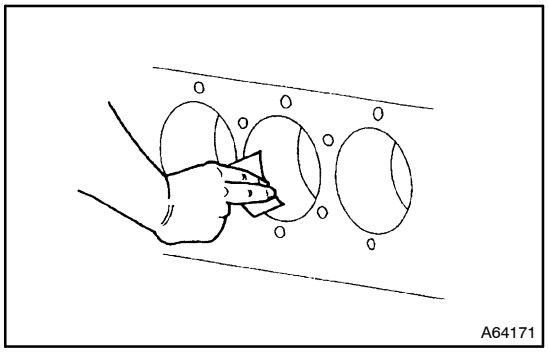
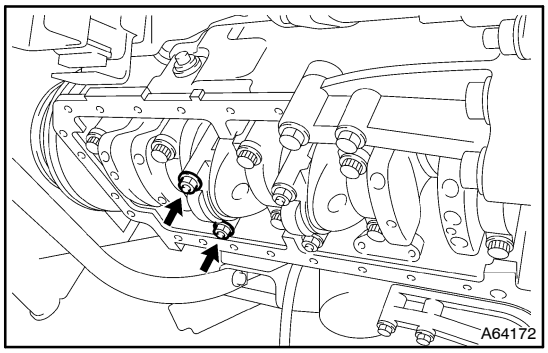
1417Q–01

OVERHAUL



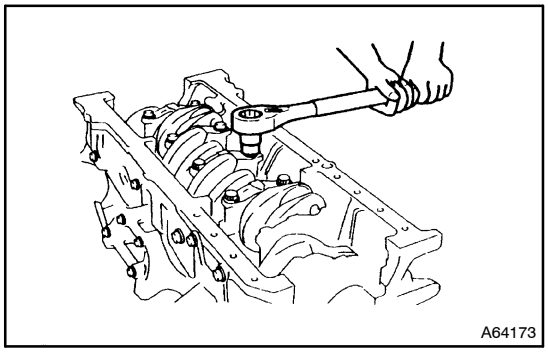
1. REMOVE PISTON AND CONNECTING ROD

(a) Remove the connecting rod bearing cap mounting bolts and pull out the pistons along with the connecting rods from the cylinder block upper side.



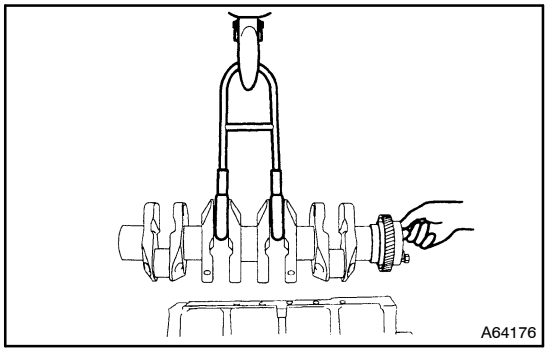
HINT:

- Before pulling out the pistons, remove carbon deposits from the upper end inside the cylinder liner with a scraper or an emery paper (recommended: No.150), working in a circular direction.
- When pulling out the pistons, be careful that the insides of the cylinder liners are not damaged by the connecting rod big ends.
- When pulling out the pistons, be careful that the nozzle of the cooling jet should not be deformed. If it is deformed, replace or correct it.
- When pulling out the pistons, be careful not to drop the connecting rod bearings from the connecting rod big ends, which may cause deformation or damage.
- Arrange the removed parts in the order of the cylinder numbers. Be careful not to change the combination of the connecting rod and cap.
- 2 pistons can be removed at a time (Nos. 1 and 4, Nos. 2 and 3).

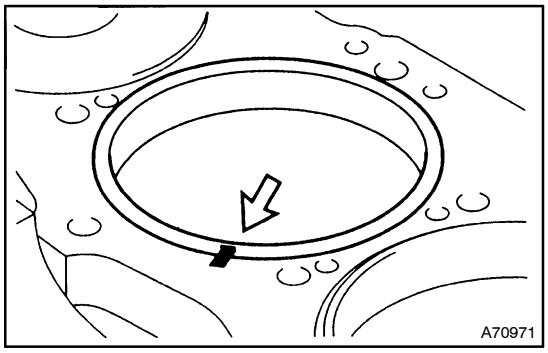


2. REMOVE CRANKSHAFT

(a) Remove the bearing cap mounting bolts.

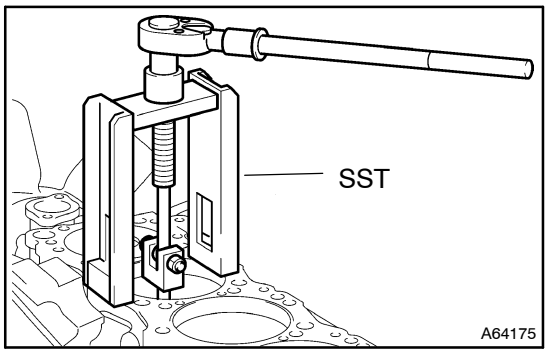


(b) Remove the crankshaft.



3. REMOVE CYLINDER LINER

HINT:
Before removing the piston, put alignment marks on the cylinder liner and cylinder is bent by ”run–in”. When reusing the cylinder liner, misalignment with the cylinder block may concentrate stress on the thin part of the cylinder liner and it may be broken.



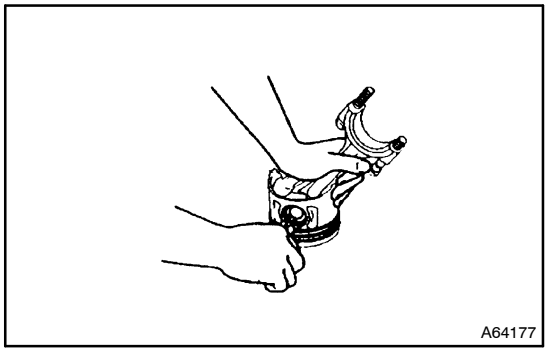
(a) Remove the cylinder liner.
If this is difficult, use SST.

SST S0942–01720

HINT:
Arrange the removed parts in the order of the cylinder numbers.

