: 0.14 mm (0.0055 in.)

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

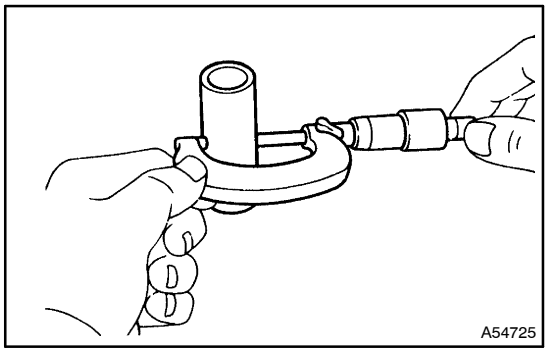
HINT:

Use a piston with the same number as the cylinder bore diameter marked on the cylinder block.



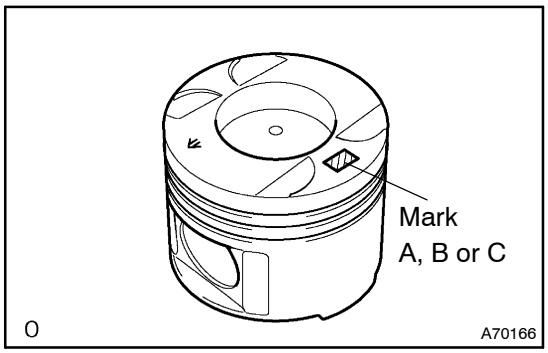
(b) Inspect the piston pin fit.
(1) At 80°C (176°F), you can push the piston pin into the piston pin hole.

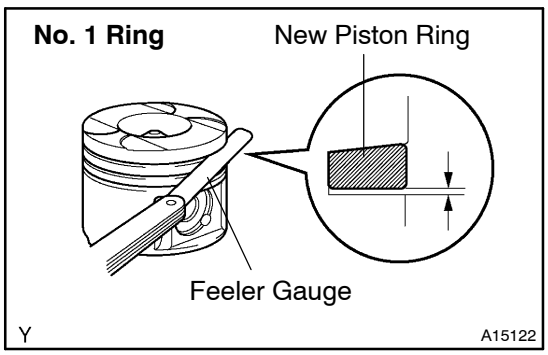
If the pin can be installed at a lower temperature, replace the piston and pin as set.



(c) Using a micrometer, measure the piston pin diameter.
Piston pin diameter:

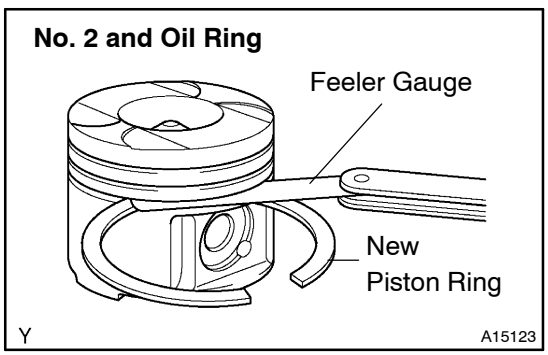
Mark A	33.996 – 34.000 mm (1.33842 – 1.33858 in.)
Mark B	34.000 – 34.004 mm (1.33858 – 1.33874 in.)
Mark C	34.004 – 34.008 mm (1.33874 – 1.33889 in.)





21. INSPECT RING SET, PISTON

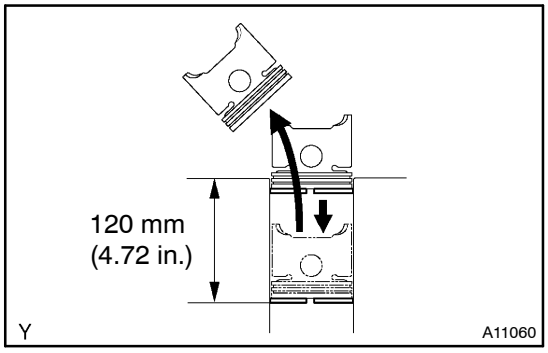
(a) Inspect the piston ring groove clearance.
(1) No. 1 ring:
Install a new No. 1 piston ring to the piston. Using a feeler gauge, measure the clearance between new piston ring and the wall of the ring groove.
Ring groove clearance (No. 1):
0.091 – 0.135 mm (0.0036 – 0.0053 in.)



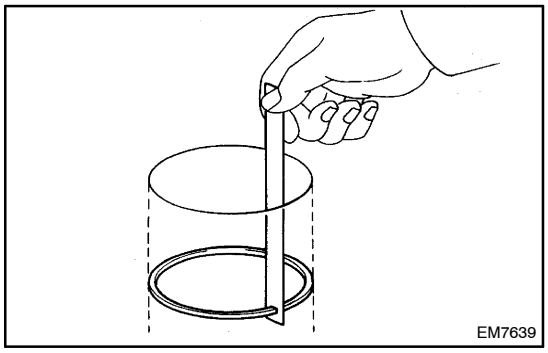
(2) No. 2 and oil ring:
Using a feeler gauge, measure the clearance between the new piston ring and the wall of the ring groove.
Ring groove clearance (No. 2 and oil ring):

No. 2	0.090 – 0.130 mm (0.0036 – 0.0051 in.)
Oil	0.030 – 0.070 mm (0.0012 – 0.0028 in.)

If the clearance is greater than the maximum, 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, 120 mm (4.72 in.) from the top of the cylinder block.



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

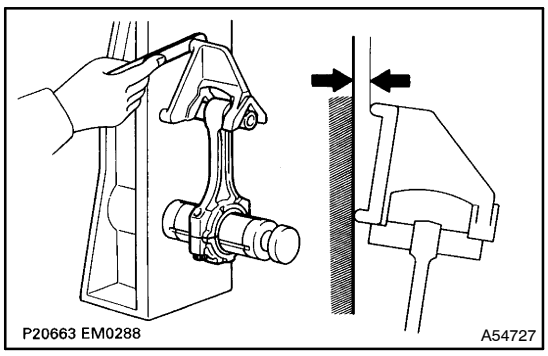
Standard end gap:

No. 1	0.27 – 0.39 mm (0.0106 – 0.0154 in.)
No. 2	0.47 – 0.57 mm (0.0185 – 0.0224 in.)
Oil	0.20 – 0.40 mm (0.0079 – 0.0157 in.)

Maximum end gap:

No. 1	0.85 mm (0.0335 in.)
No. 2	1.07 mm (0.0421 in.)
Oil	0.77 mm (0.0303 in.)

If the end gap is greater than the maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, rebore all the 4 cylinders or replace the cylinder block.



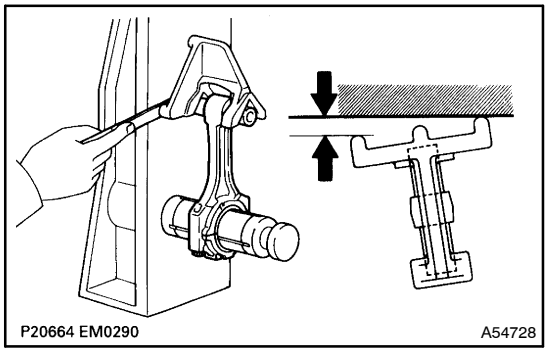
22. INSPECT ROD SUB–ASSY, CONNECTING

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

Maximum bend:

0.03 mm (0.0012 in.) per 100 mm (3.94 in.)

