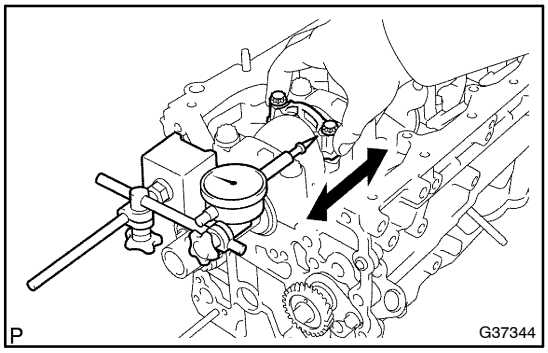
1421T–02

OVERHAUL



1. INSPECT CONNECTING ROD THRUST CLEARANCE

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

Standard thrust clearance:
0.150 to 0.350 mm (0.0059 to 0.0138 in.)
Maximum thrust clearance: 0.40 mm (0.016 in.)

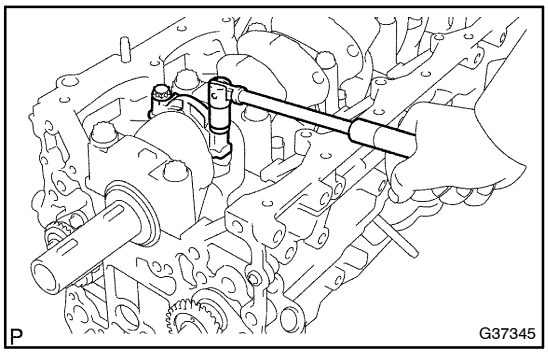
If the thrust clearance is greater than the maximum, replace the connecting rod assembly(s). If necessary, replace the crankshaft.

2. INSPECT CONNECTING ROD OIL CLEARANCE

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

HINT:

The matchmarks on the connecting rods and caps are for ensuring the correct reassembly.



(b) Remove the 2 connecting rod cap bolts.

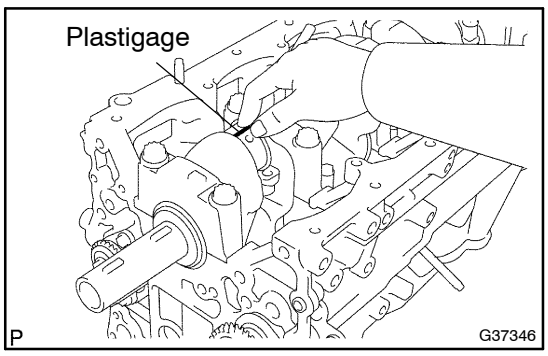
(c) Using the 2 removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

HINT:

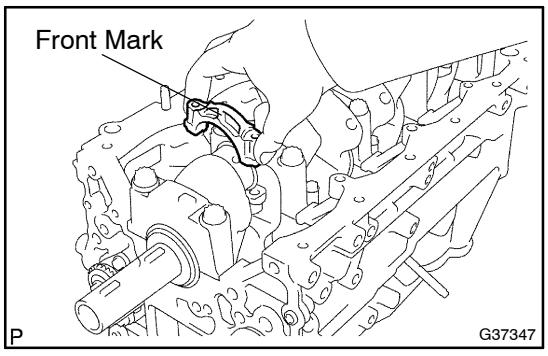
Keep the lower bearing inserted to the connecting rod cap.

(d) Clean the crank pin and bearing.

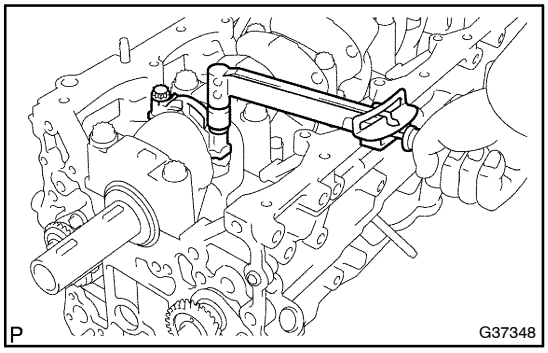
(e) Check the crank pin and bearing for pitting and scratches.



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



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

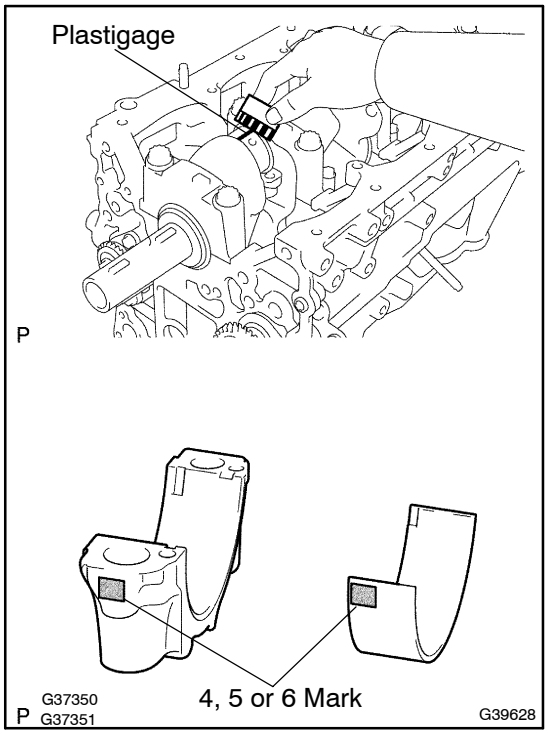


(h) Install the connecting rod cap. (see step 51)

NOTICE:

Do not turn the crankshaft.

(i) Remove the 2 bolts and connecting rod cap (see steps (b) and (c) above).



(j) Measure the Plastigage at its widest point.

Standard oil clearance:

0.024 to 0.049 mm (0.0009 to 0.0019 in.)

Maximum oil clearance: 0.066 mm (0.0026 in.)

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

HINT:

If replacing a bearing, replace it with one that has the same number as its respective connecting rod cap. Each bearing's standard thickness is indicated by a 1, 2 and 3 mark on its surface.

Reference:

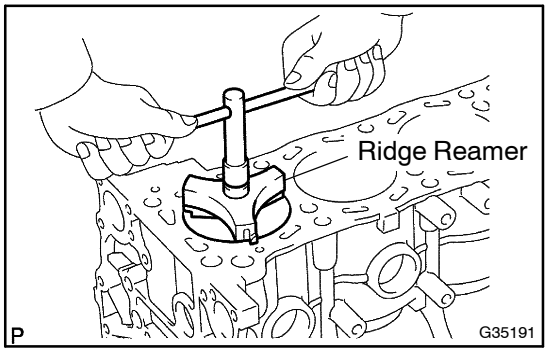
Crankshaft pin diameter:

Mark	Thickness
4	52.989 to 53.002 mm (2.0862 to 2.0867 in.)
5	52.989 to 53.002 mm (2.0862 to 2.0867 in.)
6	52.989 to 53.002 mm (2.0862 to 2.0867 in.)

Standard bearing center wall thickness:

Mark	Thickness
4	1.484 to 1.487 mm (0.0584 to 0.0585 in.)
5	1.488 to 1.490 mm (0.0586 to 0.0587 in.)
6	1.491 to 1.493 mm (0.0587 to 0.0588 in.)

(k) Completely remove the Plastigage.



3. REMOVE PISTON SUB–ASSY W/CONNECTING ROD

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

(b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

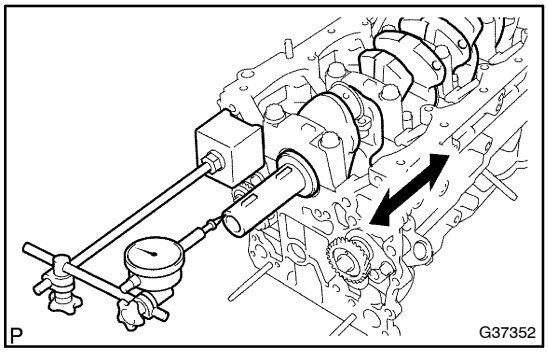
HINT:

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

4. REMOVE CONNECTING ROD BEARING

HINT:

Arrange the removed parts in the correct order.



5. INSPECT CRANKSHAFT THRUST CLEARANCE

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

Standard thrust clearance:

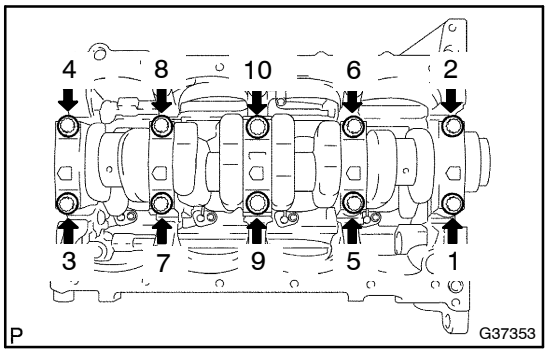
0.020 to 0.220 mm (0.0008 to 0.0087 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

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

Thrust washer thickness:

2.440 to 2.490 mm (0.0961 to 0.0980 in.)



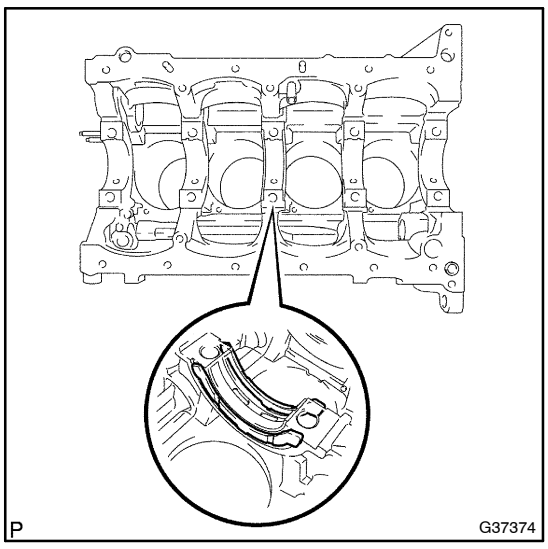
6. REMOVE CRANKSHAFT

(a) Uniformly loosen the 10 bearing cap bolts, in several steps, in the sequence shown in the illustration.

HINT:

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

(b) Lift out the crankshaft.



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

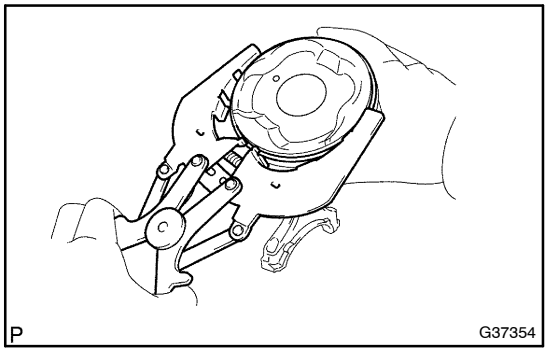
HINT:

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

7. REMOVE CRANKSHAFT BEARING

HINT:

Arrange the removed parts in the correct order.



8. REMOVE PISTON RING SET

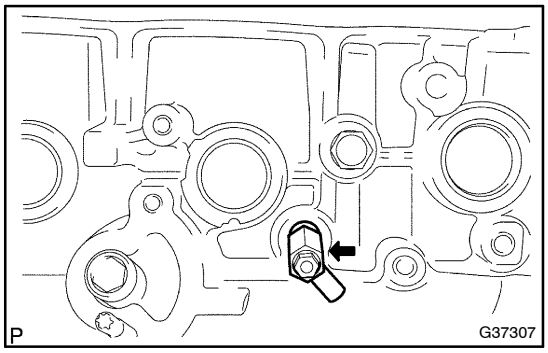
(a) Using a piston ring expander, remove the 2 compression rings.

(b) Using a piston ring expander, remove the oil ring rail.

(c) Remove the oil ring expander by hand.

HINT:

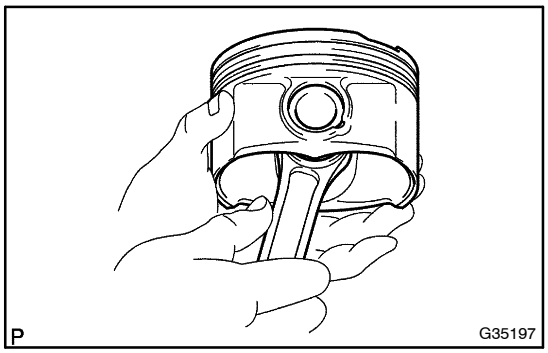
Arrange the piston rings in the correct order.



9. REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB–ASSY

(a) Remove the water drain cock sub–assy from the cylinder block.

(b) Remove the water drain cock plug from the water drain cock sub–assy.

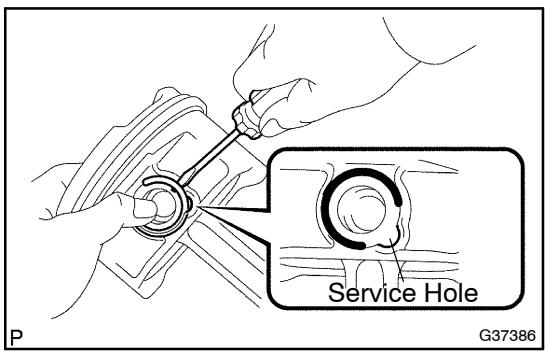


10. REMOVE W/PIN PISTON SUB–ASSY

(a) Check the fitting condition between the piston and piston pin.