4. CLEAN CYLINDER BLOCK SUB–ASSY

(a) Rinse the cylinder block in a hot commercial alkaline solution, and remove oil from the cylinder block.
(b) Remove the alkaline solution from the cylinder block using a steam cleaner.
(c) If the water jacket is dirty, clean it as follows.
  (1) Rinse the cylinder block in a commercial acid solution.
  (2) After rinsing the cylinder block for a while, immerse it in the solution for approximately 30 minutes.
  (3) Pull out the cylinder block. After the solution has drained off, re–immerse the cylinder block in the solution and leave it for approximately 10 minutes.
  (4) Repeat step 3 until deposits are removed.
  (5) Remove the acid solution with hot water.
  (6) Immerse the cylinder block in the alkaline solution to neutralize the acid.
  (7) Finish by cleaning with a steam cleaner.
(d) When the cooling water passage and oil passage are cleaned completely, dry the cylinder block, press–fit a new blank cap and apply seal packing.


A64177

5. REMOVE CONNECTING ROD SUB–ASSY

(a) Using snap ring pliers, remove the retainer rings from the both ends of the piston pin.

CAUTION:

Removing the retainer rings may cause the retainer rings to fly up. Be sure to wear protective goggles.

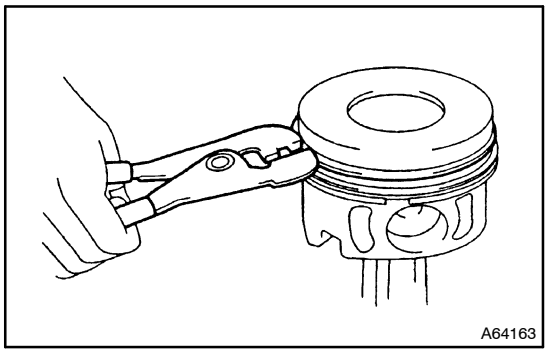
(b) Using a hammer, apply the reinforcing plate to the piston pin and punch out the piston pin.

HINT:

If it is difficult to punch out the piston pin, first immerse the piston and piston pin in hot water 80 – 90°C (176 – 194°F) for approximately 5 minutes to facilitate removal.

CAUTION:

Never touch the piston with your bare hands when it is hot.

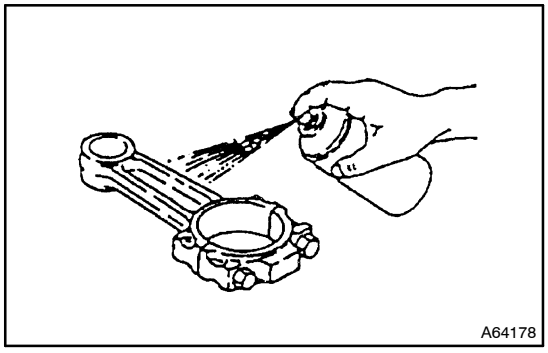

A64163

6. REMOVE PISTON RING

(a) Using a piston ring expander, remove the piston ring.

HINT:

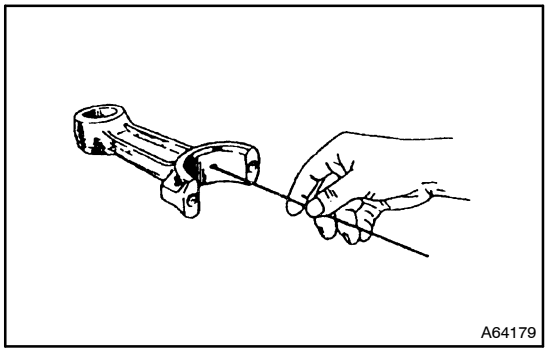
- Handle the piston rings carefully because they are made of a special casting which is easily broken.
- Arrange the piston rings in the order of the cylinder numbers.


A64178

7. INSPECT CONNECTING ROD SUB–ASSY

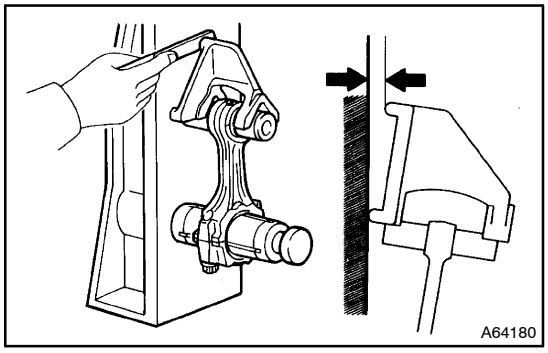
(a) Using dye penetrant examination or magnetic examination, check the connecting rod for cracks or damage.

If there are any cracks or damage, replace the connecting rod with a new one.


A64179

(b) Check that there is no clogging in the lubrication passage to the connecting rod small end.

If there is any clogging, blow air through the lubrication passage using an air gun, or clean by inserting a wire.



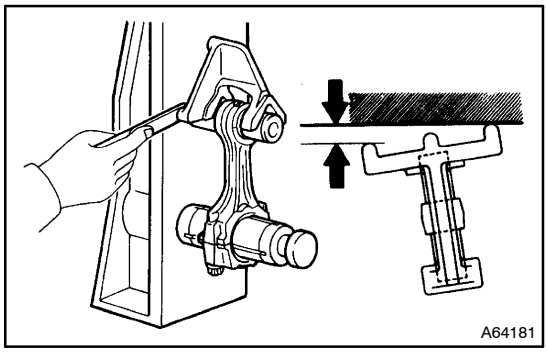
(c) Using a rod aligner and feeler gauge, check the connecting rod alignment.

(1) Check for bend.

Maximum bend:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If the bend is greater than the maximum, replace the connecting rod with a new one.

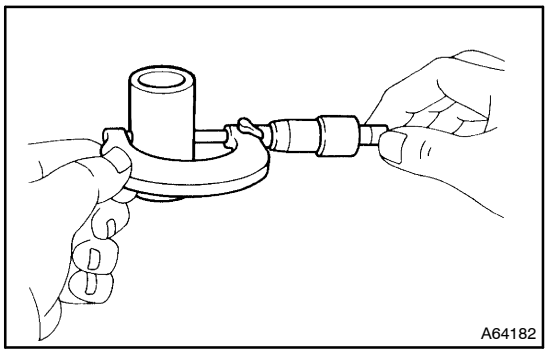


(2) Check for twist.