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

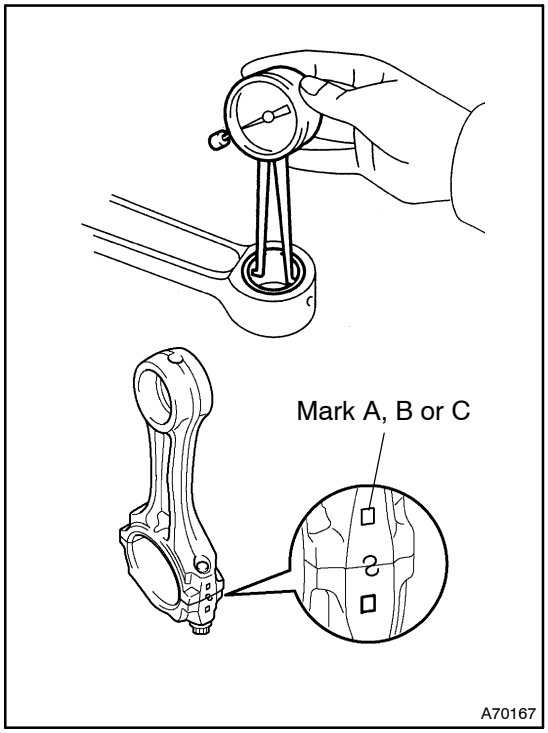


(2) Check for twist

Maximum twist:

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

If the twist is greater than the maximum, replace the connecting rod sub–assy.



(b) Inspect the piston pin oil clearance.

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

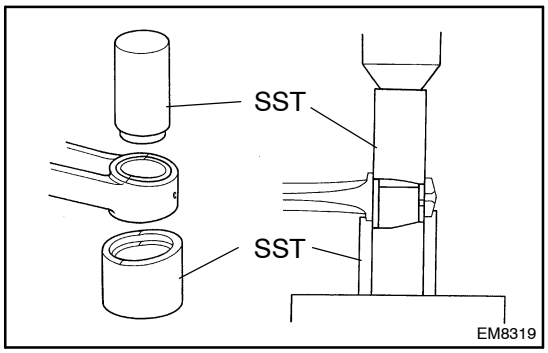
Bush inside diameter:

Mark A	34.012 – 34.016 mm (1.3391 – 1.3392 in.)
Mark B	34.016 – 34.020 mm (1.3392 – 1.3394 in.)
Mark C	34.020 – 34.024 mm (1.3394 – 1.3395 in.)

(2) Subtract the piston pin diameter (See step 20) from the bush inside diameter.

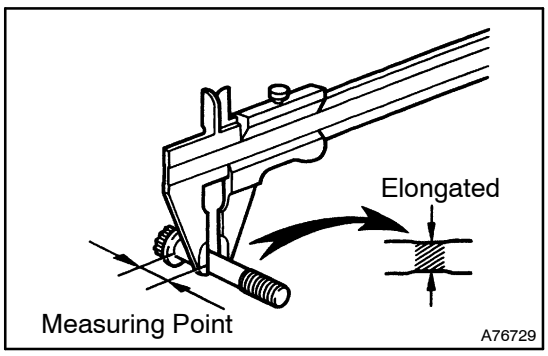
Standard oil clearance:
0.012 – 0.020 mm (0.0005 – 0.0008 in.)
Maximum oil clearance: 0.03 mm (0.0012 in.)

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



23. REMOVE BUSH,BIMETAL FORMED

(a) Using SST and a press, press out the bush.
SST 09222–06010 (09222–06031)

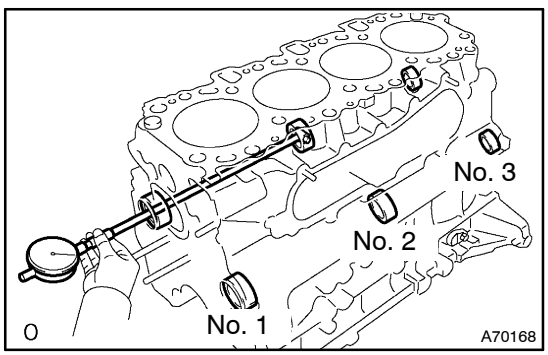


24. INSPECT BOLT, CONNECTING ROD

(a) Using a vernier caliper, measure the constricted portion of the connecting rod bolt.

Standard diameter:
8.500 – 8.600 mm (0.3346 – 0.3385 in.)
Minimum diameter: 8.30 mm (0.3268 in.)

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

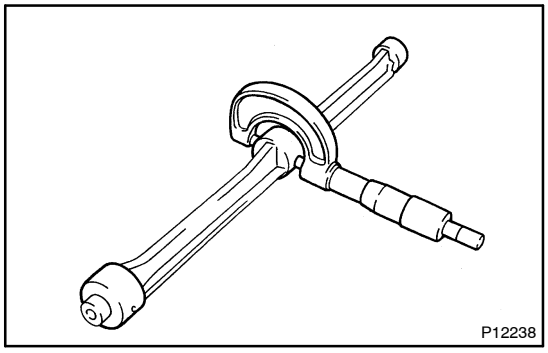


25. INSPECT BALANCESHAFT SUB–ASSY, NO.1

(a) Using a cylinder gauge, measure the inside diameter of the balance shaft bearing.

Bearing inside diameter:

No. 1	42.000 – 42.020 mm (1.6535 – 1.6543 in.)
No. 2	41.000 – 41.020 mm (1.6142 – 1.6150 in.)
No. 3	32.000 – 32.020 mm (1.2598 – 1.2606 in.)



(b) Using a micrometer, measure the outside diameter of the balance shaft main journals.

Main journal diameter:

No. 1	41.941 – 41.960 mm (1.6512 – 1.6520 in.)
No. 2	40.931 – 40.950 mm (1.6115 – 1.6122 in.)
No. 3	31.941 – 31.960 mm (1.2575 – 12583 in.)

(c) Subtract the outside diameter of the balance shaft main journal from the inside diameter to the balance shaft bearing.

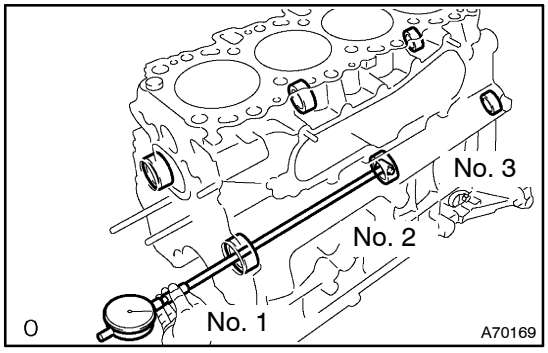
Standard oil clearance:

No. 1	0.040 – 0.079 mm (0.0016 – 0.0031 in.)
No. 2	0.040 – 0.079 mm (0.0016 – 0.0031 in.)
No. 3	0.050 – 0.089 mm (0.0020 – 0.0035 in.)

Maximum oil clearance:

No. 1	0.18 mm (0.0071 in.)
No. 2	0.19 mm (0.0075 in.)
No. 3	0.18 mm (0.0071 in.)

If the clearance is greater than the maximum, replace the cylinder block and balance shaft.

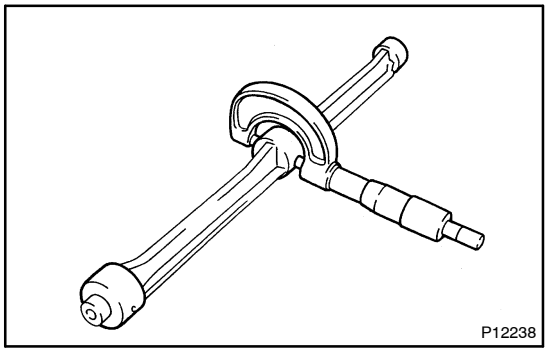


26. INSPECT BALANCESHAFT SUB–ASSY, NO.2

(a) Using cylinder gauge, measure the inside diameter of the balance shaft bearing.

Bearing inside diameter:

No. 1	42.000 – 42.020 mm (1.6535 – 1.6543 in.)
No. 2	41.000 – 41.020 mm (1.6142 – 1.6150 in.)
No. 3	32.000 – 32.020 mm (1.2598 – 1.2606 in.)



(b) Using a micrometer, measure the outside diameter of the balance shaft main journals.

Main journal diameter:

No. 1	41.941 – 41.960 mm (1.6512 – 1.6520 in.)
No. 2	40.931 – 40.950 mm (1.6115 – 1.6122 in.)
No. 3	31.941 – 31.960 mm (1.2575 – 12583 in.)