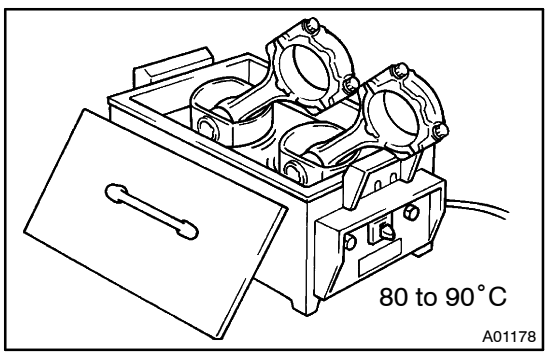
(1) Try to move the piston back and forth on the piston pin.

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

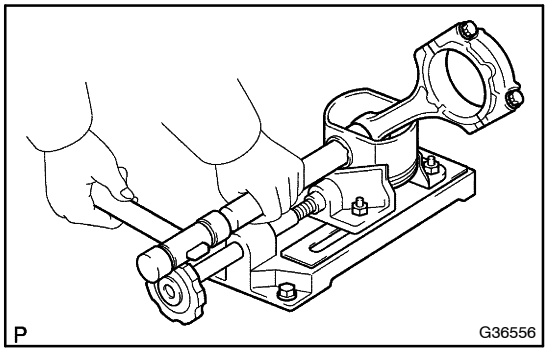


(b) Disconnect the connecting rod from the piston.

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



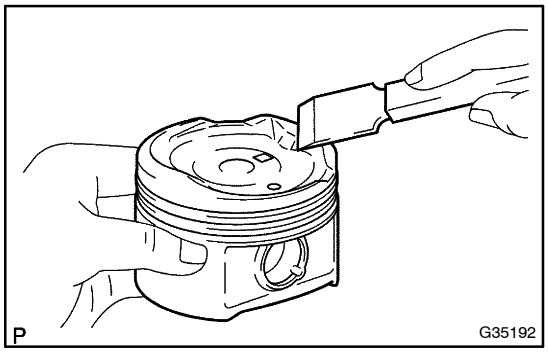
(2) Gradually heat the piston to approximately 80 to 90°C (176 to 194°F).



(3) Using a brass bar and plastic–faced hammer, lightly tap out the piston pin and remove the connecting rod.

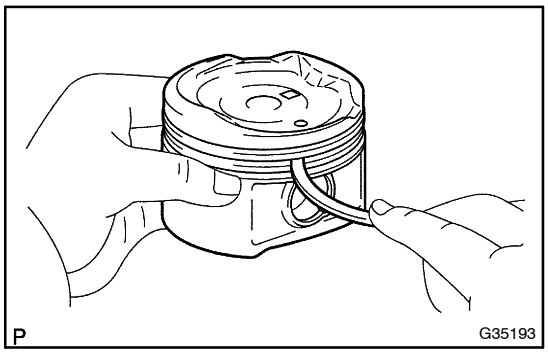
HINT:

- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.

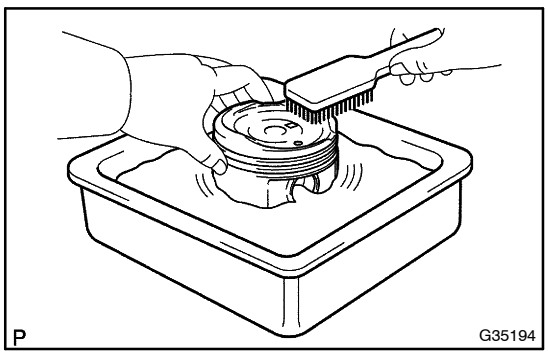


11. CLEAN W/PIN PISTON SUB–ASSY

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



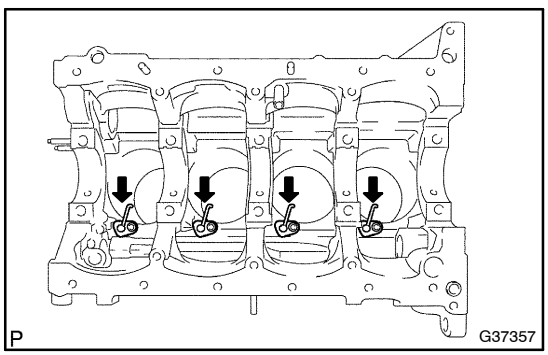
(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



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

NOTICE:

Do not use a wire brush.



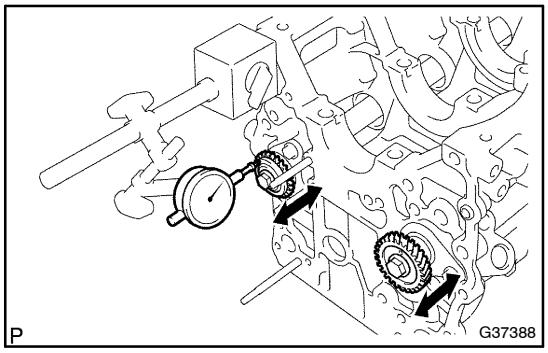
12. REMOVE SUB–ASSY OIL NOZZLE NO.1

(a) Using a 5 mm hexagon wrench, remove the oil nozzles.

13. INSPECT SUB–ASSY OIL NOZZLE NO.1

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

If necessary, replace the oil nozzle.

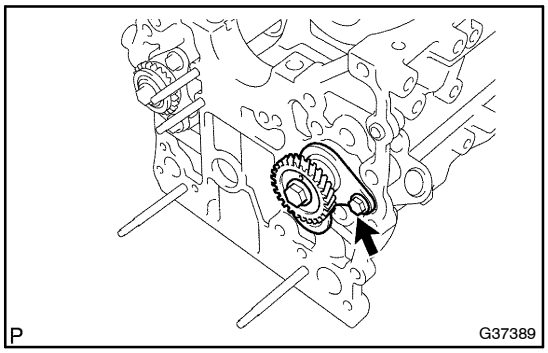


14. INSPECT BALANCE SHAFT THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance while moving the balanceshaft back and forth.

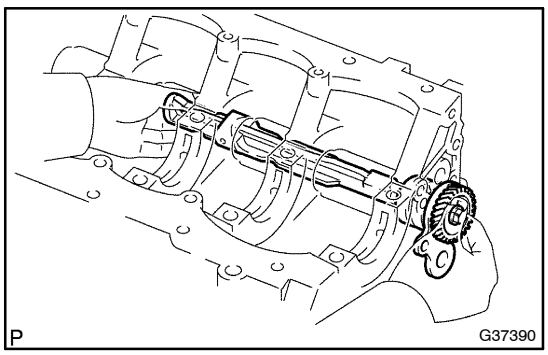
Standard thrust clearance:
0.07 to 0.13 mm (0.0027 to 0.0051 in.)
Maximum thrust clearance: 0.20 mm (0.0079 in.)

If the thrust clearance is greater than the maximum, replace the balanceshaft thrust washer. If necessary, replace the balanceshaft.



15. REMOVE NO.1 BALANCESHAFT

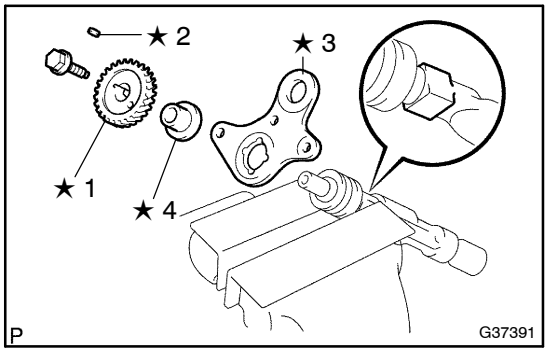
(a) Remove the bolt.



(b) Remove the balanceshaft from the cylinder block.

NOTICE:

When removing the balanceshaft, make sure to support the balanceshaft with both hands and avoid scratching the balanceshaft bearing on the cylinder block side.



16. REMOVE BALANCESHAFT DRIVEN GEAR NO.1

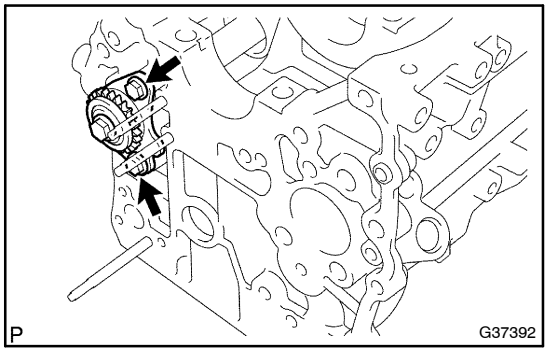
(a) Mount the head portion of the balanceshaft in a vise.

NOTICE:

Be careful not to damage the balanceshaft.

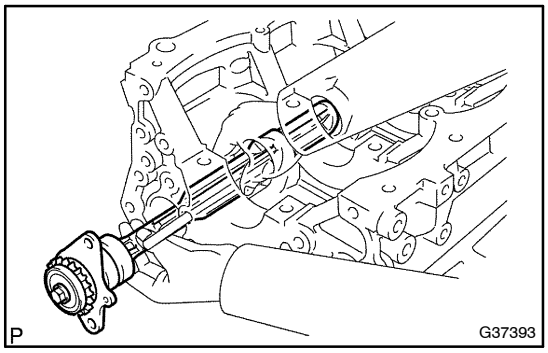
(b) Remove the bolt.

(c) Remove the balanceshaft driven gear No.1 (★ 1), sliding key (★ 2), balanceshaft thrust washer No.1 (★ 3) and balanceshaft thrust spacer (★ 4).



17. REMOVE NO.2 BALANCESHAFT

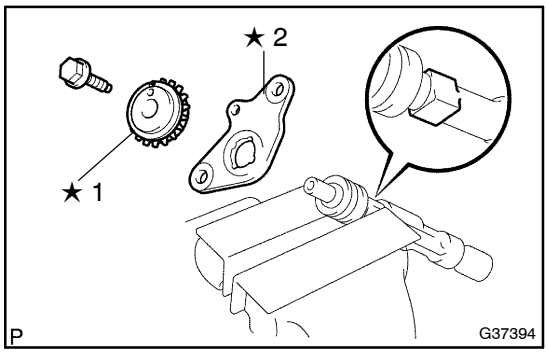
(a) Remove the 2 bolts.



(b) Remove the balanceshaft from the cylinder block.

NOTICE:

When removing the balanceshaft, make sure to support the balanceshaft with both hands and avoid scratching the balanceshaft bearing on the cylinder block side.



18. REMOVE BALANCESHAFT DRIVEN GEAR NO.2

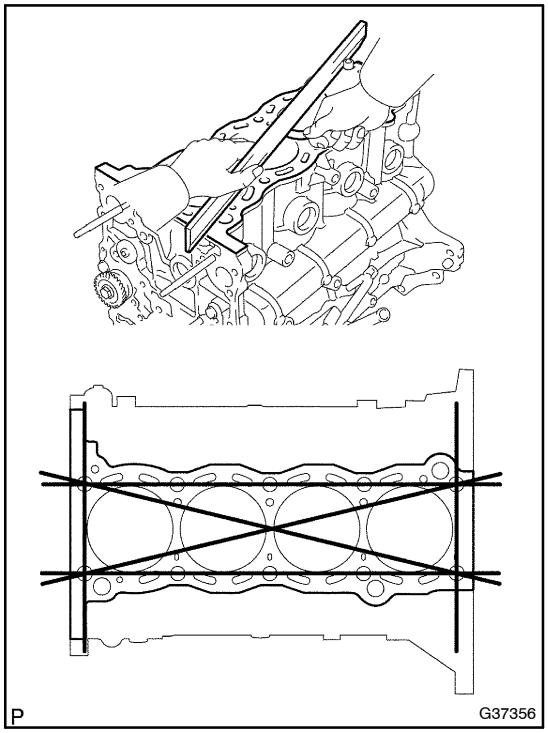
(a) Mount the head portion of the balanceshaft in a vise.

NOTICE:

Be careful not to damage the balanceshaft.

(b) Remove the bolt.

(c) Remove the balanceshaft driven gear No.2 (★ 1) and balanceshaft thrust washer No.2 (★ 2).

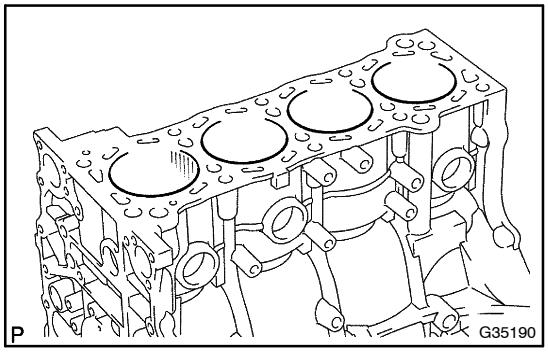


19. INSPECT CYLINDER BLOCK FOR FLATNESS

(a) Using a precision straight edge and feeler gauge, measure the warpage of the contact surface of the cylinder head gasket.