Maximum twist:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If the twist is greater than the maximum, replace the connecting rod with a new one.



8. INSPECT PISTON PIN

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

Standard pin diameter:

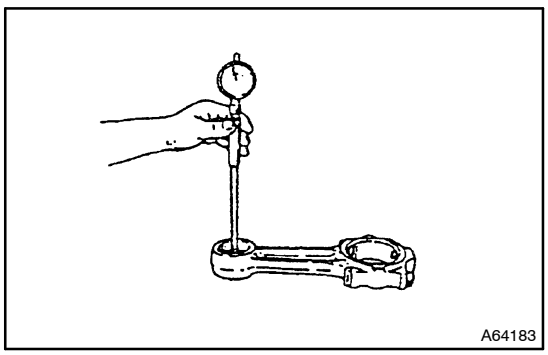
36.989 – 37.000 mm (1.453 – 1.4567 in.)

Minimum pin diameter: 36.96 mm (1.4551 in.)

If the diameter is less than the minimum, replace the piston pin with a new one.

HINT:

Never grind the piston pin, because the surface is coated with a special material.



9. INSPECT CONNECTING ROD SMALL END BUSH

(a) Using a cylinder gauge, measure the connecting rod bush inside diameter.

Standard inside diameter:

37.015 – 37.025 mm (1.4573 – 1.4577 in.)

Maximum inside diameter: 37.10 mm (1.4606 in.)

If the inside diameter is greater than the maximum, replace the connecting rod bush with a new one.

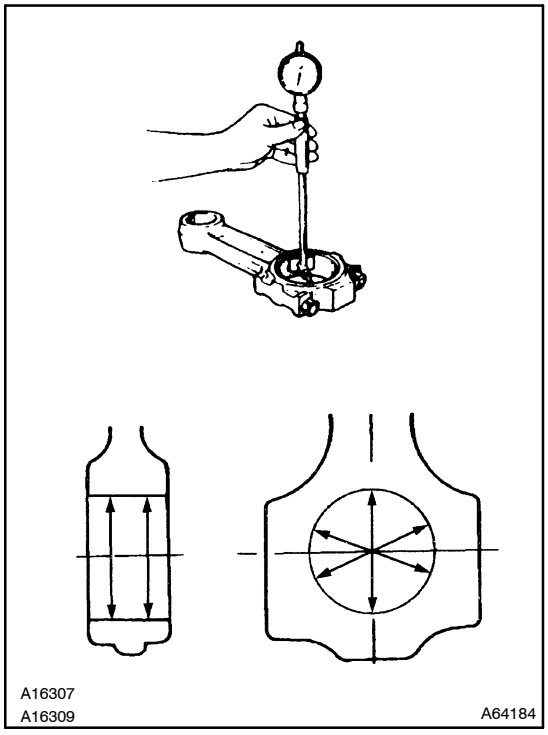
(b) Calculate the oil clearance between the piston pin and piston pin bush.

Standard oil clearance:

0.015 – 0.036 mm (0.0006 – 0.0014 in.)

Maximum oil clearance: 0.08 mm (0.0031 in.)

If the oil clearance is greater than the maximum, replace the piston with a new one.

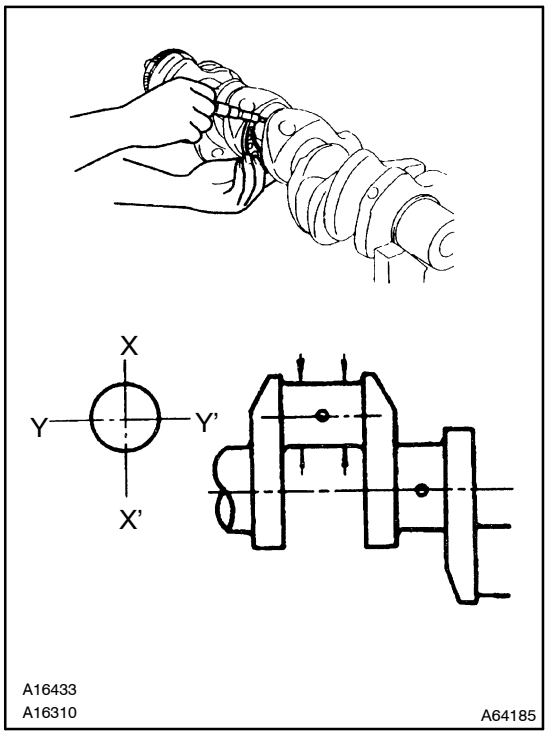


10. INSPECT CONNECTING ROD BIG END

(a) After tightening the connecting rod cap without bearing, using a cylinder gauge, measure the inside diameter of the connecting rod big end to calculate the roundness.

Standard inside diameter:
68.985 – 69.000 mm (2.7159 – 2.7165 in.)
Maximum inside diameter: 69.00 mm (2.7165 in.)

HINT:
For tightening of the connecting rod cap, see step 34.
If the diameter is greater than the maximum, replace the connecting rod big end a new one.

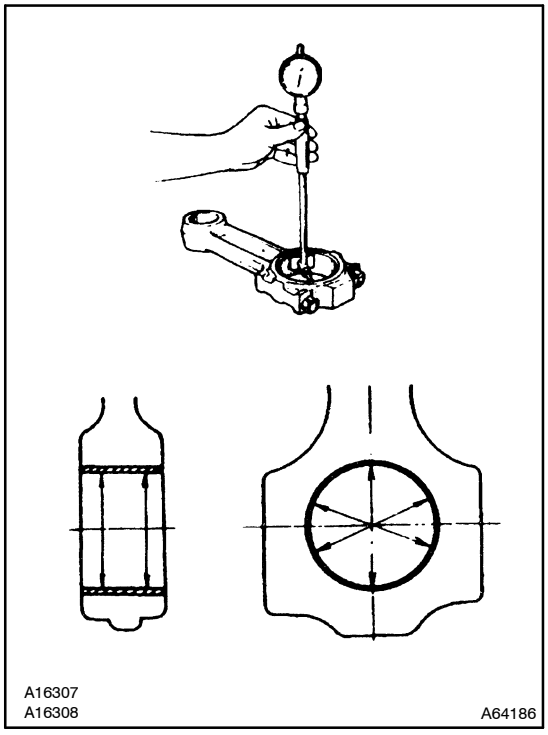


11. INSPECT CRANKSHAFT PIN AND BEARING

(a) Using a micrometer, measure the crankshaft pin diameter.