(c) Subtract the outside diameter of the balance shaft main journal from the inside diameter to the balance shaft bearing.

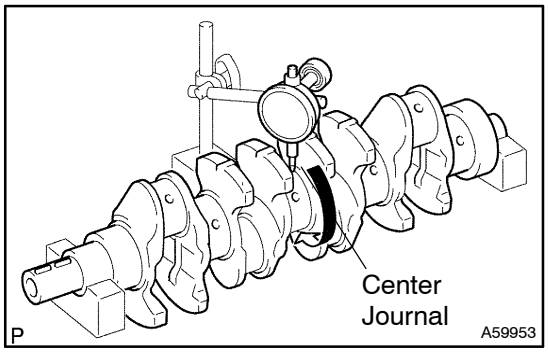
Standard oil clearance:

No. 1	0.040 – 0.079 mm (0.0016 – 0.0031 in.)
No. 2	0.040 – 0.079 mm (0.0016 – 0.0031 in.)
No. 3	0.050 – 0.089 mm (0.0020 – 0.0035 in.)

Maximum oil clearance:

No. 1	0.18 mm (0.0071 in.)
No. 2	0.19 mm (0.0075 in.)
No. 3	0.18 mm (0.0071 in.)

If the clearance is greater than the maximum, replace the cylinder block and balance shaft.



27. INSPECT CRANKSHAFT SUB–ASSY

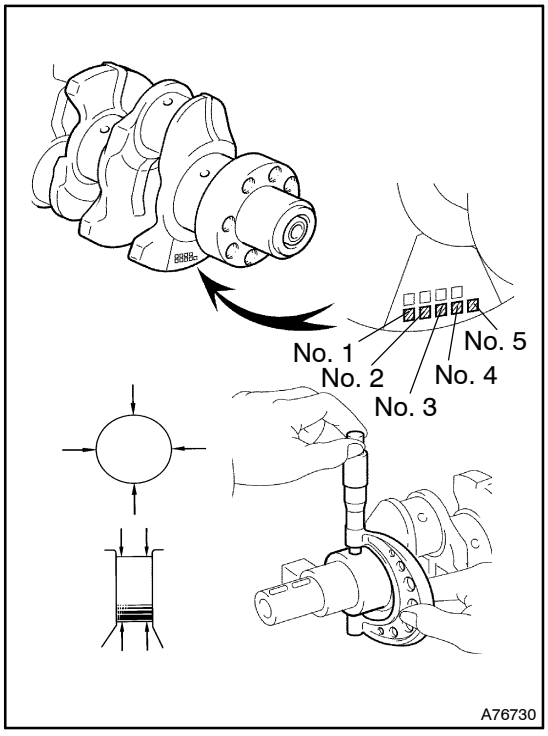
(a) Inspect for circle runout.

(1) Place the crankshaft on V–blocks.

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

Maximum circle runout: 0.03 mm (0.0012 in.)

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

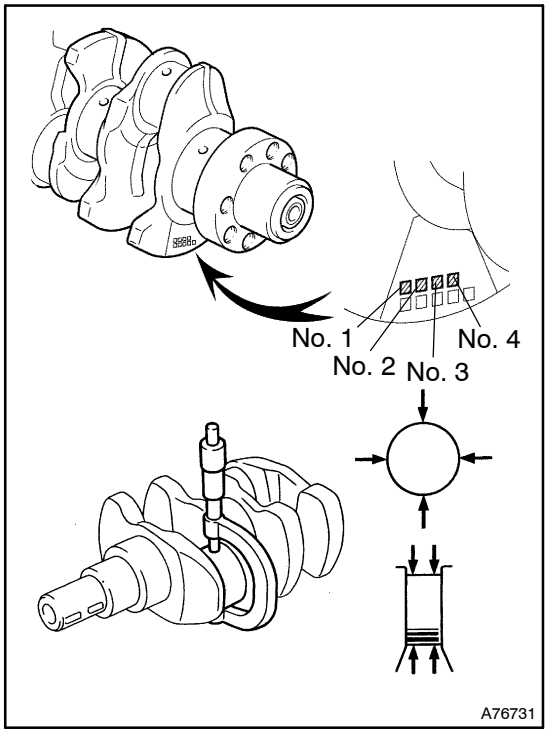


(b) Inspect the main journals.

(1) Using a micrometer, measure the outside diameter of each main journal.

Main journal diameter:

Mark 1	69.994 – 70.000 mm (2.75566 – 2.75590 in.)
Mark 2	69.988 – 69.994 mm (2.75543 – 2.75566 in.)
Mark 3	69.982 – 69.988 mm (2.75519 – 2.75543 in.)



(c) Inspect the crank pins.

(1) Using a micrometer, measure the outside diameter of each crank pin.

Crank pin diameter:

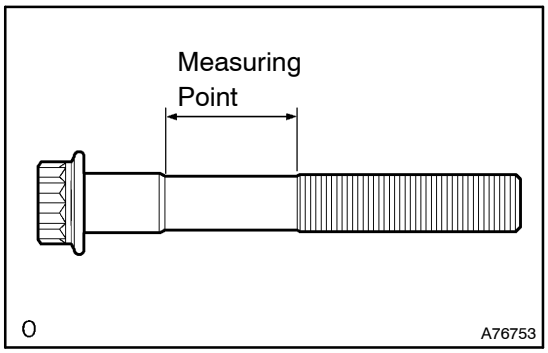
Mark 1	58.994 – 59.000 mm (2.32259 – 2.32283 in.)
Mark 2	58.988 – 59.994 mm (2.32236 – 2.32259 in.)
Mark 3	58.982 – 58.988 mm (2.32212 – 2.32239 in.)

If the diameter is not as specified, check the oil clearance (See step 4). If necessary, grid or replace the crankshaft.

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

maximum taper and out–of–round:
0.020 mm (0.0008 in.)

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

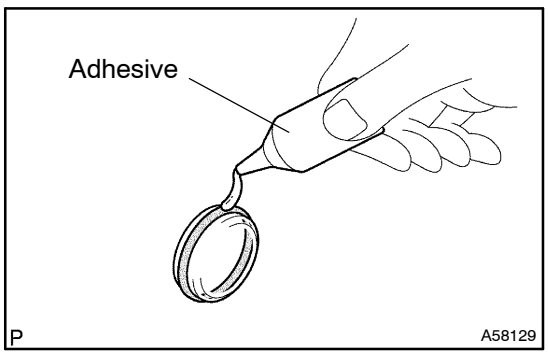


28. INSPECT CRANKSHAFT BEARING CAP BOLT

(a) Using a vernier caliper, measure the minimum diameter of the compressed thread at the measuring point.

Standard diameter:
13.500 – 14.000 mm (0.5315 – 0.5512 in.)
Minimum diameter: 12.60 mm (0.4961 in.)

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



29. INSTALL TIGHT PLUG

(a) Apply an adhesive around tight plugs.

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

NOTICE:
Do ont start the engine 1 hour after the installation.

(1) Using SST, tap in the tight plug No. 1 as shown in the illustration.

SST 09950–60010 (09951–00450), 09950–70010 (09951–07100)

(2) Using SST, tap in the tight plug No. 2 as shown in the illustration.

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

(3) Using SST, tap in the tight plug No. 3 as shown in the illustration.

SST 09950–60010 (09951–00400), 09950–70010 (09951–07100)

(4) Using SST, tap in the tight plug No. 4 as shown in the illustration.