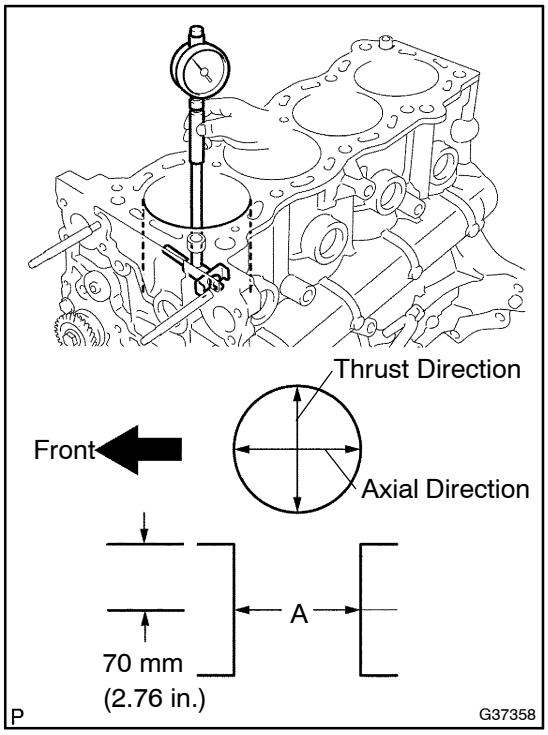
Maximum warpage: 0.05 mm (0.0020 in.)

If the warpage is greater than the 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.

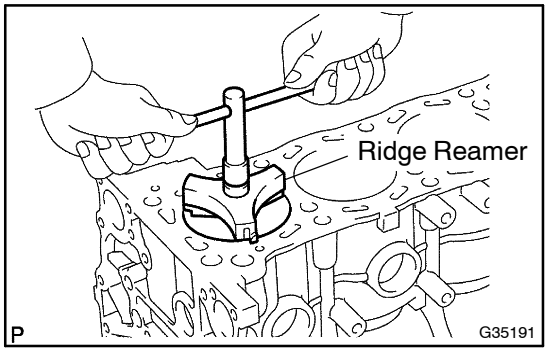


20. INSPECT CYLINDER BORE

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

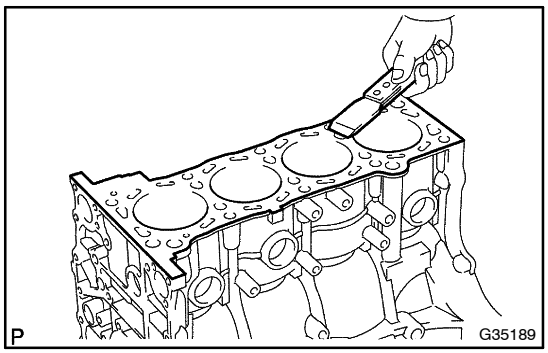
Standard diameter:
94.990 to 95.003 mm (3.7398 to 3.7403 in.)
Maximum difference diameter: 0.2 mm (0.008 in.)

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



(b) Inspect the cylinder ridge.

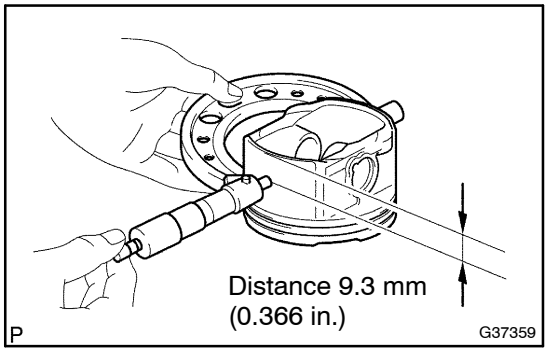
If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.



21. CLEAN CYLINDER BLOCK

(a) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

(b) Using a soft brush and solvent, thoroughly clean the cylinder block.



22. INSPECT PISTON DIAMETER

(a) Using a micrometer, measure the piston diameter at right angles to the piston center line, the indicated distance from the piston end.

Distance: 9.3 mm (0.366 in.)

Piston diameter:

Standard	94.941 to 94.971 mm (3.7378 to 3.7390 in.)

23. INSPECT PISTON OIL CLEARANCE

(a) Measure the cylinder bore diameter in the thrust directions (see step 20).

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

Standard oil clearance:

0.019 to 0.052 mm (0.0007 to 0.0020 in.)

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

HINT:

- Bore all the cylinders for the O/S piston outside diameter.
- Replace all the piston rings with ones to match the O/S pistons.

(c) If the oil clearance is greater than the standard.

(1) Prepare 4 new O/S pistons.

O/S 0.50 piston diameter:

95.441 to 95.451 mm (3.7575 to 3.7579 in.)

(2) Using a micrometer, measure the piston diameter at right angles to the piston center line, the indicated distance from the piston end.

Distance: 9.3 mm (0.366 in.)

(3) Calculate the amount each cylinder is to be rebored as follows:

Size to be rebored = P + C – H

P = Piston diameter

C = Piston clearance:

0.019 to 0.052 mm (0.0007 to 0.0020 in.)

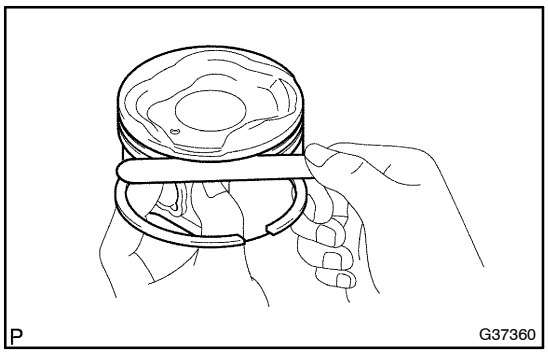
H = Allowance for honing: 0.02 mm (0.0008 in.) or less

(4) Bore and hone the cylinders to calculated dimensions.

Maximum honing: 0.02 mm (0.0008 in.)

NOTICE:

Excess honing will destroy the finished roundness.



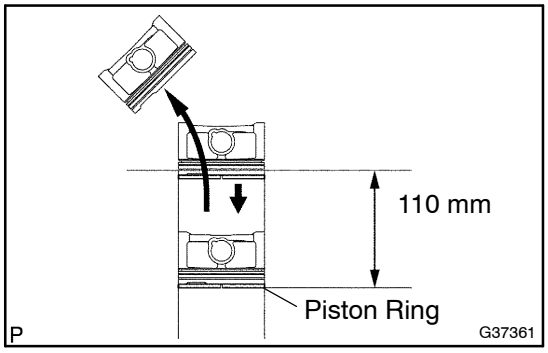
24. INSPECT RING GROOVE CLEARANCE

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

Ring groove clearance:

No.1	0.020 to 0.075 mm (0.0008 to 0.0030 in.)
No.2	0.020 to 0.065 mm (0.0008 to 0.0026 in.)
Oil	0.020 to 0.070 mm (0.0008 to 0.0028 in.)

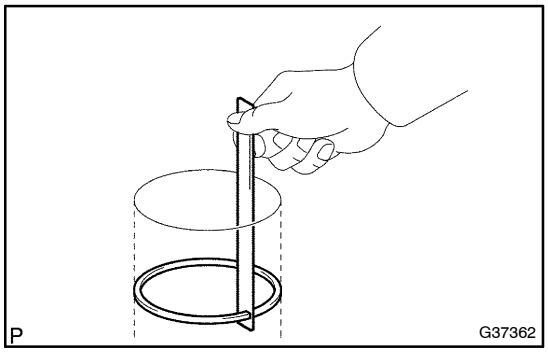
If the clearance is not as specified, replace the piston.



25. INSPECT PISTON RING END GAP

(a) Insert the piston ring into the cylinder bore.

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.



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

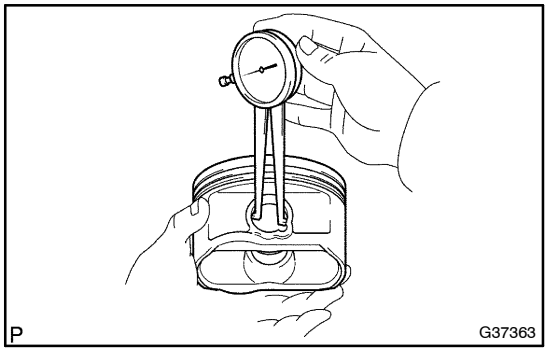
Standard end gap:

No.1	0.22 to 0.34 mm (0.0087 to 0.0134 in.)
No.2	0.45 to 0.57 mm (0.0177 to 0.0224 in.)
Oil	0.10 to 0.40 mm (0.0039 to 0.0157 in.)

Maximum end gap:

No. 1	0.90 mm (0.0354 in.)
No. 2	1.36 mm (0.0535 in.)
Oil	0.75 mm (0.0295 in.)

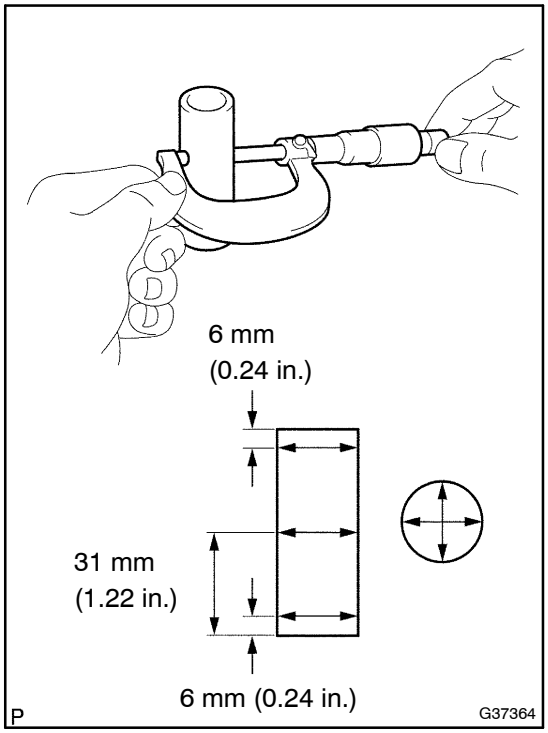
If the end gap is greater than the maximum, replace the piston ring. If the end gap is greater than the maximum, even with a new piston ring, rebore all the 4 cylinders or replace the cylinder block.



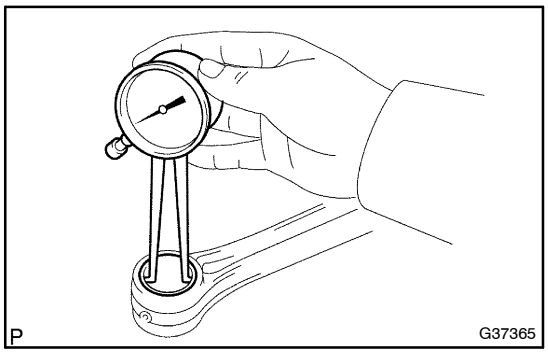
26. INSPECT PISTON PIN OIL CLEARANCE

(a) Using a caliper gauge, measure the inside diameter of the piston pin hole.

Piston pin hole inside diameter:
22.001 to 22.010 mm (0.8662 to 0.8665 in.)



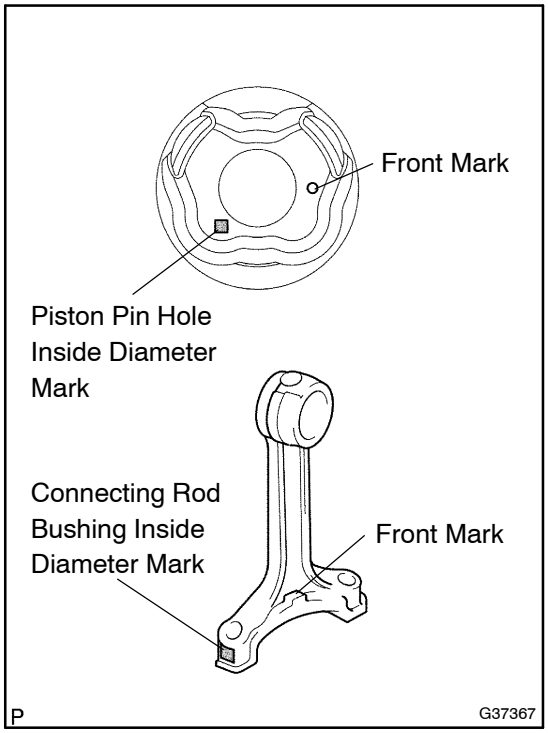
(b) Using a micrometer, measure the piston pin diameter.
Piston pin diameter:
21.997 to 22.006 mm (0.8660 to 0.8664 in.)



(c) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.
Bushing inside diameter:
22.005 to 22.014 mm (0.8663 to 0.8667 in.)