Standard crankshaft pin diameter:
64.940 – 64.960 mm (2.5566 – 2.5575 in.)
Minimum crankshaft pin diameter:
63.80 mm (2.5118 in.)

If the diameter is less than the minimum, replace the crankshaft pin a new one.


A16307
A16308
A64186

(b) Using a cylinder gauge, measure the connecting rod bearing inside diameter.
Standard inside diameter:
64.991 – 65.022 mm (2.5587 – 2.5599 in.)
Maximum inside diameter: 65.022 mm (2.5599 in.)

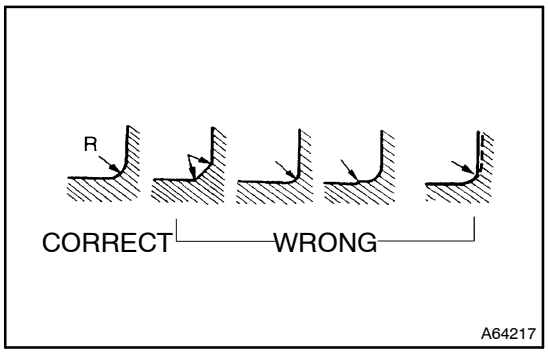
(c) Calculate the clearance between the crankshaft pin and connecting rod bearing.
Standard clearance:
0.031 – 0.082 mm (0.0012 – 0.0032 in.)
Maximum clearance: 0.20 mm (0.0079 in.)

If the clearance is greater than the maximum, replace the connecting rod bearing with the correct one.

Undersize machining dimension: 2 sizes below

Undersize machining dimension:

0.25 mm (0.0098 in.)	0.50 mm (0.0197 in.)

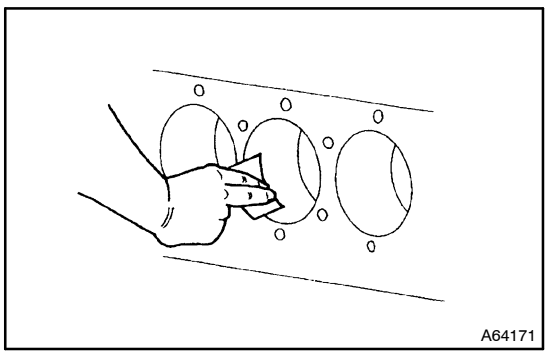


A64217

HINT:

Machined dimension of filet R

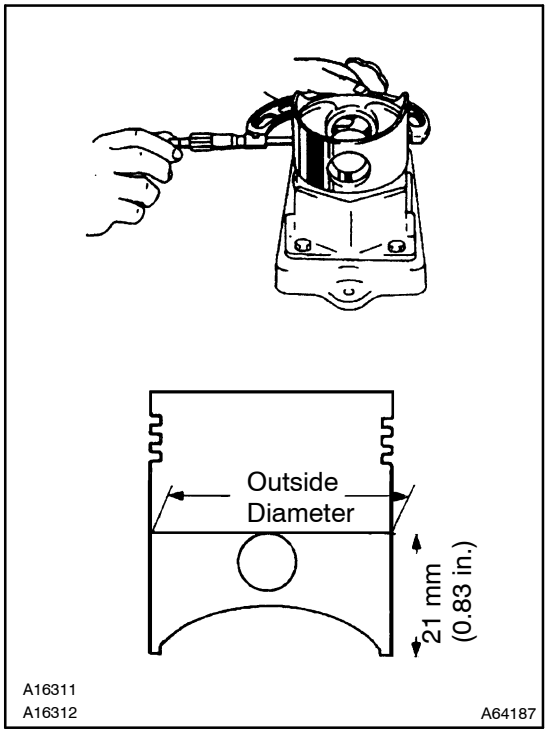
Crankshaft pin: 5.0 – 5.5 mm (0.20 – 0.21 in.)


A64171

12. INSPECT PISTON AND CYLINDER LINER

HINT:

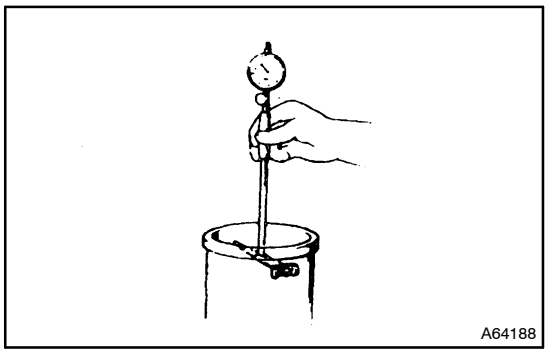
Before the measurement, remove carbon deposits from the upper end inside the cylinder liner with a scraper or an emery paper (recommended: No.150), working in a circular direction. Make sure that there is no scratches inside the cylinder liner.



(a) Using a micrometer, measure the piston diameter at the in the illustration points.

Standard piston diameter:
S05C–B:
113.920 – 113.944 mm (4.4850 – 4.4859 in.)
S05C–TA, TB:
113.869 – 113.885 mm (4.4830 – 4.4837 in.)
Minimum piston diameter: 113.869 mm (4.4850 in.)

If the piston diameter is less than the minimum, replace the piston with a new one.



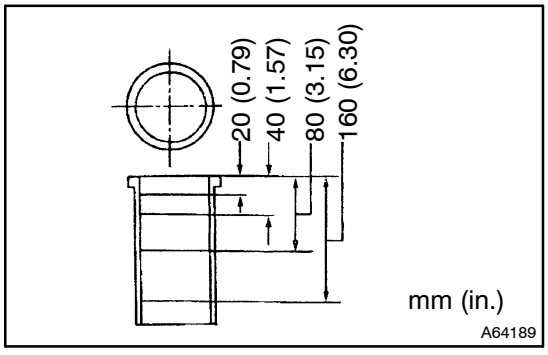
(b) Using a cylinder gauge, measure the cylinder liner inside diameter at the 4 points in the piston boss and thrust direction, as shown in the illustration.