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

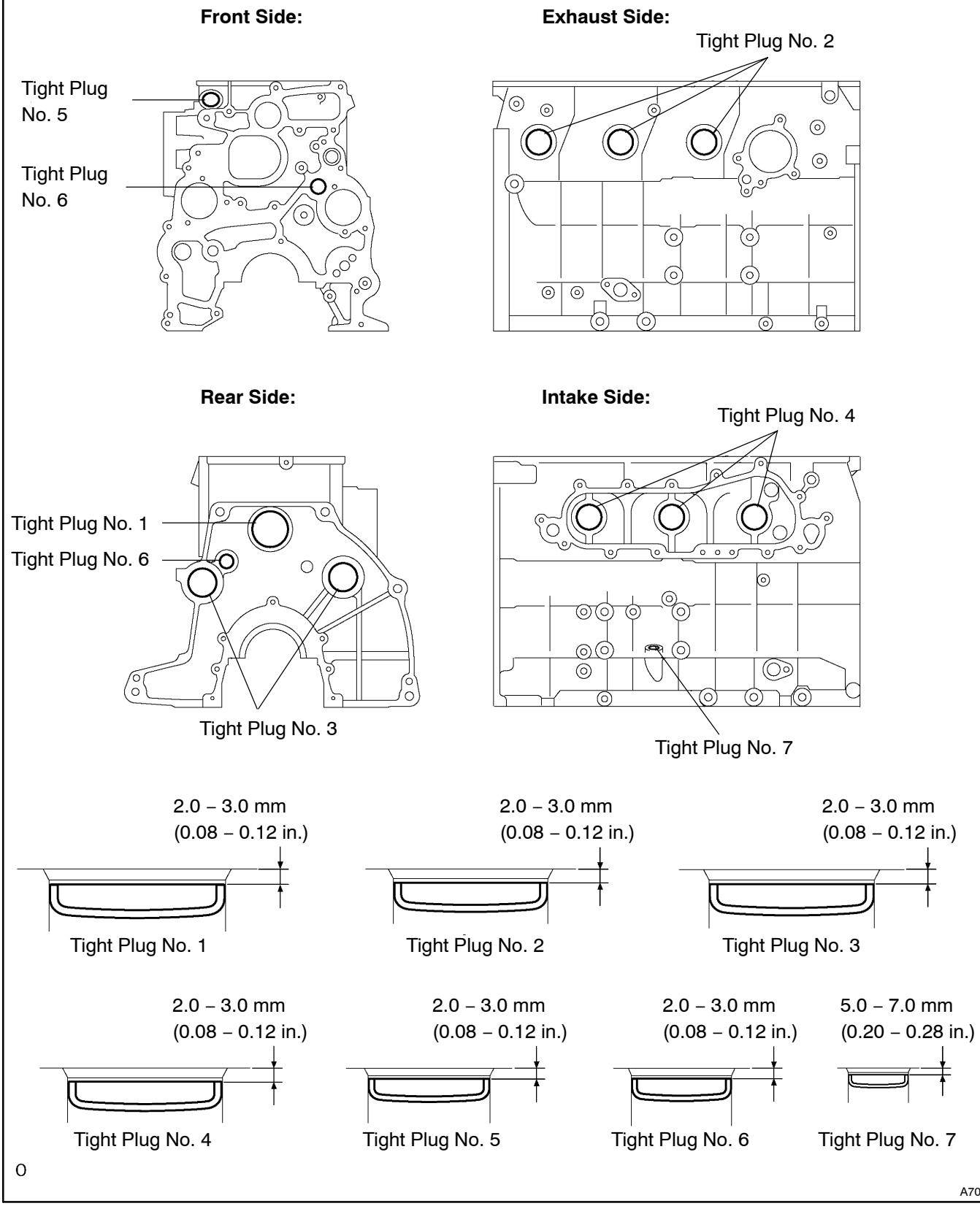
(5) Using SST, tap in the tight plug No. 5 as shown in the illustration.

SST 09950–60010 (09951–00200), 09950–70010 (09951–07100)

(6) Using SST, tap in the tight plug No. 6 as shown in the illustration.

SST 09950–60010 (09951–00180), 09950–70010 (09951–07100)

(7) Using a 8mm deep socket wrench, tap in the tight plug No. 7 as shown in the illustration.


Front Side:
Tight Plug No. 5
Tight Plug No. 6
Exhaust Side:
Tight Plug No. 2
Rear Side:
Tight Plug No. 1
Tight Plug No. 6
Tight Plug No. 3
Intake Side:
Tight Plug No. 4
Tight Plug No. 7
2.0 – 3.0 mm
(0.08 – 0.12 in.)
Tight Plug No. 1
2.0 – 3.0 mm
(0.08 – 0.12 in.)
Tight Plug No. 2
2.0 – 3.0 mm
(0.08 – 0.12 in.)
Tight Plug No. 3
2.0 – 3.0 mm
(0.08 – 0.12 in.)
Tight Plug No. 4
2.0 – 3.0 mm
(0.08 – 0.12 in.)
Tight Plug No. 5
2.0 – 3.0 mm
(0.08 – 0.12 in.)
Tight Plug No. 6
5.0 – 7.0 mm
(0.20 – 0.28 in.)
Tight Plug No. 7
O
A70165

30. INSTALL STUD BOLT

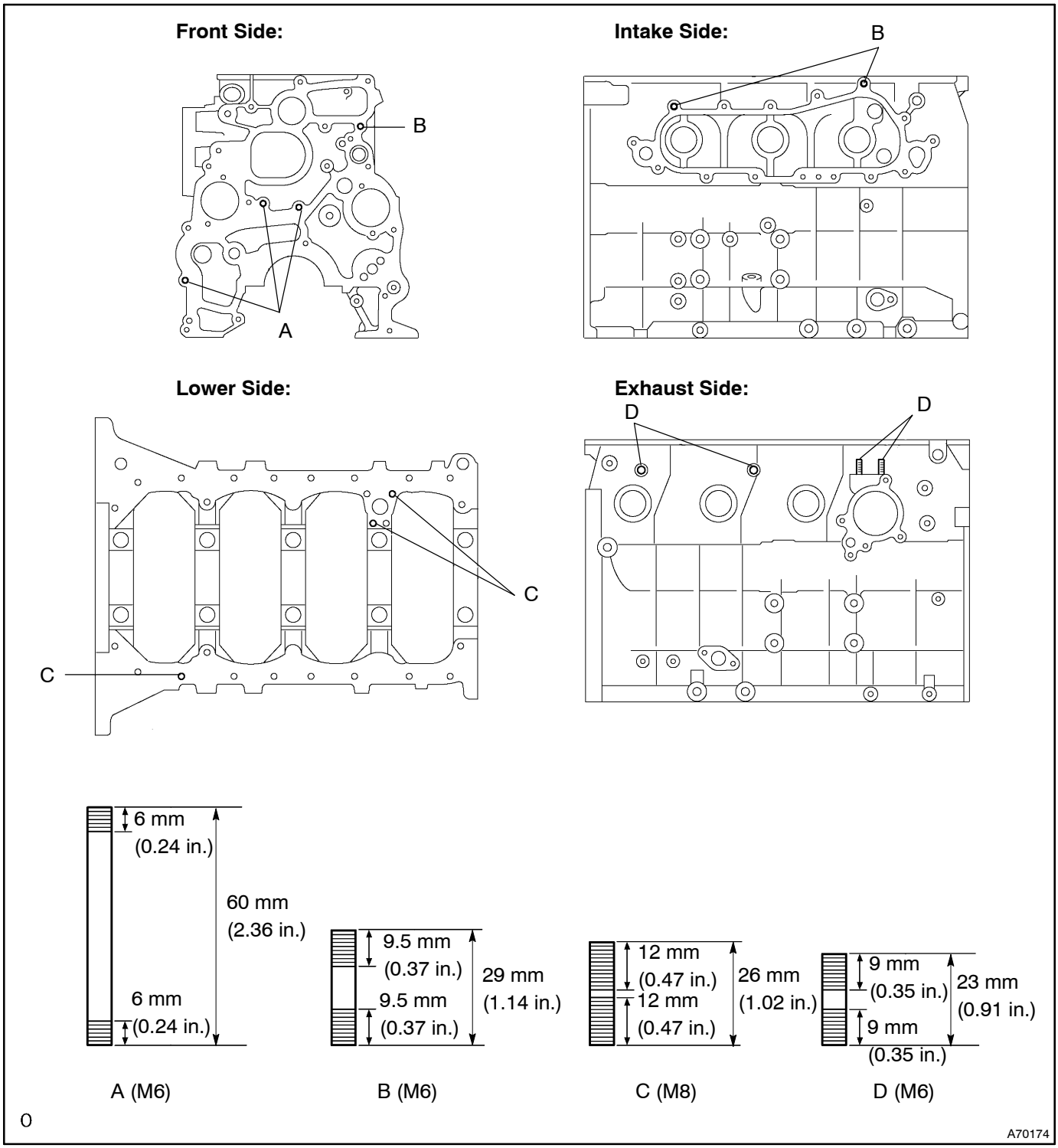
(a) Install the stud bolts as shown in the illustration.