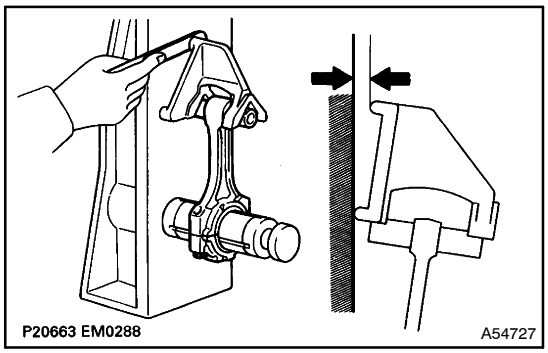
(d) Subtract the piston pin diameter measurement from the piton pin hole diameter measurement.
Standard oil clearance:
0.001 to 0.007 mm (0.00004 to 0.00028 in.)
Maximum oil clearance: 0.010 mm (0.0004 in.)

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



(e) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.
Standard oil clearance:
0.005 to 0.011 mm (0.0002 to 0.0004 in.)
Maximum oil clearance: 0.025 mm (0.0010 in.)

(f) If the oil clearance is greater than the maximum, replace the bushing. If necessary, replace the connecting rod and piston pin as a set.

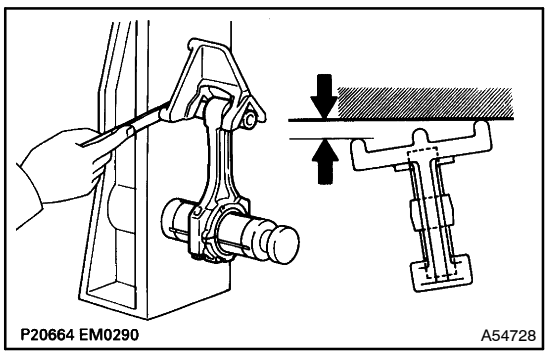


27. INSPECT CONNECTING ROD

(a) Using a rod aligner and feeler gauge, check the connecting rod alignment.

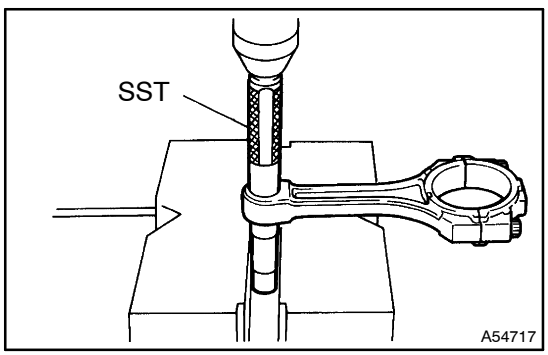
(1) Check for bend.
Maximum bend:
0.03 mm (0.0012 in.) per 100 mm (3.94 in.)

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



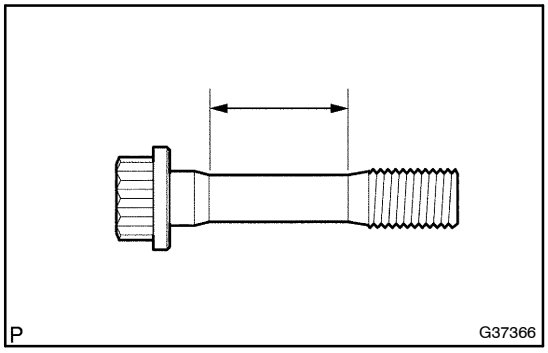
(2) Check for twist.
Maximum twist:
0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

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



28. REMOVE CONNECTING ROD SMALL END BUSH

(a) Using SST and a press, press out the bush.
SST 09222–30010



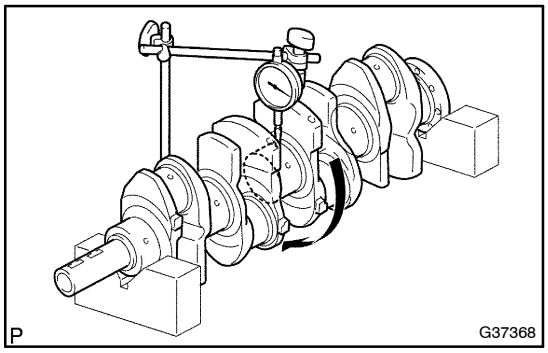
29. INSPECT CONNECTING ROD BOLT

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

Standard diameter: 7.2 to 7.3 mm (0.283 to 0.287 in.)

Minimum diameter: 7.0 mm (0.276 in.)

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



30. INSPECT CRANKSHAFT

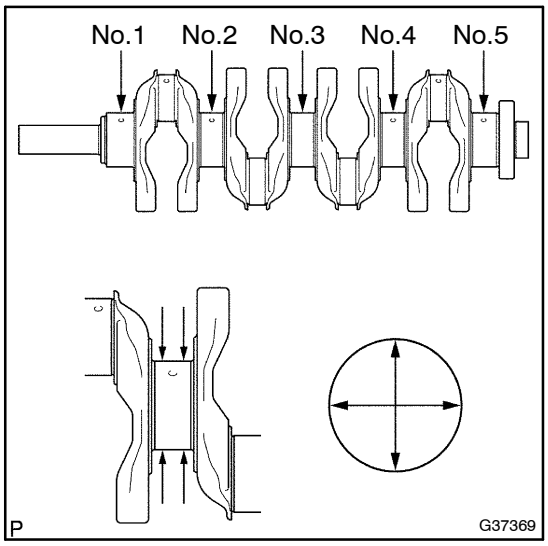
(a) Inspect for circle runout.

(1) Place the crankshaft on V–blocks.

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

Maximum circle runout: 0.03 mm (0.0012 in.)

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



(b) Inspect the main journals.

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

Standard journal diameter:

No.3 journal	59.981 to 59.994 mm (2.3615 to 2.3620 in.)
Except No.3 journal	59.987 to 60.000 mm (2.3619 to 2.3622 in.)

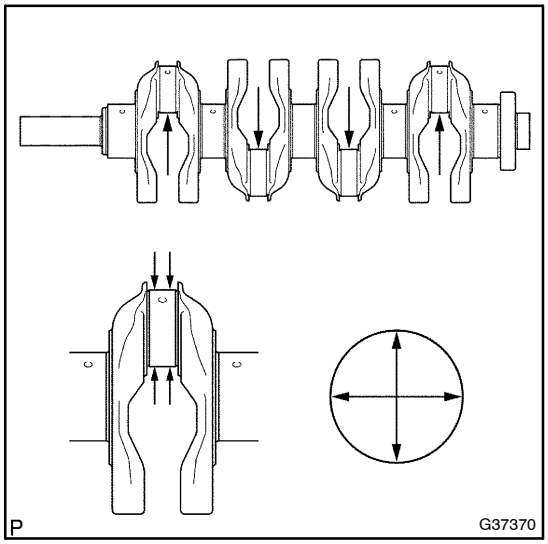
If the diameter is not as specified, check the oil clearance (see step 31). If necessary, replace the crankshaft.

(2) Check each main journal for taper and out–of–round as shown in the illustration.

Maximum taper and out–of–round:

0.005 mm (0.0002 in.)

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



(c) Inspect the crank pin.

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

Diameter: 52.989 to 53.002 mm (2.0862 to 2.0867 in.)

If the diameter is not as specified, check the oil clearance (see step 2). If necessary, replace the crankshaft.

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

Maximum taper and out–of–round:

0.003 mm (0.0001 in.)

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

31. INSPECT CRANKSHAFT OIL CLEARANCE

HINT:

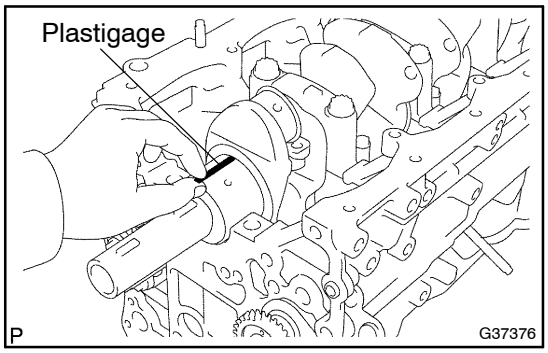
- Keep the lower bearings and crankshaft bearing caps together.
- Arrange the thrust washers in the correct order.
- Keep the upper crankshaft bearings and upper thrust washers together with the cylinder block.

(a) Clean each main journal and bearing.

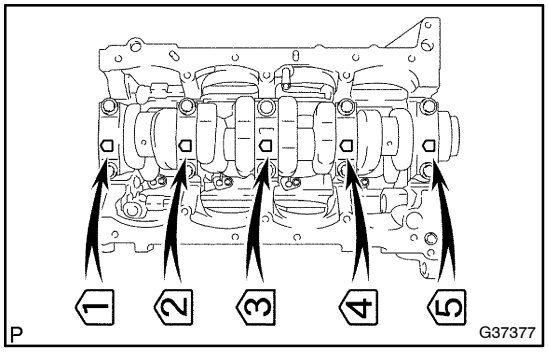
(b) Check each main journal and bearing for pitting and scratches.

If the journal or bearing is damaged, replace the bearing.

(c) Place the crankshaft on the cylinder block.



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



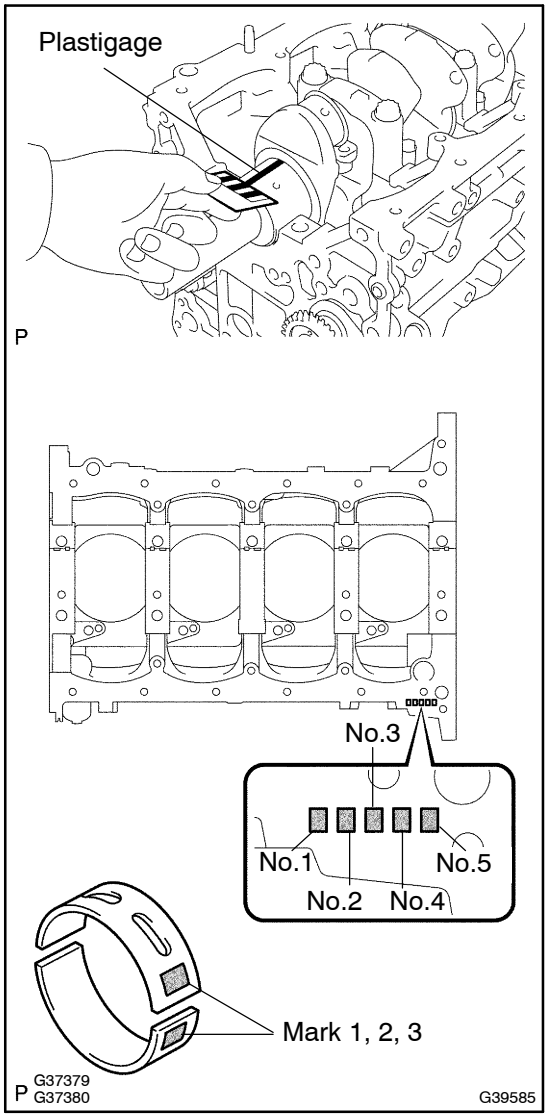
(e) Install the 5 crankshaft bearing caps in their proper locations.

(f) Install the 5 crankshaft bearing caps with the 10 bolts (see step 49).

NOTICE:

Do not turn the crankshaft.

(g) Remove the 10 bolts and 5 crankshaft bearing caps (see step 6).



(h) Measure the Plastigage at its widest point.

Standard oil clearance:

Bearing Cap	Standard
No.3	0.030 to 0.055 mm (0.0012 to 0.0022 in.)
Others	0.024 to 0.049 mm (0.0009 to 0.0019 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

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

HINT:

- If replacing the cylinder block, measure the bearing standard clearance.
- If replacing a bearing, first check the number on the cylinder block for the bearing's respective journal. Then replace the bearing with one that has the same number. Each bearing's standard thickness is indicated by a 1, 2 or 3 mark on its surface.

Reference:

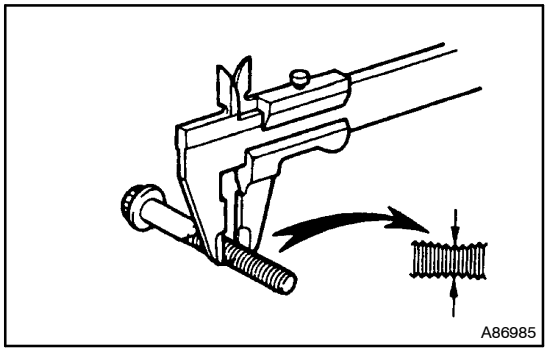
Cylinder block main journal bore diameter:

Mark	Diameter
1	64.004 to 64.010 mm (2.5198 to 2.5201 in.)
2	64.011 to 64.016 mm (2.5201 to 2.5203 in.)
3	64.017 to 64.022 mm (2.5203 to 2.5206 in.)

Standard bearing center wall thickness:

Mark	Thickness
1	1.987 to 1.990 mm (0.0782 to 0.0783 in.)
2	1.991 to 1.993 mm (0.0784 to 0.0785 in.)
3	1.994 to 1.996 mm (0.0785 to 0.0786 in.)

(i) Completely remove the Plastigage.