Standard inside diameter:
113.988 – 114.012 mm (4.4877 – 4.4886 in.)
Maximum inside diameter: 114.15 mm (4.4910 in.)

If the inside diameter is greater than the maximum, replace the cylinder liner with a new one.

HINT:

- Apply the value measured at the most worn point to the cylinder liner inside diameter.
- If the cylinder liner is heavily wornor if only the piston ring must be replaced, correct the corrugation at the top of the cylinder liner.



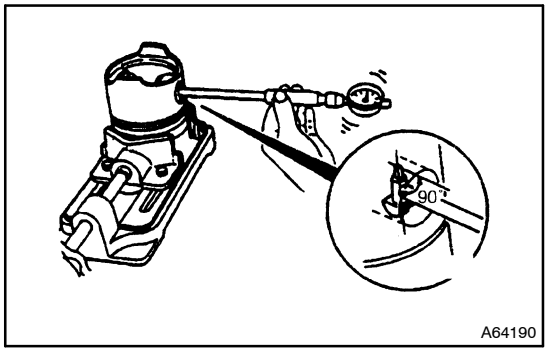
(c) Measure the clearance between the piston and cylinder liner.

Standard clearance:
S05C–B:
0.056 – 0.080 mm (0.0022 – 0.0031 in.)
S05C–TA, TB:
0.0515 – 0.0715 mm (0.0020 – 0.0028 in.)
Maximum clearance: 0.15 mm (0.0059 in.)

If the clearance is greater than the maximum, replace the cylinder liner and/or piston with a new one.

HINT:

Apply the value measured at the most worn point to the cylinder liner inside diameter.



13. INSPECT PISTON PIN BOSS

(a) Using a cylinder gauge, measure the piston pin boss inside diameter.

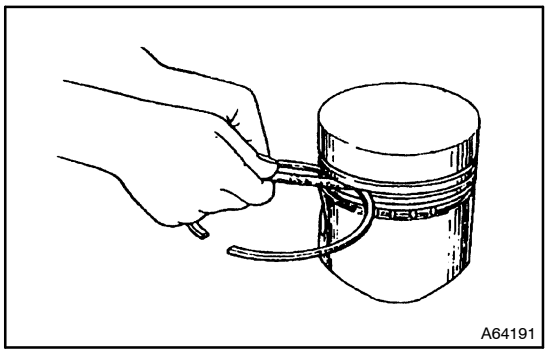
Standard piston pin boss inside diameter:
36.987 – 37.003 mm (1.4561 – 1.4568 in.)
Maximum piston pin boss inside diameter:
37.05 mm (1.4587 in.)

If the inside diameter is greater than the maximum, replace the piston with a new one.

(b) Calculate the clearance between the piston pin and the piston pin boss.

Standard clearance:
(–0.00051 (T) – 0.00055 (L) in.) –0.013 (T) – 0.014 (L) mm
Maximum oil clearance: 0.05 mm (0.0020 in.)

HINT:
T = tightening allowance, L = clearance
If the clearance is greater than the maximum, replace the piston or piston pin.



14. INSPECT PISTON RING AND PISTON RING GROOVE

(a) Insert the piston ring into the piston ring groove.

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

Clearance:
S05C–B

Item	Standard	Maximum
1st ring	0.06 – 0.10 mm (0.0024 – 0.0039 in.)	0.30 mm (0.0118 in.)
2nd ring	0.04 – 0.08 mm (0.0016 – 0.0031 in.)	0.30 mm (0.0118 in.)
Oil ring	0.02 – 0.06 mm (0.0008 – 0.0023 in.)	0.20 mm (0.0079 in.)

Clearance:
S05C–TA, TB

Item	Standard	Maximum
1st ring	0.09 – 0.13 mm (0.0035 – 0.0051 in.)	0.20 mm (0.0078 in.)
2nd ring	0.07 – 0.11 mm (0.0016 – 0.0031 in.)	0.18 mm (0.0070 in.)
Oil ring	0.02 – 0.06 mm (0.0007 – 0.0023 in.)	0.13 mm (0.0051 in.)

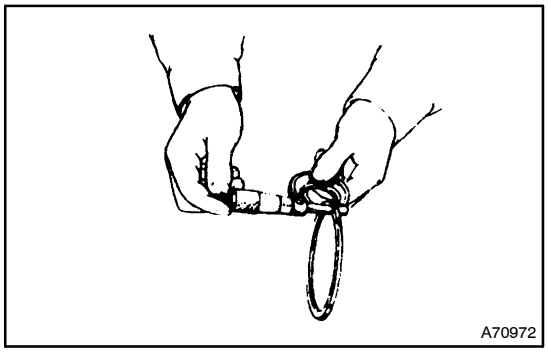
If the clearance is greater than the maximum, measure the width of the piston ring and piston ring groove individually and replace any parts that do not meet the limit with new ones.

Groove width:
S05C–B

Item	Standard	Maximum
1st ring	2.55 – 2.57 mm (0.1003 – 0.1011 in.)	2.70 mm (0.1062 in.)
2nd ring	2.03 – 2.05 mm (0.0799 – 0.0807 in.)	2.20 mm (0.0866 in.)
Oil ring	4.01 – 4.03 mm (0.1578 – 1586 in.)	4.10 mm (0.1614 in.)

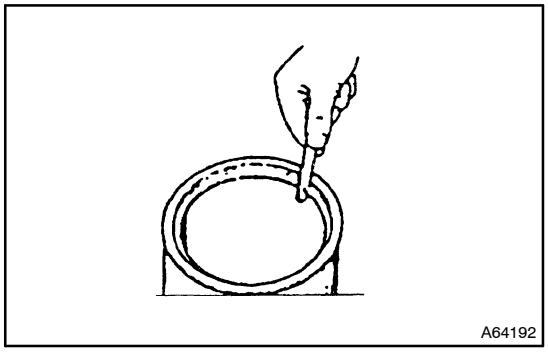
Groove width:
S05C–TA, TB

Item	Standard	Maximum
1st ring	2.58 – 2.60 mm (0.1015 – 0.1023 in.)	2.70 mm (0.1062 in.)
2nd ring	2.06 – 2.08 mm (0.0811 – 0.0818 in.)	2.20 mm (0.0866 in.)
Oil ring	4.01 – 4.03 mm (0.1578 – 1586 in.)	4.10 mm (0.1614 in.)