Torque:

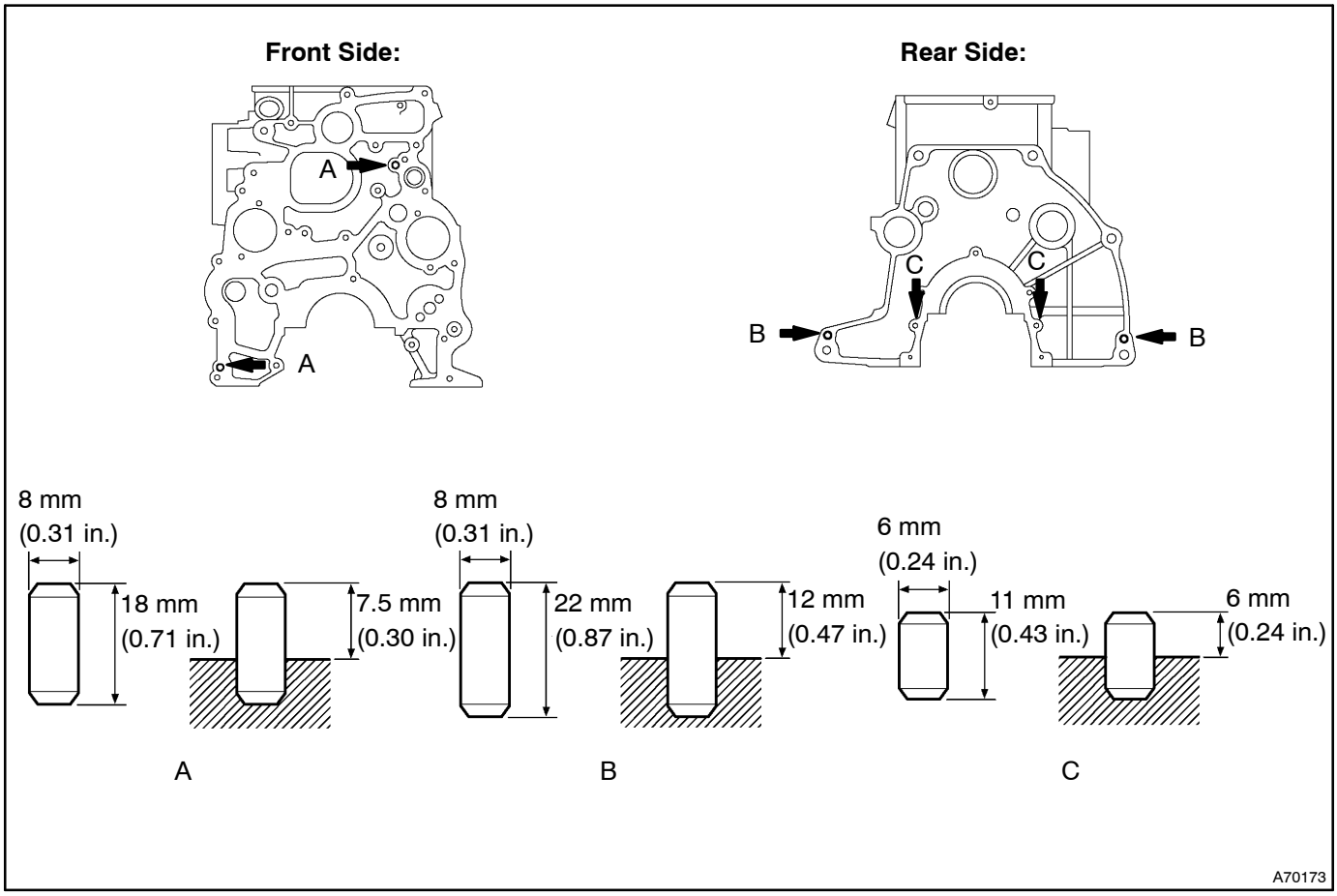
7.0 N·m (71 kgf·cm, 62 in.·lbf) for bolt A, B

8.0 N·m (82 kgf·cm, 71 in.·lbf) for bolt C

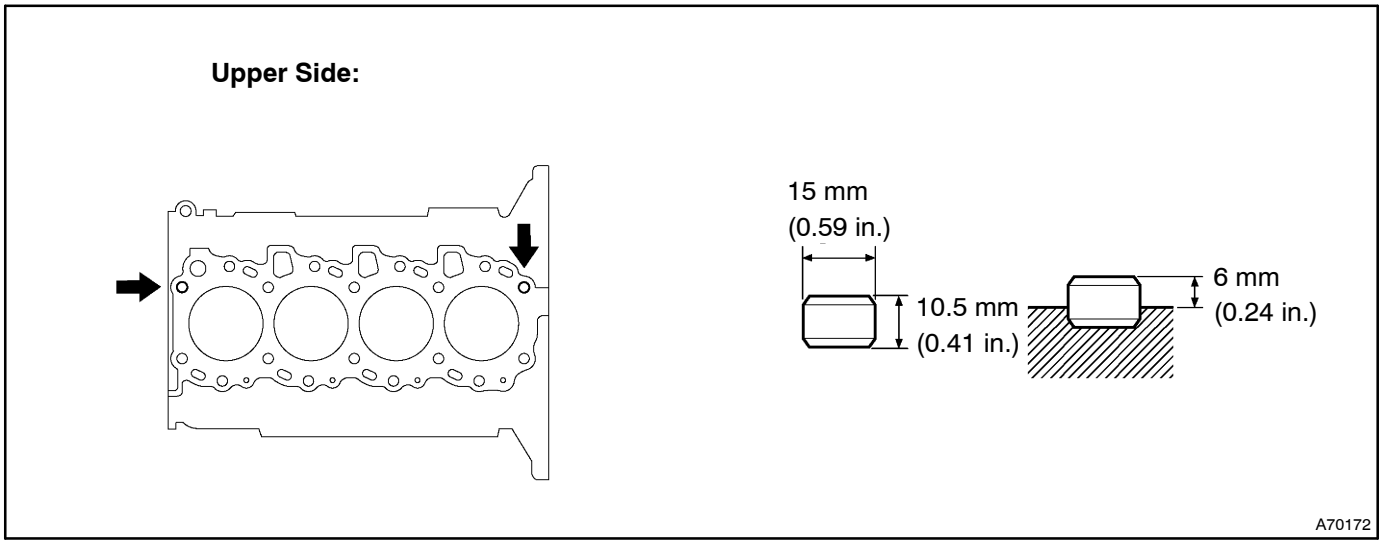
4.0 N·m (41 kgf·cm, 35 in.·lbf) for bolt D, E