32. INSPECT CRANKSHAFT BEARING CAP SET BOLT

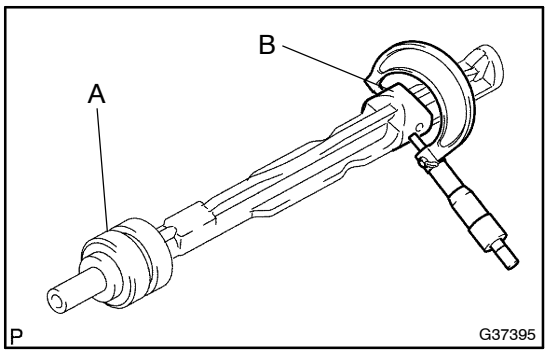
(a) Using vernier calipers, measure the minimum diameter of the compressed thread at the measuring point.

Standard diameter:

10.76 to 10.97 mm (0.4236 to 0.4319 in.)

Minimum diameter: 10.66 mm (0.4197 in.)

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



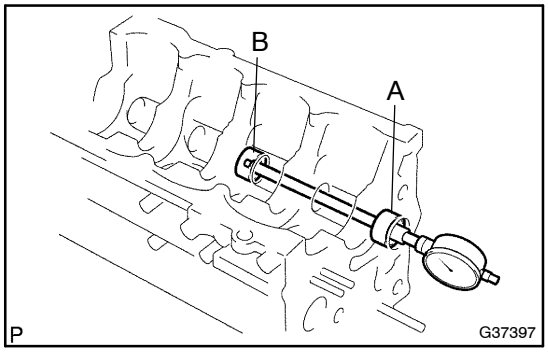
33. INSPECT NO.1 BALANCESHAFT

(a) Inspect the diameter of the journal.

(1) Using a micrometer, measure the diameter of the balanceshaft main journals.

Main journal diameter:

A	37.969 to 37.985 mm (1.4948 to 1.4955 in.)
B	37.449 to 37.465 mm (1.4744 to 1.4750 in.)



(b) Inspect the diameter of bearing.
(1) Using a cylinder gauge, measure the inside diameter of the balanceshaft bearing.

Bearing inside diameter:

A	38.025 to 38.045 mm (1.4970 to 1.4978 in.)
B	37.525 to 37.545 mm (1.4774 to 1.4781 in.)

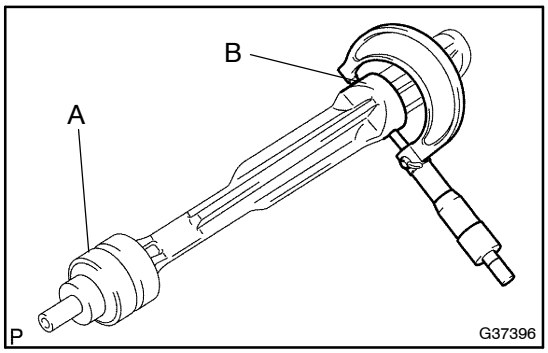
(c) Inspect oil clearance.
(1) Subtract the balanceshaft main journal diameter measurement from the balanceshaft bearing inside diameter measurement.

Standard oil clearance:

A	0.040 to 0.076 mm (0.0016 to 0.0030 in.)
B	0.060 to 0.096 mm (0.0024 to 0.0038 in.)

Maximum oil clearance: 0.15 mm (0.0059 in.)

If the oil clearance is greater than the maximum, replace the cylinder block and balanceshaft.

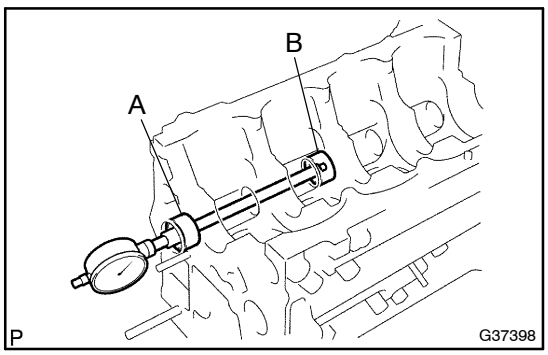


34. INSPECT NO.2 BALANCESHAFT

(a) Inspect the diameter of the journal.
(1) Using a micrometer, measure the diameter of the balanceshaft main journals.

Main journal diameter:

A	37.969 to 37.985 mm (1.4948 to 1.4955 in.)
B	37.449 to 37.465 mm (1.4744 to 1.4750 in.)



(b) Inspect the diameter of bearing.
(1) Using a cylinder gauge, measure the inside diameter of the balanceshaft bearing.

Bearing inside diameter:

A	38.025 to 38.045 mm (1.4970 to 1.4978 in.)
B	37.525 to 37.545 mm (1.4774 to 1.4781 in.)

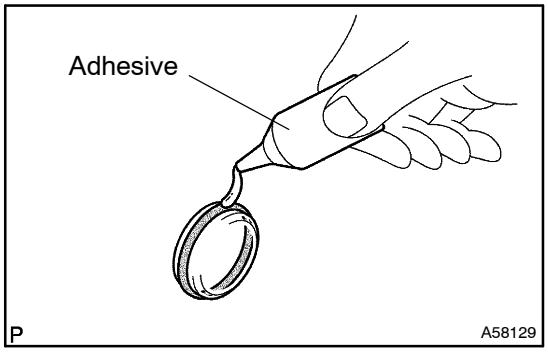
(c) Inspect oil clearance.

Standard oil clearance:

A	0.040 to 0.076 mm (0.0016 to 0.0030 in.)
B	0.060 to 0.096 mm (0.0024 to 0.0038 in.)

Maximum oil clearance: 0.15 mm (0.0059 in.)

If the oil clearance is greater than the maximum, replace the cylinder block and balanceshaft.



35. INSTALL TIGHT PLUG

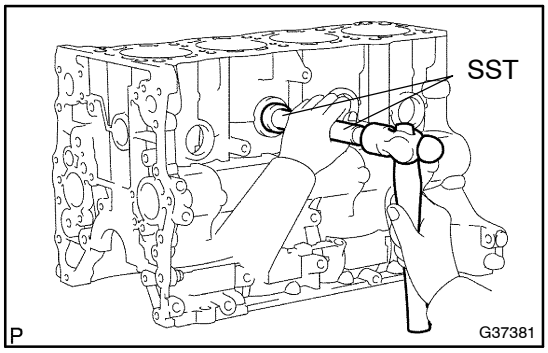
NOTICE:

If water leaks from the tight plug or the plug corrodes, replace it.

(a) Apply adhesive around the tight plugs.

Adhesive:

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



(b) Using SST and a hammer, tap in new tight plugs as shown in the illustration.

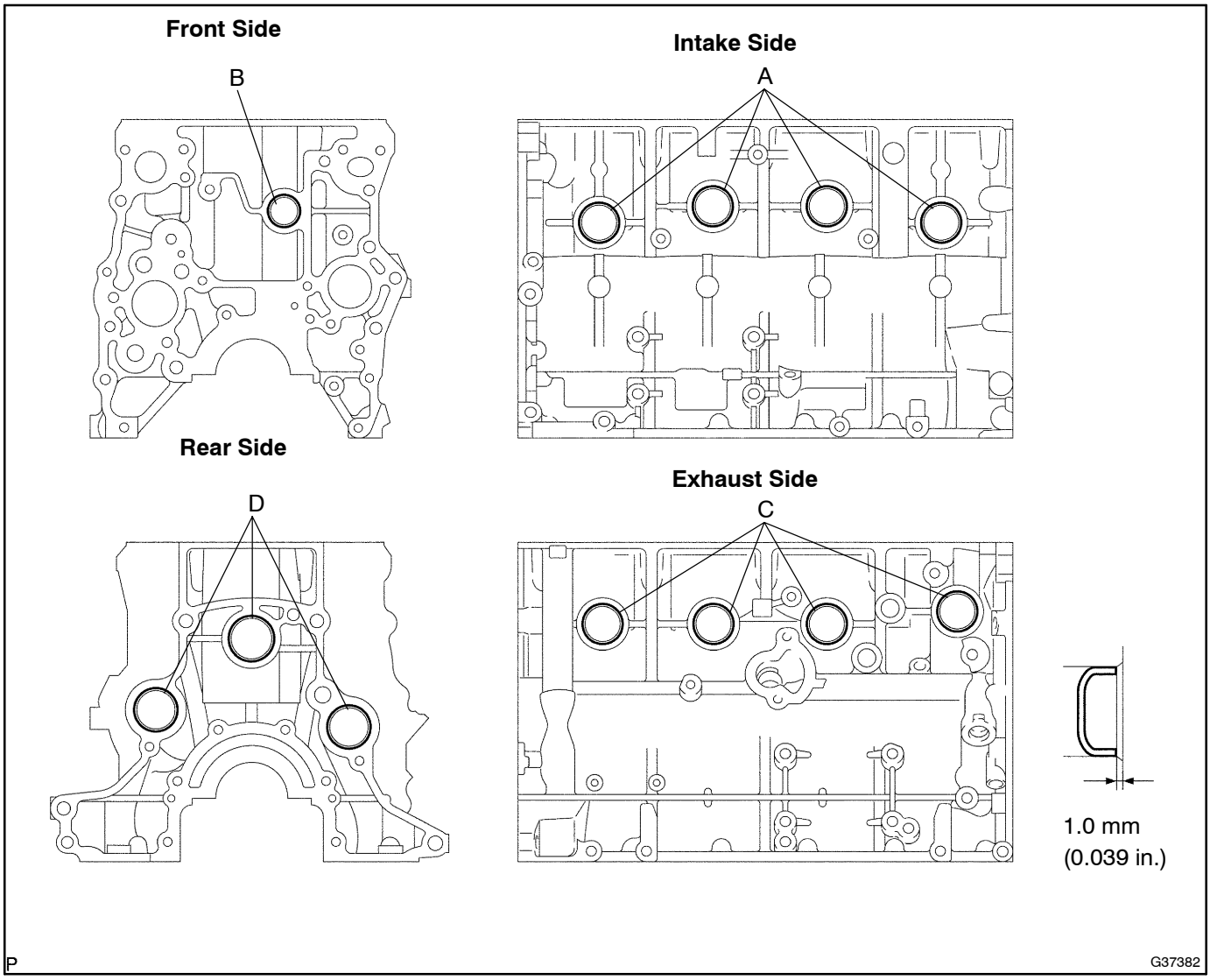
(c) Using SST, tap in the 8 tight plugs A and C.

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

(d) Using SST, tap in the tight plug B.

SST 09950–60010 (09951–00300), 09950–70010 (09951–07100)

(e) Using SST, tap in the 3 tight plugs D.
SST 09950–60010 (09951–00400), 09950–70010 (09951–07100)