Ring thickness:

Item	Standard	Minimum
1st ring	2.47 – 2.49 mm (0.0972 – 0.0980 in.)	2.40 mm (0.0944 in.)
2nd ring	1.97 – 1.99 mm (0.0775 – 0.0783 in.)	1.90 mm (0.0748 in.)
Oil ring	3.97 – 3.99 mm (0.1562 – 0.1570 in.)	3.90 mm (0.1535 in.)



15. INSPECT PISTON RING GAP

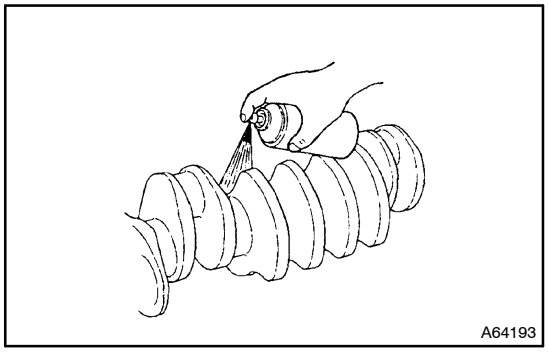
(a) Fit the piston ring into the cylinder liner.

(b) Using a feeler gauge, measure the end gap of the piston ring matching point.

Clearance:

Item	Standard	Maximum
1st ring	0.30 – 0.40 mm (0.0119 – 0.0157 in.)	1.50 mm (0.0590 in.)
2nd ring	0.50 – 0.65 mm (0.0197 – 0.0255 in.)	1.20 mm (0.0472 in.)
Oil ring	0.15 – 0.30 mm (0.0059 – 0.0118 in.)	1.20 mm (0.0472 in.)

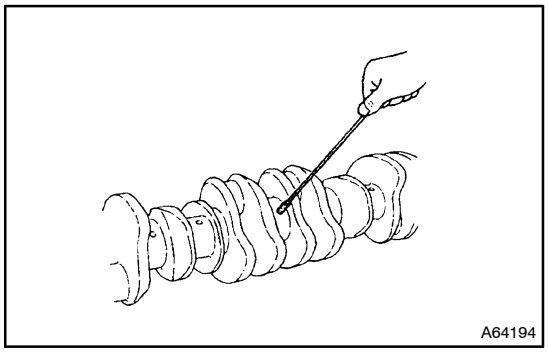
If the end gap is greater than the maximum, replace the piston ring with a new one.


A64193

16. INSPECT CRANKSHAFT

HINT:

Before the inspection, clean the crankshaft with a commercial cleaning agent and clean the lubrication passage using an air gun.


A64194

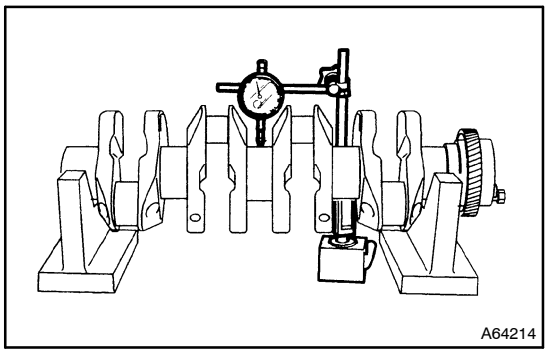
(a) Performing the dye penetrant test, and check the crankshaft for cracks.

HINT:

Pay special attention to the finished R section and oil hole of the crankshaft journal and crankpin.

(b) Visually check the condition of the crankshaft journal and pin for damage or wear.

If any damage are found, replace the crankshaft with a new one.


A64214

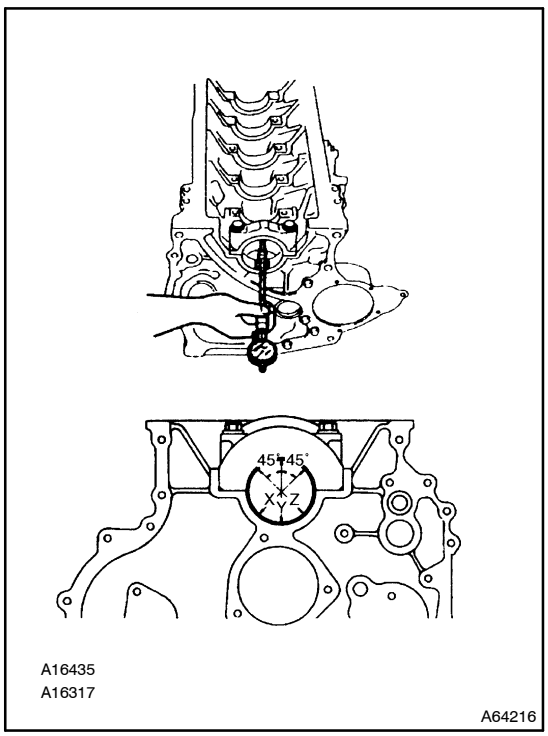
(c) Inspect for circle runout.

(1) Place the crankshaft on V–blocks.

(2) Using a dial gauge, measure the circle runout of the crankshaft at the center journal.

Maximum circle runout: 0.15 mm (0.0059 in.)

If the circle runout is greater than the maximum, replace the crankshaft with a new one.



A16435
A16317
A64216

17. INSPECT CRANKSHAFT BEARING CAP

(a) After tightening the main bearing caps without bearing, using a cylinder gauge, measure the inside diameter of the main bearing caps to calculate the roundness.