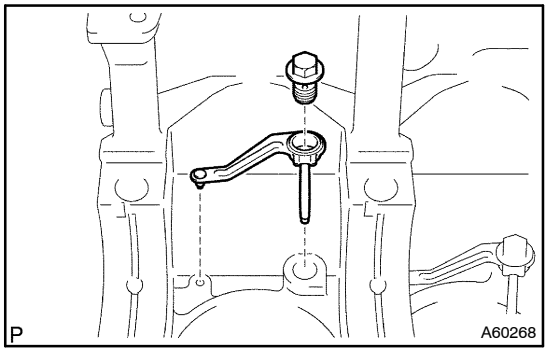


31. INSTALL STRAIGHT PIN



32. INSTALL RING PIN

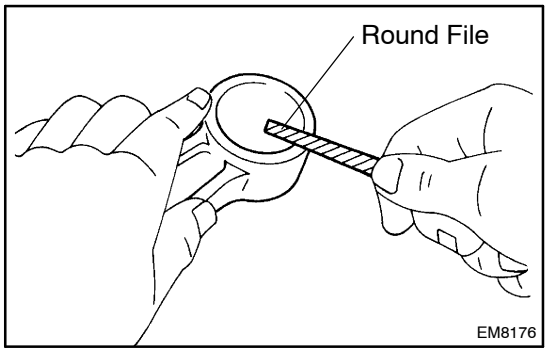




33. INSTALL NOZZLE SUB–ASSY, OIL, NO.1

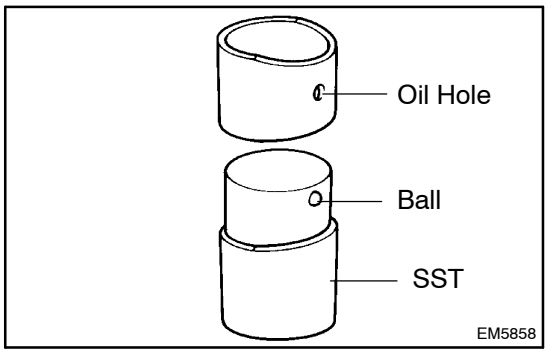
(a) Align the oil nozzle pin with the pin hole of the cylinder block.

(b) Install the oil nozzle with the check valve. Install the 4 oil nozzles and check valves.
Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)

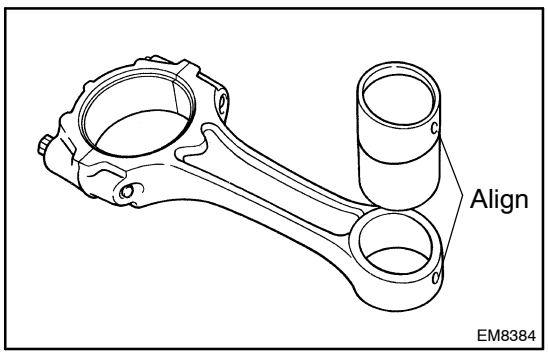


34. INSTALL BUSH,BIMETAL FORMED

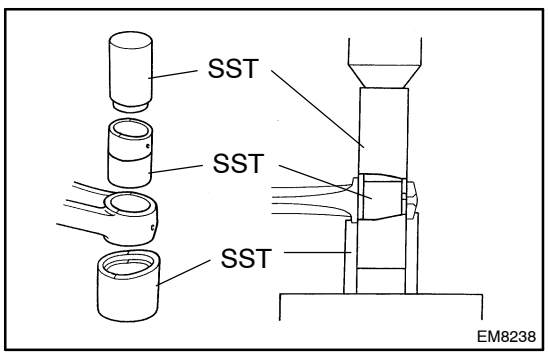
(a) Using a round file, lightly file the small end of the connecting rod.



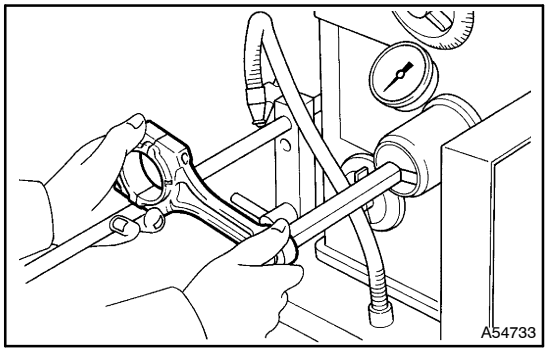
(b) Install the bushing to SST with the ball of SST inside the oil hole of the bushing.
SST 09222–06020



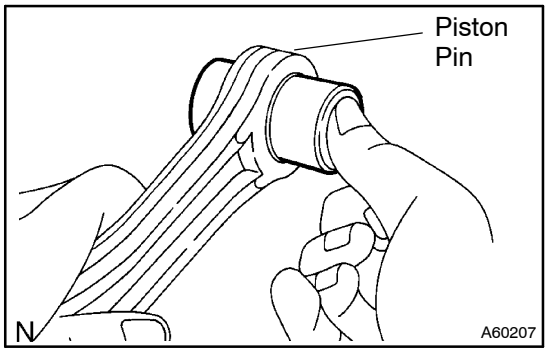
(c) Align the oil holes of a new bushing and the connecting rod.



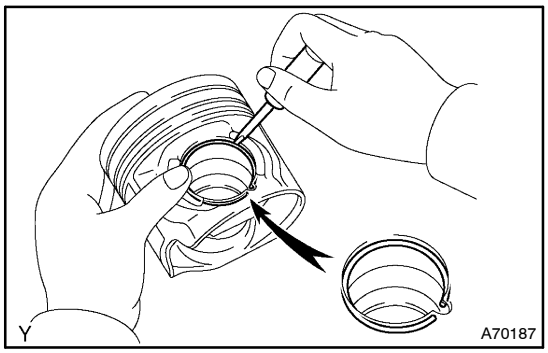
(d) Using SST and a press, press in the bushing.
SST 09222–06010 (09222–06020, 09222–06031)



(1) Using a pin hole grinder, hone the bush to obtain the standard specified clearance (See step 22) between the bush and piston pin.



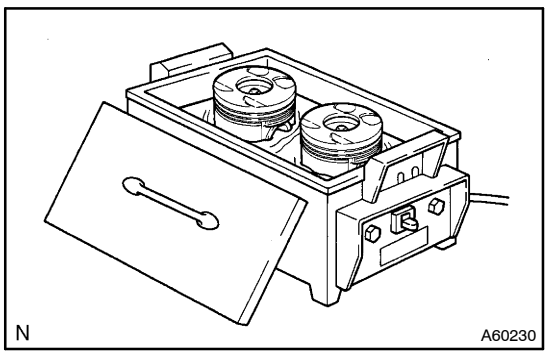
(2) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.



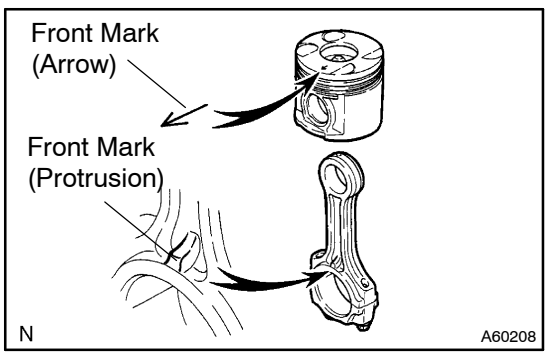
35. INSTALL PISTON SUB–ASSY, W/PIN

(a) Assemble the piston and connecting rod.

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

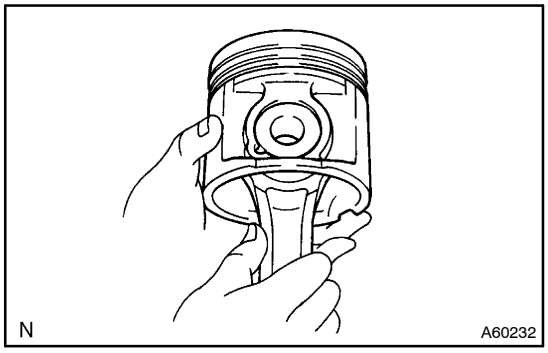


(2) Gradually heat the piston to about 80°C (176°F).