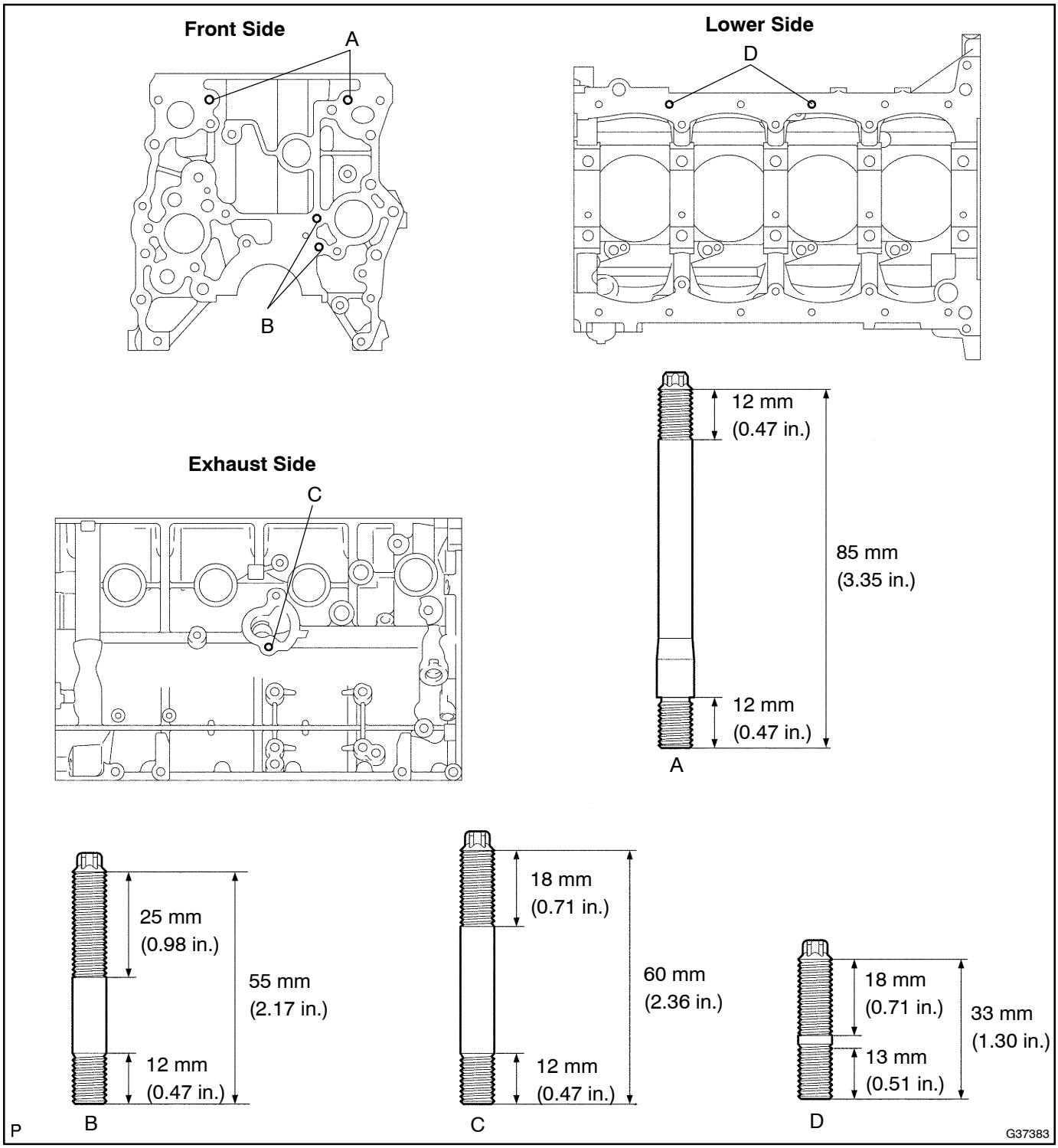
36. INSTALL STUD BOLT

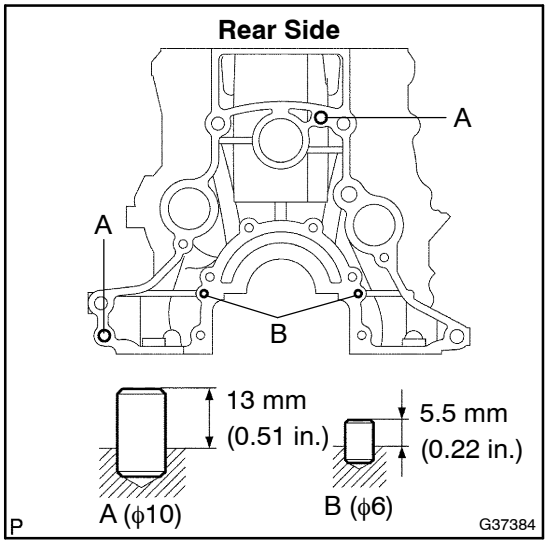
(a) Using an E7 torx® socket wrench, install the stud bolts B and D.
Torque: 7.5 N·m (77 kgf·cm, 66 in.·lbf) for stud bolts B and D

(b) Using an E8 torx® socket wrench, install the stud bolts A.
Torque: 7.5 N·m (77 kgf·cm, 66 in.·lbf) for stud bolts A

(c) Apply adhesive to the hole for the stud bolt C on the cylinder block. Using an E7 torx® socket wrench, install the stud bolts C.
Torque: 7.5 N·m (77 kgf·cm, 66 in.·lbf) for stud bolt C

NOTICE:
If the stud bolt is deformed or the threads are damaged, replace it.



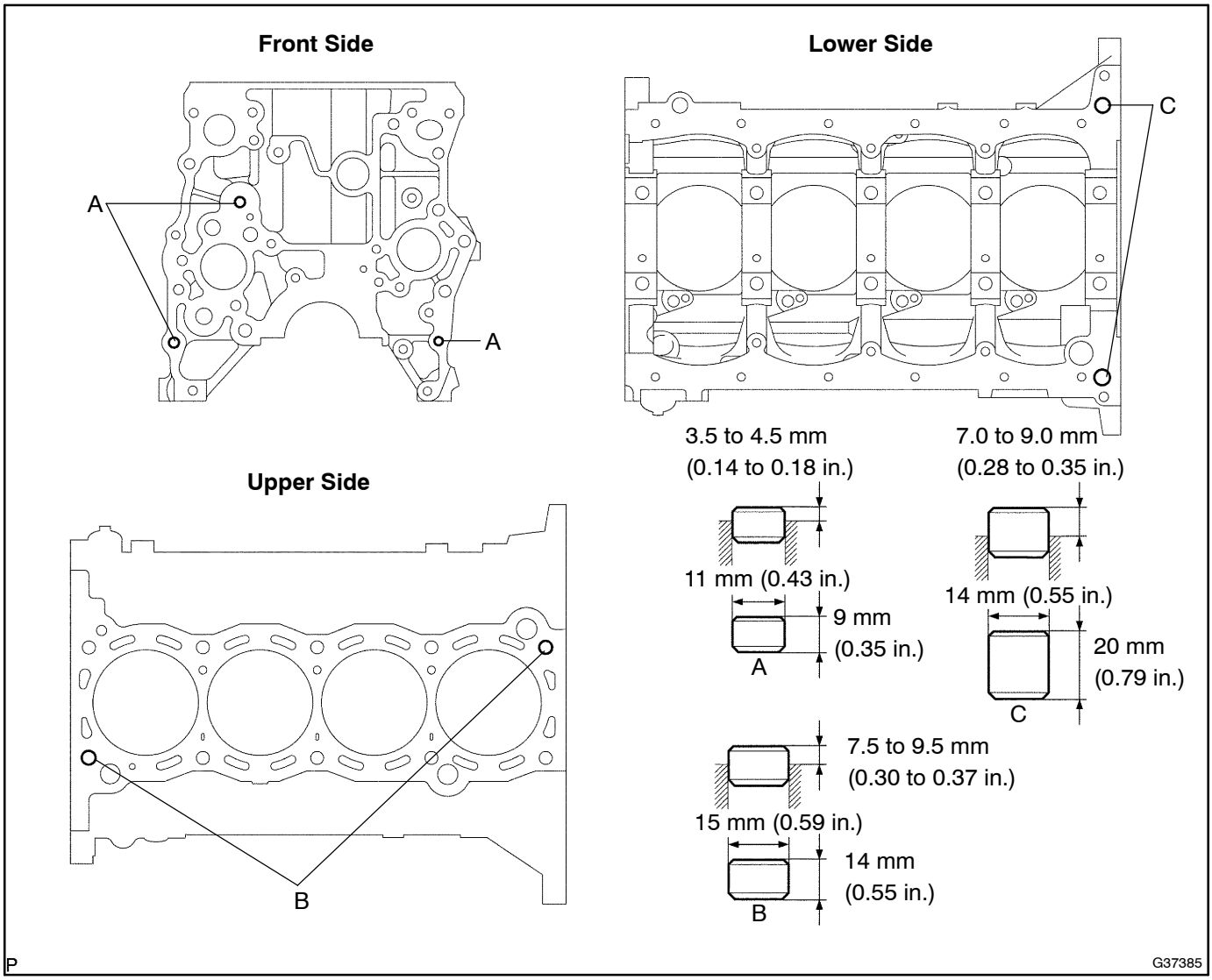


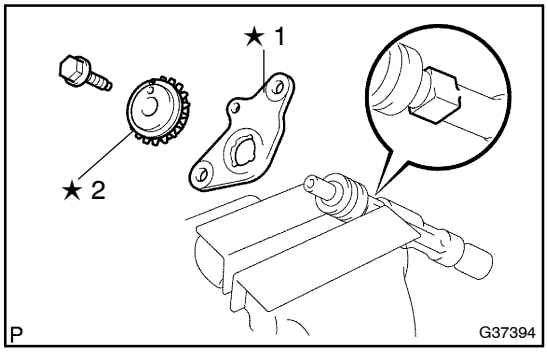
37. INSTALL STRAIGHT PIN

(a) Using a plastic–faced hammer, tap in new straight pins to the cylinder block.

38. INSTALL RING PIN

(a) Using a plastic–faced hammer, tap in new ring pins to the cylinder block.





39. INSTALL BALANCESHAFT DRIVEN GEAR NO.2

(a) Mount the head portion of the balanceshaft in a vise.

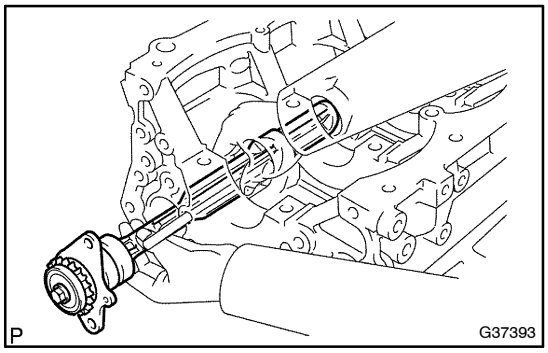
NOTICE:

Be careful not to damage the balanceshaft.

(b) Install the balanceshaft thrust washer No.2 (★ 1) and balanceshaft driven gear No.2 (★ 2).

(c) Install and torque the bolt.

Torque: 36 N·m (365 kgf·cm, 26 ft·lbf)

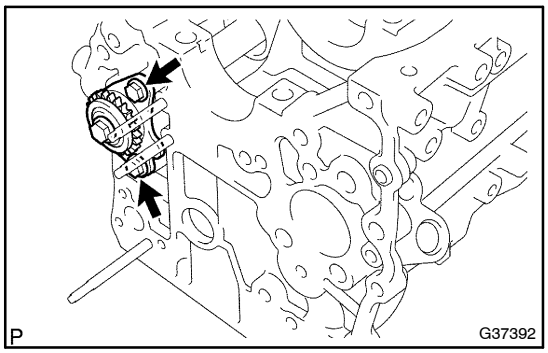


40. INSTALL NO.2 BALANCESHAFT

(a) Install the balanceshaft to the cylinder block.

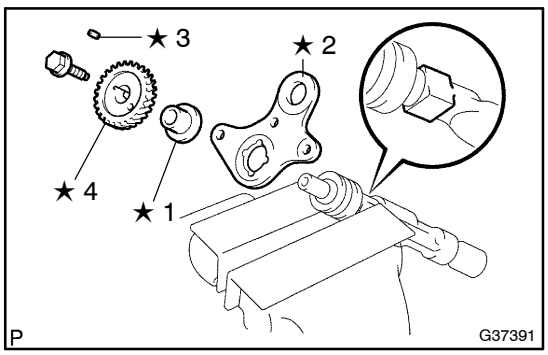
NOTICE:

When installing the balanceshaft, make sure to support the balanceshaft with both hands and avoid scratching the balanceshaft bearing on the cylinder block side.



(b) Install and torque the 2 bolts.

Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)



41. INSTALL BALANCESHAFT DRIVEN GEAR NO.1

(a) Mount the head portion of the balanceshaft in a vise.

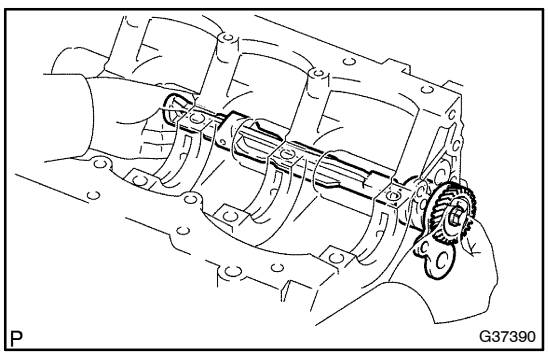
NOTICE:

Be careful not to damage the balanceshaft.

(b) Install the balanceshaft thrust spacer (★ 1), balanceshaft thrust washer No.1 (★ 2), sliding key (★ 3) and balanceshaft driven gear No.1 (★ 4).

(c) Install and torque the bolt.

Torque: 36 N·m (365 kgf·cm, 26 ft·lbf)

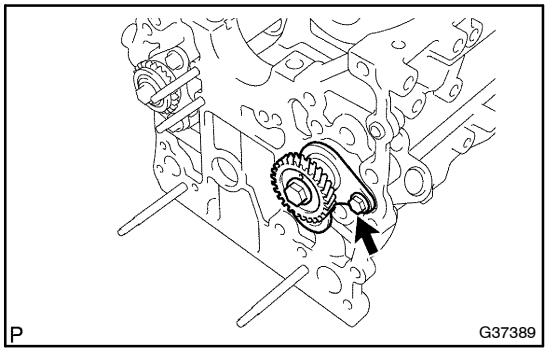


42. INSTALL NO.1 BALANCESHAFT

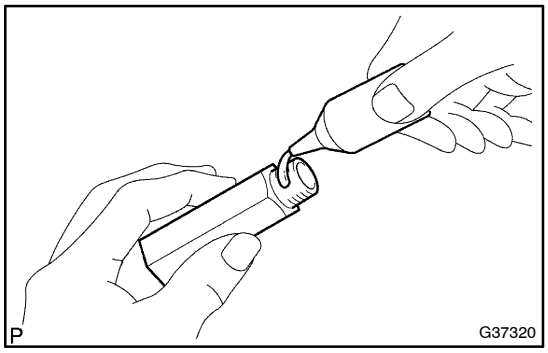
(a) Install the No.1 balanceshaft to the cylinder block.

NOTICE:

When installing the balanceshaft, make sure to support the balanceshaft with both hands and avoid scratching the balanceshaft bearing on the cylinder block side.