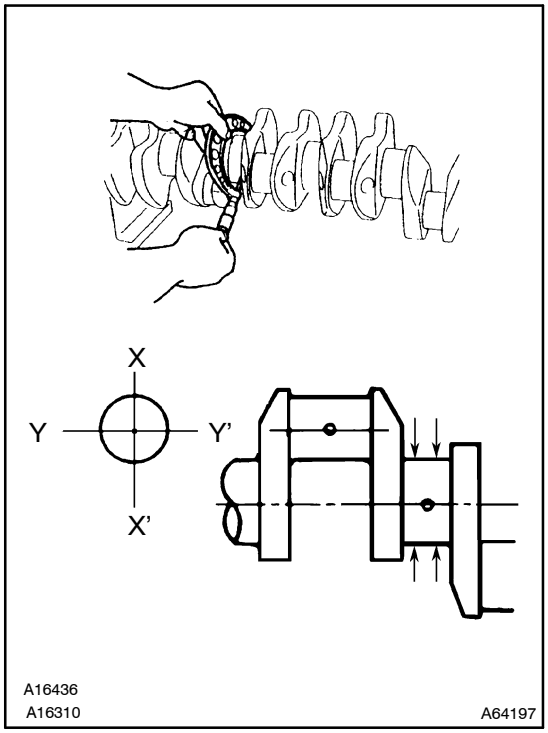
Inside diameter:

Standard	84.985 – 85.000 mm (3.3459 – 3.3465 in.)
Maximum	85.20 mm (3.3543 in.)

If the inside diameter is greater than the maximum, carry out boring after overlay welding or replace the cylinder block with a new one.

HINT:

- When installing the main bearing caps, make sure to return them to the original position according to the number stamped on the caps. The main bearing caps together with the cylinder block are round.
- For tightening of the main bearing caps, see step 28.



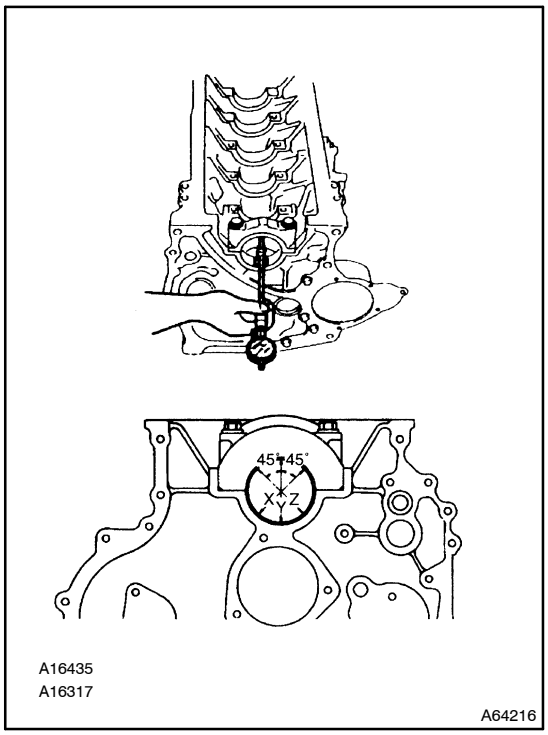
18. INSPECT CRANKSHAFT JOURNAL AND BEARING

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

Standard journal diameter:
79.940 – 79.960 mm (3.1472 – 3.1480 in.)
Minimum journal diameter:

Repair	79.80 mm (3.1417 in.)
Use	78.80 mm (3.1024 in.)

If the diameter is less than the minimum for use, replace the crankshaft with a new one.



(b) After installing and tightening the bearing caps, using a cylinder gauge, measure the bearing inside diameter.

Inside diameter:

Standard	80.00 mm (3.1496 in.)
Maximum	80.30 mm (3.1614 in.)

If the inside diameter is greater than the maximum, replace the bearing with a new one.

HINT:

- When installing the bearing caps, make sure to return them to the original position according to the number stamped on the caps. The bearing caps together with the cylinder block are round.
- For tightening of the bearing cap, see step 28.

(c) Calculate the oil clearance between the crankshaft journal and bearing.

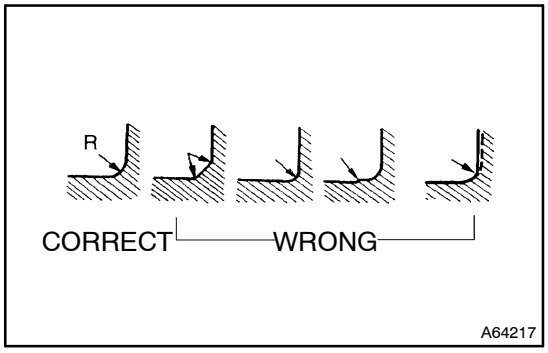
Oil clearance:

Standard	0.051 – 0.102 mm (0.0020 – 0.0040 in.)
Maximum	0.20 mm (0.0079 in.)

Undersize machining dimension:

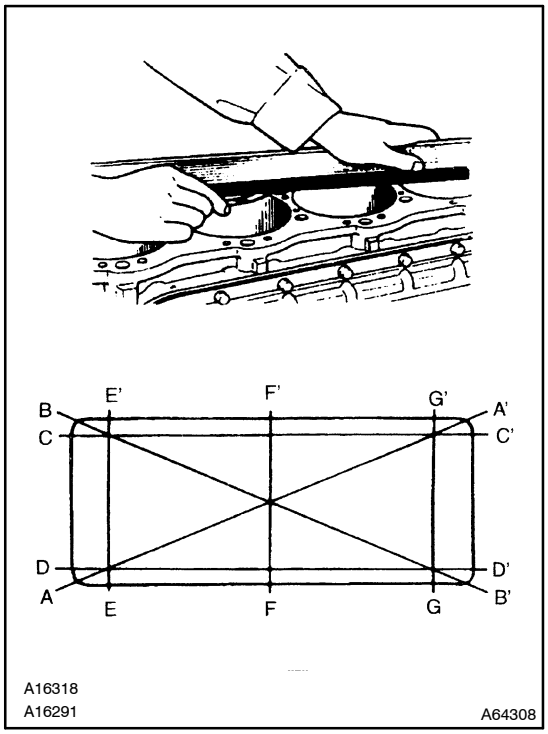
0.25 mm (0.0098 in.)	0.50 mm (0.0197 in.)

If the oil clearance is greater than the maximum, replace the bearing with a correct one.



HINT:
Make sure to replace the top and bottom main bearings as one set. The top and bottom main bearings must be round.
HINT:
Machined dimension of filet R

Main crankshaft journal:
5.0 – 5.5 mm (0.1969 – 0.2165 in.)