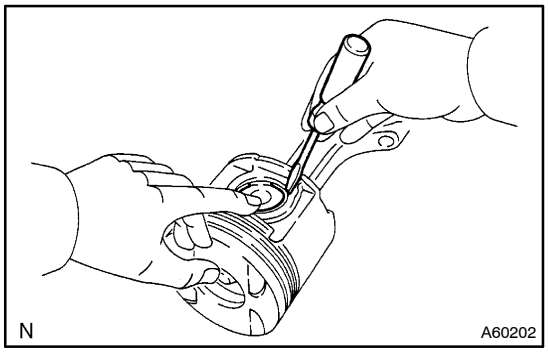


(3) Coat the piston pin with engine oil.

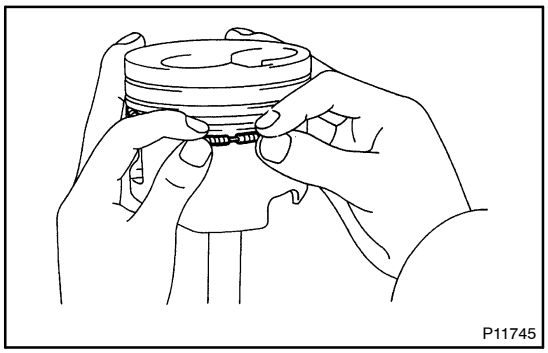
(4) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.



(5) Check it by pushing the piston back and forth that the piston and piston pin are fitted.



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

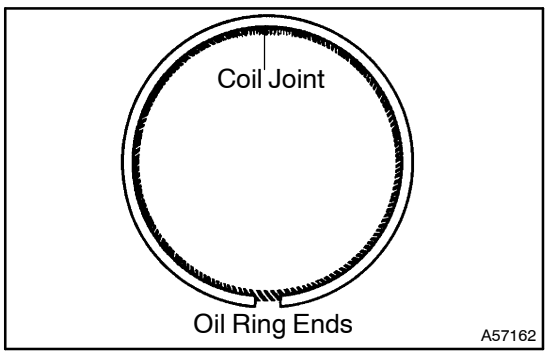


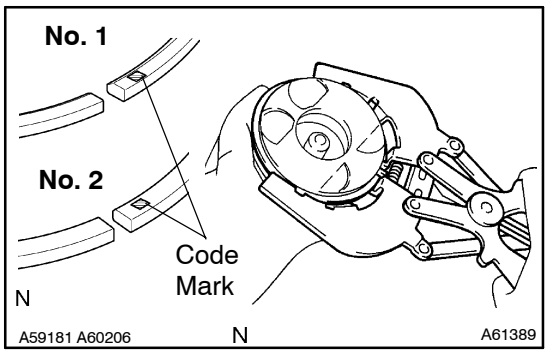
(b) Install the piston rings.

(1) Install the coil and oil ring by hand.

HINT:

Face the end gap of the oil ring in the opposite direction coil joint.

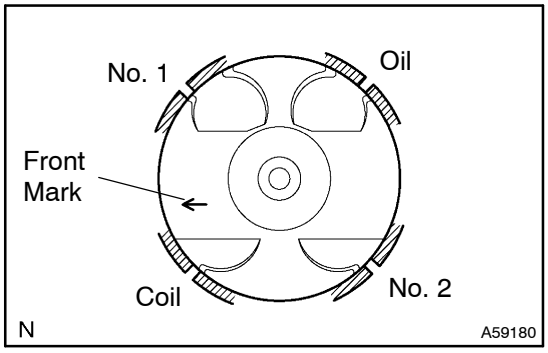




(2) Using a piston ring expander, install the No. 1 and No. 2 piston rings with the code mark facing upward.

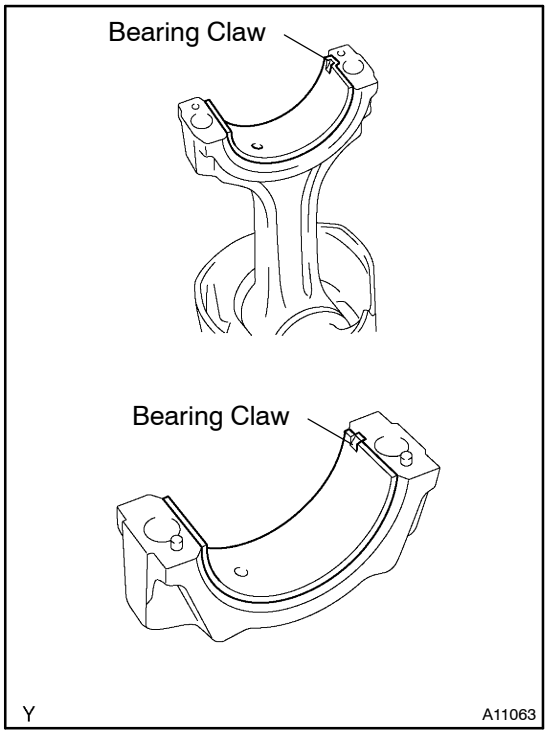
Code mark:

No. 1	NP
No. 2	N



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

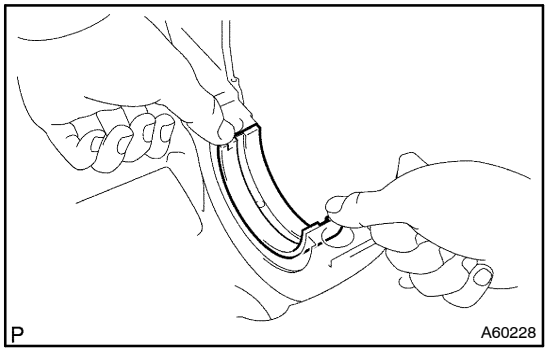
NOTICE:
Do not align the ring ends.



36. INSTALL BEARING SET, CONNECTING ROD

(a) Align the bearing claw with the groove of the connecting rod or connecting cap.

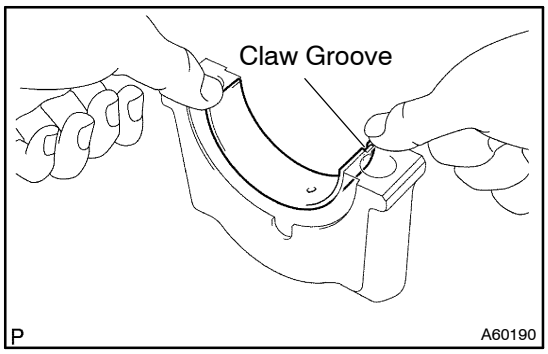
(b) Install the bearings in the connecting rod and connecting rod cap.



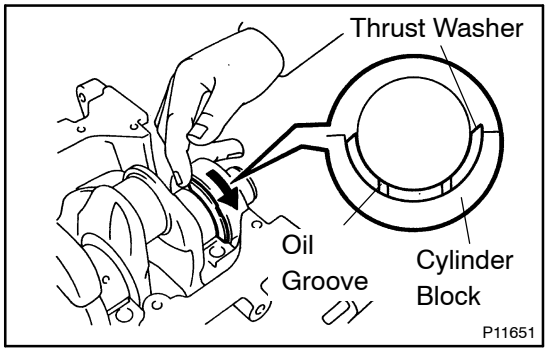
37. INSTALL BEARING SET, CRANKSHAFT

HINT:
Upper bearings have an oil groove and oil hole; 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.



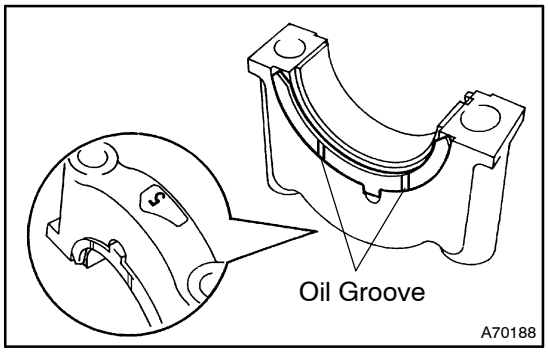
38. INSTALL CRANKSHAFT SUB–ASSY

(a) Place the crankshaft on the cylinder block.