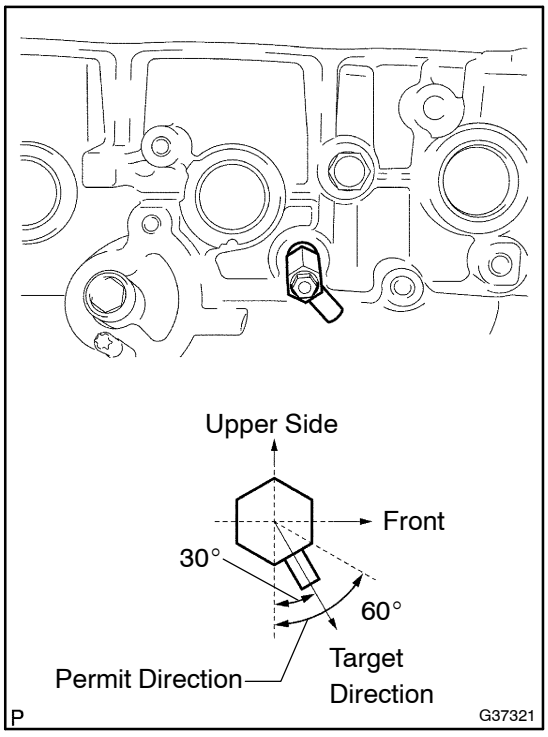


(b) Install and torque the bolt.
Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)



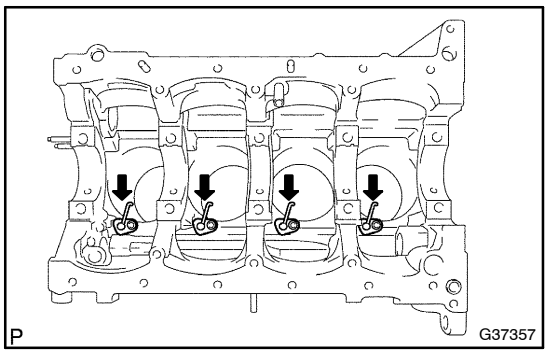
43. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB–ASSY

(a) Apply adhesive around the drain cock.



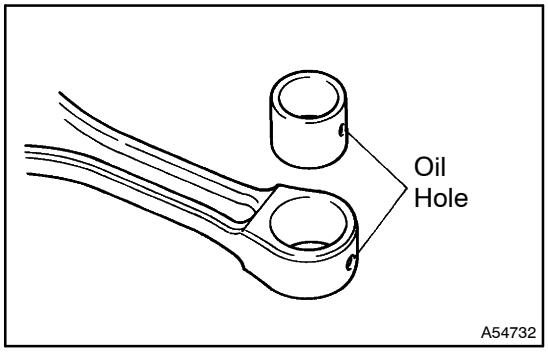
(b) Install the cylinder block water drain cock as shown in the illustration.
Torque: 25 N·m (250 kgf·cm, 18 in.·lbf)

(c) Install the water drain cock plug to the water drain cock sub–assy.
Torque: 13 N·m (130 kgf·cm, 9 in.·lbf)



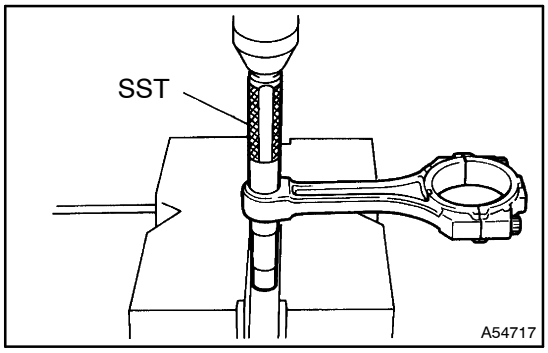
44. INSTALL SUB–ASSY OIL NOZZLE NO.1

(a) Using an E7 torx® socket wrench, install the oil nozzles.
Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)

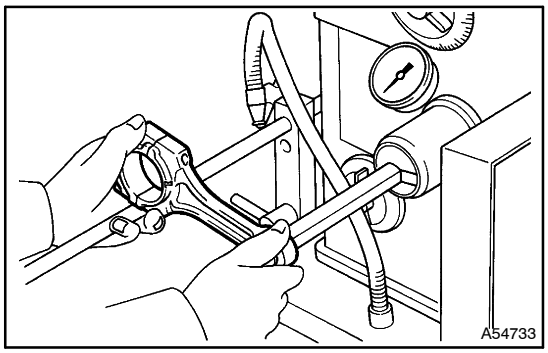


45. INSTALL CONNECTING ROD SMALL END BUSH

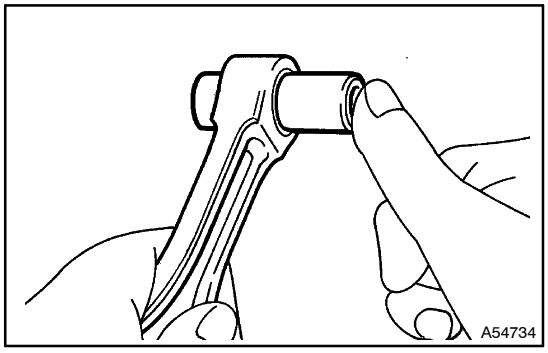
(a) Align the oil holes of a new bush and the connecting rod.



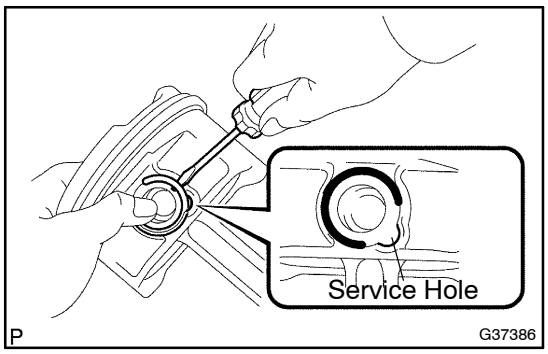
(b) Using SST and a press, press in the bush.
SST 09222–30010



(c) Using a pin hole grinder, hone the bush to obtain the standard specified clearance (see step 26) between the bush and piston pin.

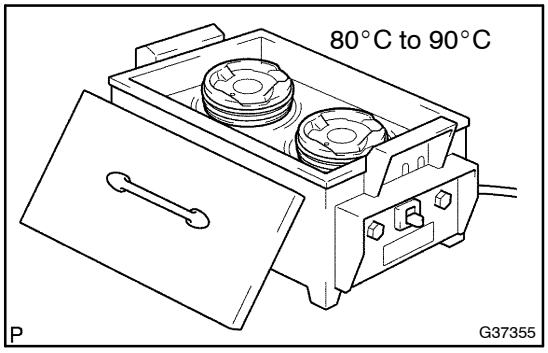


(d) Check that the piston pin fits at normal room temperature.
(1) Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.

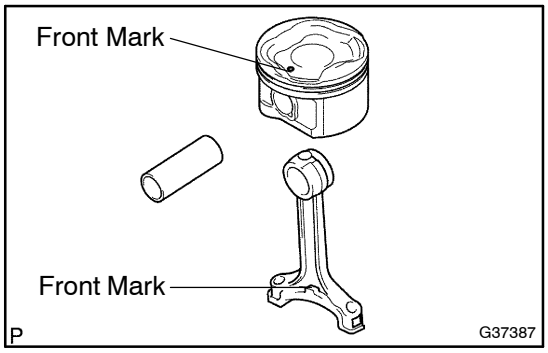


46. INSTALL W/PIN PISTON SUB–ASSY

(a) Assemble the piston and connecting rod.
(1) Using a screwdriver, install a new snap ring at one end of the piston pin hole.

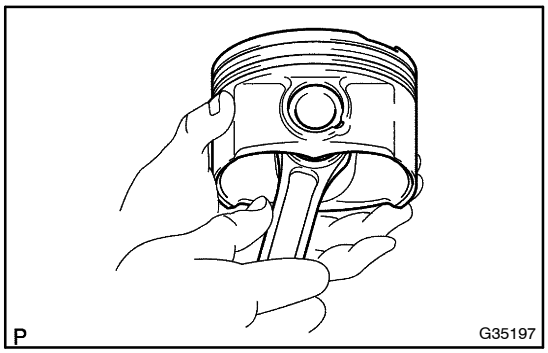


(2) Gradually heat the piston to approximately 80 to 90°C (176 to 194°F).

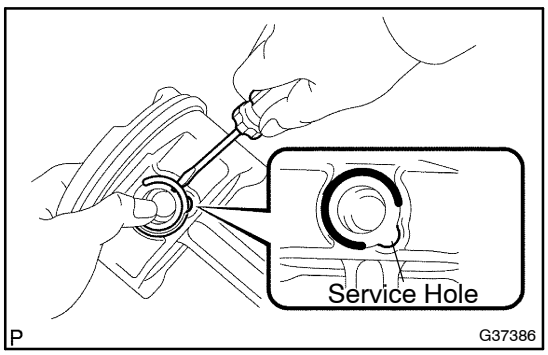


(3) Coat the piston pin with engine oil.
(4) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.

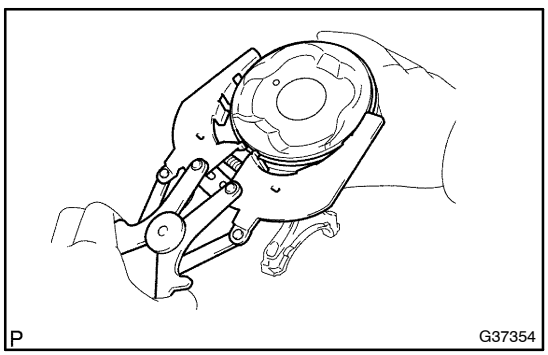
HINT:
The piston and pin are a matched set.



(5) Check the fitting condition between the piston and piston pin by trying to move the piston back and forth on the piston pin.

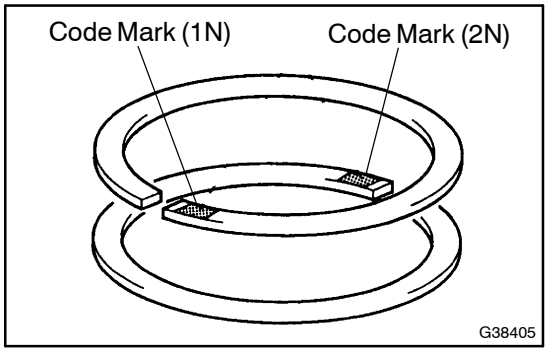


(6) Using a screwdriver, install a new snap ring at the other end of the piston pin hole.



47. INSTALL PISTON RING SET

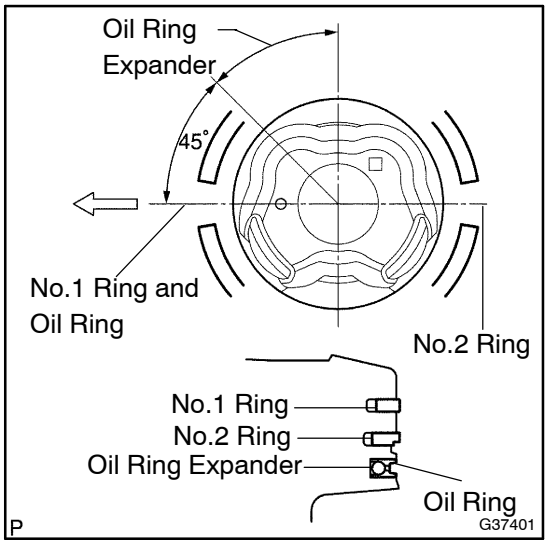
(a) Install the oil ring expander by hand.
(b) Using a piston ring expander, install the oil ring rail.



(c) Using a piston ring expander, install the 2 compression rings so that the painted marks are positioned as shown in the illustration.

HINT:

- Install the compression ring No.1 with the code mark (1N) facing upward.
- Install the compression ring No.2 with the code mark (2N) facing upward.



(d) Position the piston rings so that the ring ends are as shown in the illustration.

NOTICE:

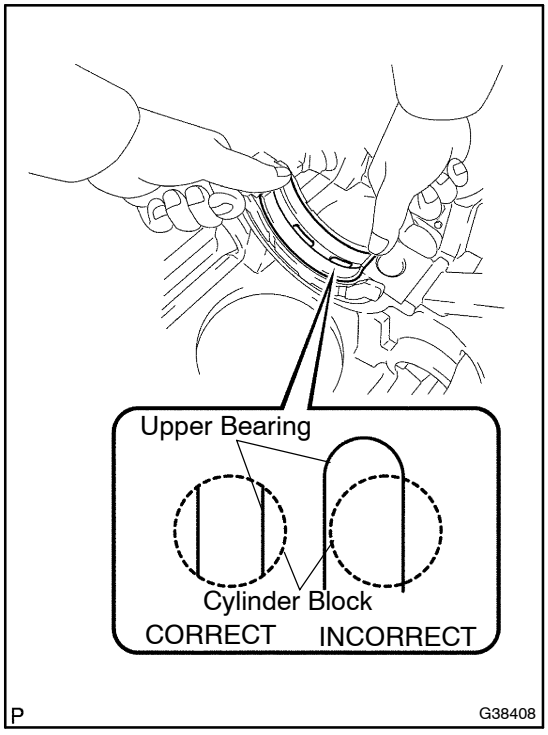
Do not align the ring ends.

48. INSTALL CRANKSHAFT BEARING

NOTICE:

- **Do not apply engine oil to the bearing's contact area and backside.**
- **The crankshaft bearing cap bolt is tightened in 2 progressive steps.**

(a) Clean the main journal, and the both surfaces of the bearing.

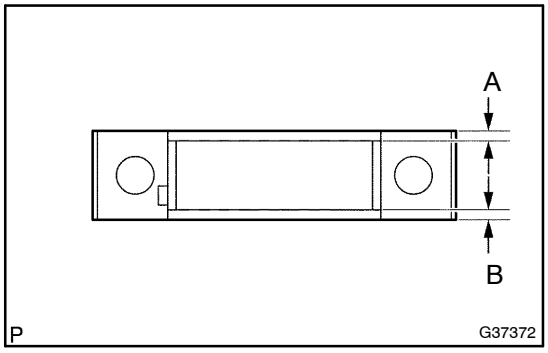


(b) Install the upper bearing.

(1) Install the upper bearing to the cylinder block as shown in the illustration.

NOTICE:

Do not apply engine oil to the bearing's contact area and backside.



(c) Install the lower bearing.
  (1) Install the lower bearing to the bearing cap.
  (2) Using vernier calipers, measure the distance between the bearing cap's edge and the lower bearing's edge.

Dimension (A – B): 0.3 mm (0.0118 in.) or less

HINT:

Journal	Dimension (A)
#1, 5	3.75 mm (0.1476 in.)
#3	1.75 mm (0.0689 in.)
#2, 4	2.75 mm (0.1083 in.)

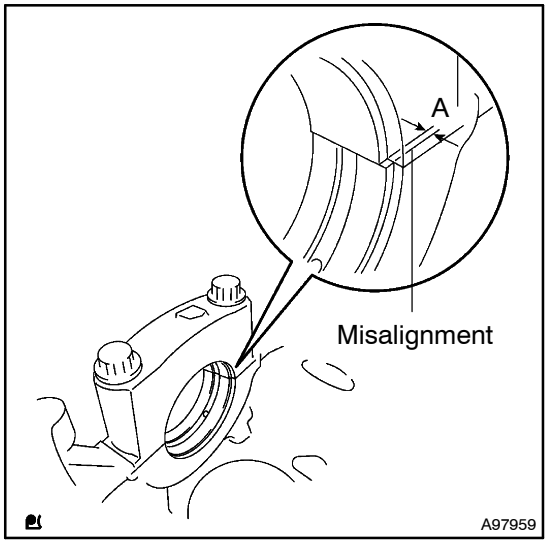
NOTICE:

Do not apply engine oil to the bearing's contact area and backside.

(d) With the upper bearing and lower bearing installed, use a plastic–faced hammer to install the bearing caps to the cylinder block.

NOTICE:

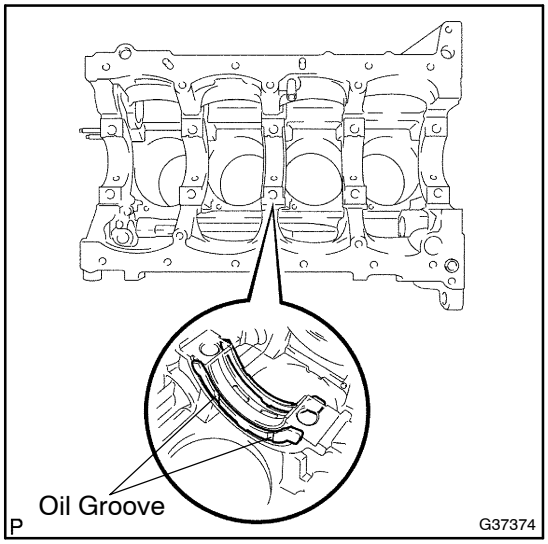
Make sure that the bearing caps are installed in the correct positions and direction.



(e) Using vernier calipers, measure the amount of misalignment between the upper bearing and lower bearing, as shown in the illustration.

Standard: 0.9 mm (0.035 in.) or less

(f) Remove the bearing cap.

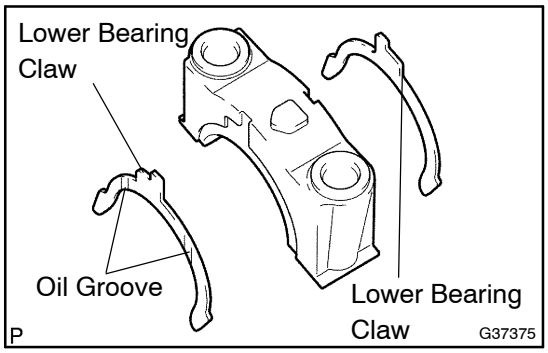


(g) Install the crankshaft thrust washer upper to the cylinder block.

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

NOTICE:

Be careful when installing the thrust bearing upper and lower as they are similar but cannot be interchanged.



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

NOTICE:

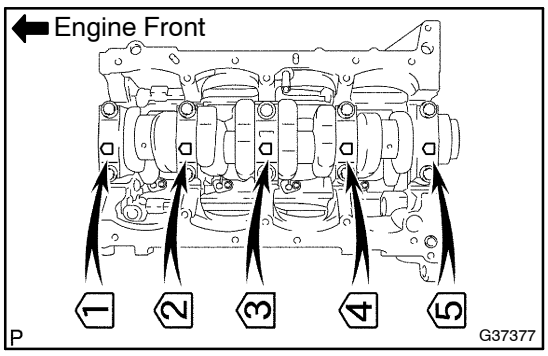
Be careful when installing the thrust bearing upper and lower as they are similar but cannot be interchanged. The bearing lower has a claw as shown in the illustration.

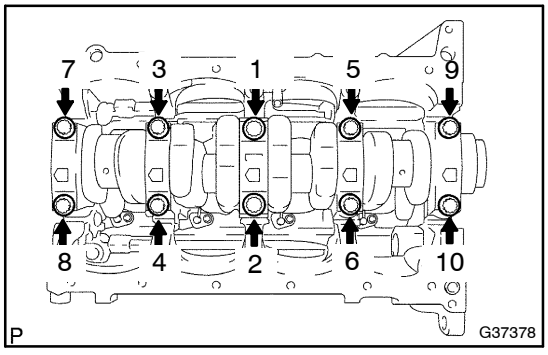
(i) Apply engine oil to the lower bearing.

49. INSTALL CRANKSHAFT

(a) Apply engine oil to the upper bearing, then place the crankshaft on the cylinder block.

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





(c) Install the crankshaft bearing cap bolts.

HINT:

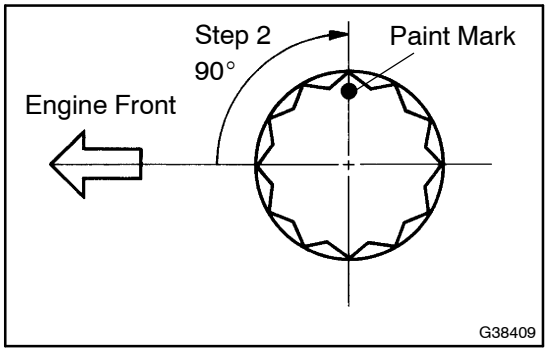
The main bearing cap bolts are tightened in 2 progressive steps.

(d) Step 1

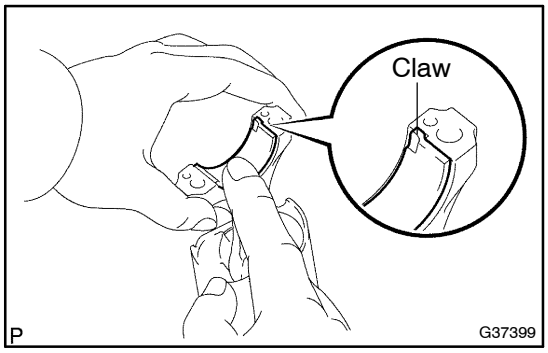
(1) Install and uniformly tighten the 10 main bearing cap bolts in the sequence shown in the illustration.

Torque: 39 N·m (398 kgf·cm, 29 ft·lbf)

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



(e) Step 2
  (1) Mark the front of the bearing cap bolts with paint.
  (2) Retighten the bearing cap bolts by 90° in the order above.
  (3) 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 5).



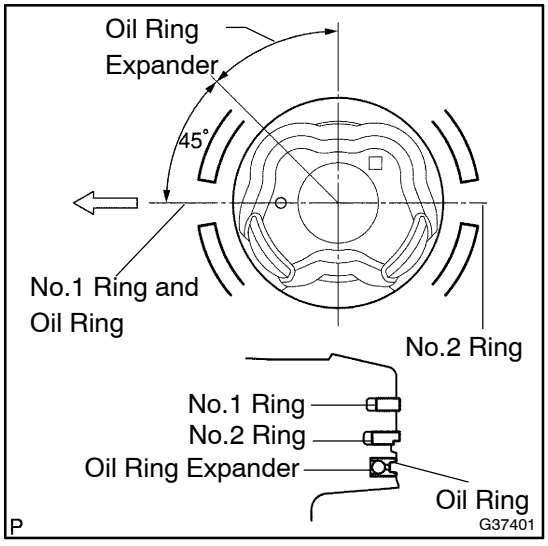
50. INSTALL CONNECTING ROD BEARING

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

NOTICE:
Clean the backside of the bearing and the bearing surface of the connecting rod.

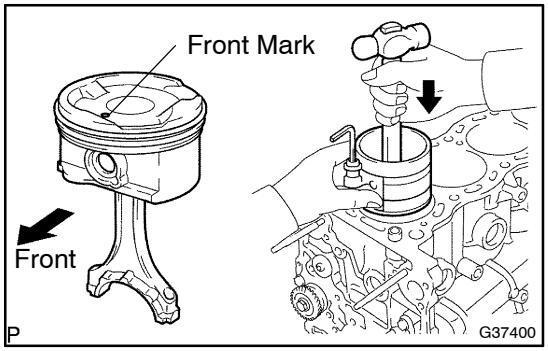
51. INSTALL PISTON SUB–ASSY W/CONNECTING ROD

(a) Apply engine oil to the cylinder walls, the pistons, and the surfaces of connecting rod bearings.



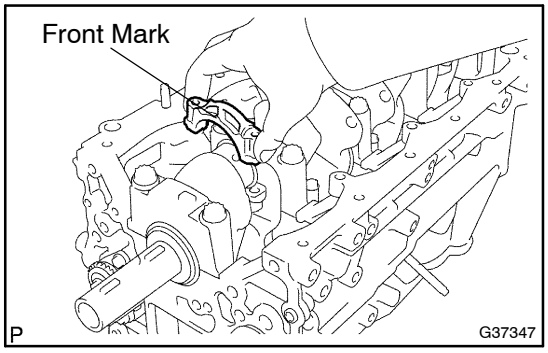
(b) Position the piston rings so that the ring ends are as shown in the illustration.

NOTICE:
Do not align the ring ends.



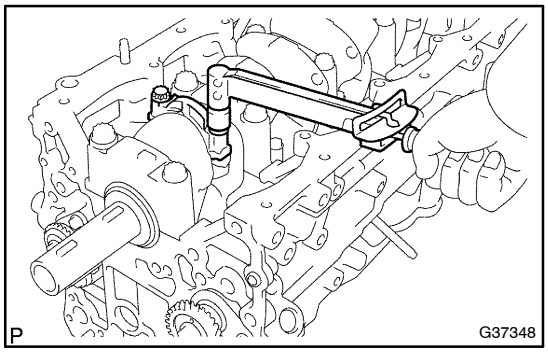
(c) Using a piston ring compressor, push the correctly numbered piston and connecting rod assembly into the cylinder with the front mark of the piston facing forward.
(d) Match the numbered connecting rod cap with the connecting rod.

NOTICE:
- **Match the numbered connecting rod cap with the connecting rod.**

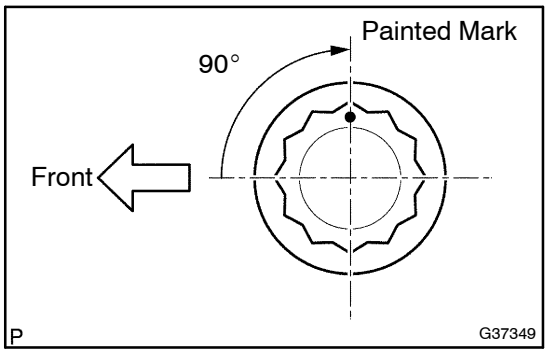


(e) Check that the front mark of the connecting rod cap is facing forward.

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



(g) Install and alternately tighten the bolts of the connecting rod cap in several steps.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



(h) Mark the front side of each connecting cap bolt with paint.

(i) Retighten the cap bolts by 90° as shown.

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

(k) Check that the crankshaft turns smoothly.

(l) Check the connecting rod thrust clearance (see step 1).