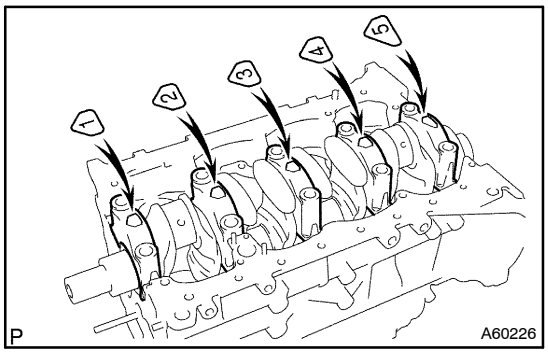
(b) Install the 2 upper thrust washers to the No. 5 journal position of the cylinder block.

(1) Push the crankshaft toward the front (rear) side.

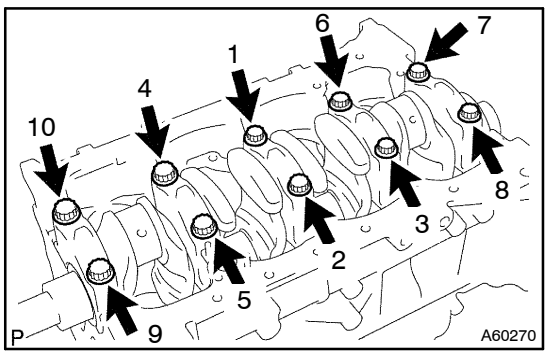
(2) Install the 2 thrust washers with the oil grooves facing outward.



(c) Install the 2 thrust washers on the No. 5 bearing cap with the grooves facing outward.



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



(e) Install the crankshaft bearing cap bolts.

HINT:

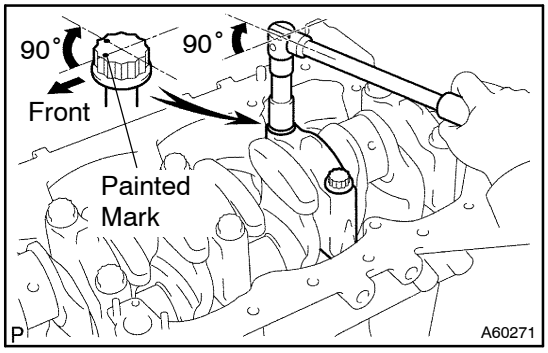
- The main bearing cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any one of the main bearing cap bolt is broken or deformed, replace it.

(1) Apply a light coat of the engine oil on the threads and under the bolt heads of the main bearing caps.

(2) Install and uniformly tighten the 10 bolts of the main bearing caps, in several passes, in the sequence shown in the order indicated in the illustration.

Torque: 50 N·m (510 kgf·cm, 37 ft·lbf)

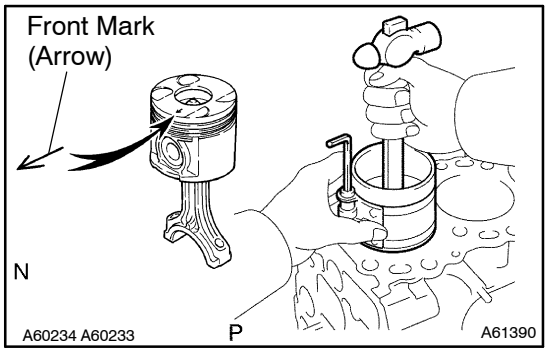
If any one of the main bearing cap bolts does not meet the torque specification, replace the main bearing cap bolt.



(3) Mark the front of the main bearing cap bolt with paint.
(4) Retighten the main bearing cap bolts 90 ° in the numerical order shown above.
(5) Check that the painted mark is now at a 90 ° angle to the front.

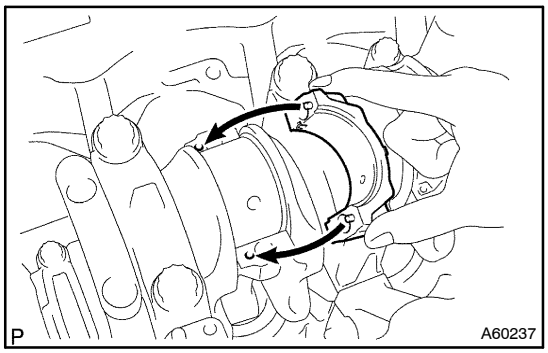
(f) Check that the crankshaft turns smoothly.

(g) Check the crankshaft thrust clearance (See step 7).

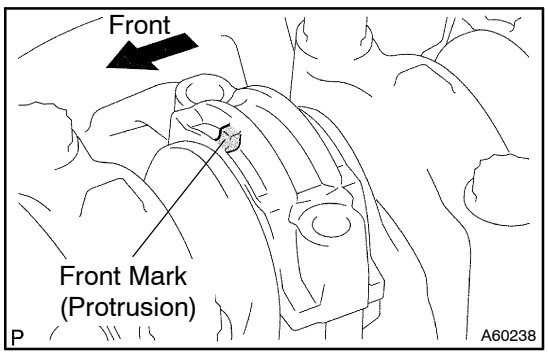


39. INSTALL PISTON AND CONNECTING ROD

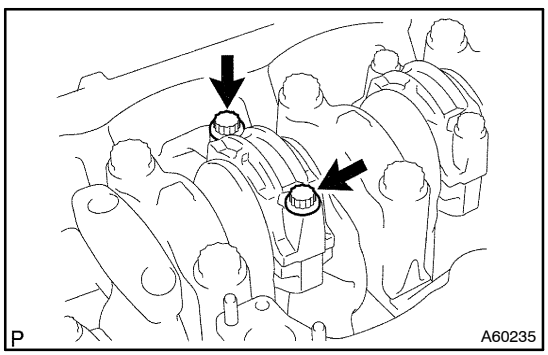
(a) Using a piston ring compressor, push the correctly numbered piston and connecting rod assembly into the cylinder with the front mark of the piston facing forward.



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



(3) Check that the front mark of the connecting rod cap is facing forward.



(c) Install the connecting rod cap bolts.

HINT:

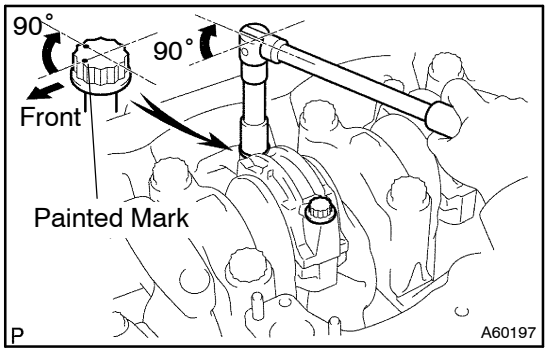
- The connecting rod cap bolts are tightened in 2 progressive steps (steps (2) and (4)).
- If any connecting rod bolt is broken or deformed, replace it.

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

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

Torque: 35 N·m (357 kgf·cm, 26 ft·lbf)

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



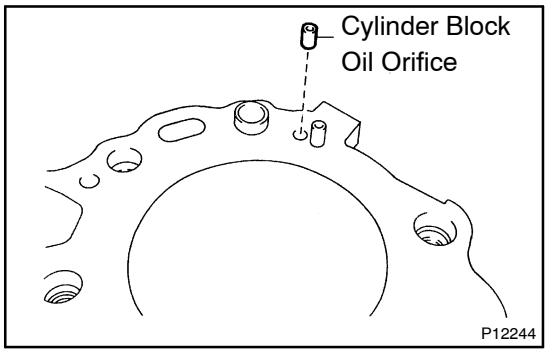
(3) Mark the front of the connecting rod cap bolts with paint.

(4) Retighten the connecting rod cap bolts 90° as shown in the illustration.

(5) Check that the painted mark is now at a 90° angle to the front.

(d) Check that the crankshaft turns smoothly.

(e) Check the connecting rod thrust clearance (See step 3).



40. INSTALL ORIFICE, CYLINDER BLOCK OIL