19. INSPECT CYLINDER BLOCK SUB–ASSY

(a) Remove the water gallery plug, and visually check the condition of the worn hole.

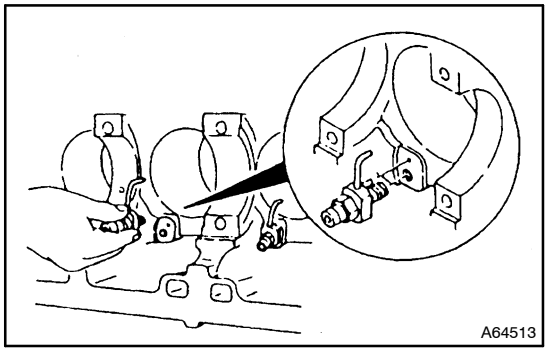
If the wear is excessive, replace the part with a new one. Also inspect the inside of the cylinder block, and clean the cylinder block main body with a commercial cleaning agent as required.

(b) Check the cylinder for cracks.
Check the cylinder block for cracks and perform the dye penetrant test.

If any cracks are found, replace the cylinder block with a new one.

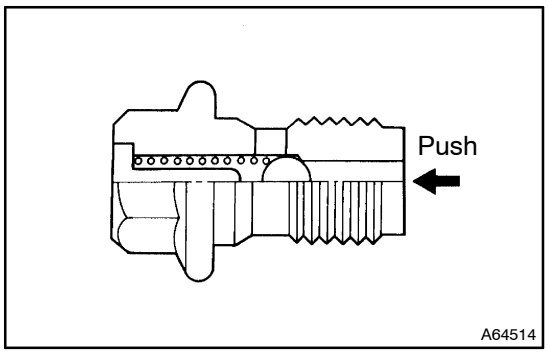
(c) Check the flatness of the cylinder block upper surface.
Using a straight edge and feeler gauge, measure the warpage of the surfaces contacting the cylinder head.
Standard warpage: 0.05 mm (0.0020 in.) or less
Maximum warpage: 0.20 mm (0.0079 in.)

If the warpage is greater than the maximum, replace the cylinder block with a new one.



20. REMOVE CHECK VALVE AND OIL JET

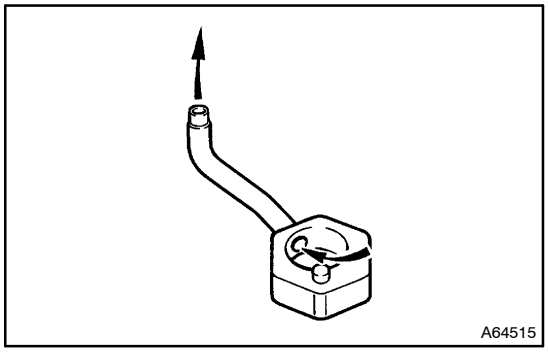
(a) Remove the 4 check valves and 4 oil jets.



21. INSPECT CHECK VALVE

(a) Using a wooden stick, push the valve and check if it is stuck.

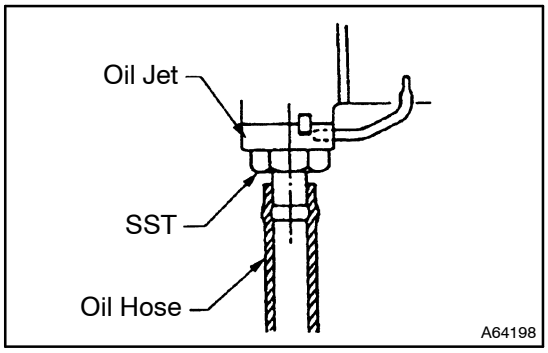
If stuck, replace the check valve.



22. INSPECT OIL JET

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

If necessary, replace the oil jet.



23. ADJUST OIL JET

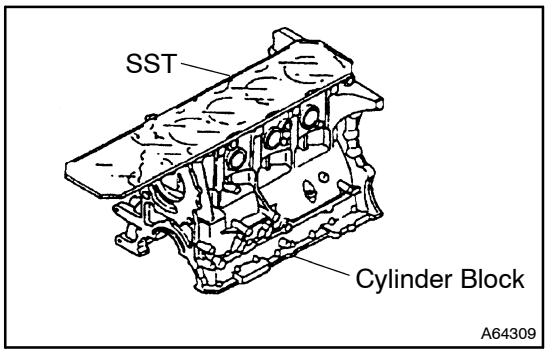
(a) Align the pin of the jet with the pin hole of the cylinder block.

(b) Using SST, install the jet with SST.

SST S9001–24262

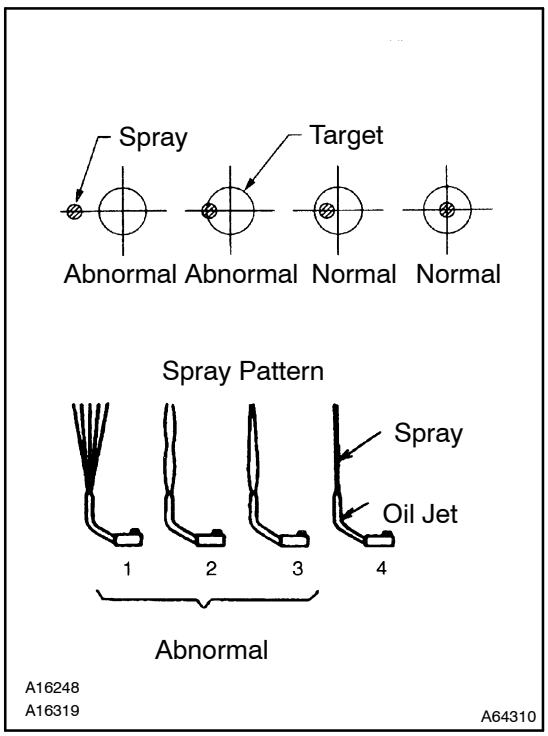
Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)

(c) Connect a commercial oil pump (hydraulic pressure: 2 kgf/cm^2 (28 lb/psi.)) to the SST using a hose.



(d) Set the SST on the cylinder block upper surface against the dowel pin.

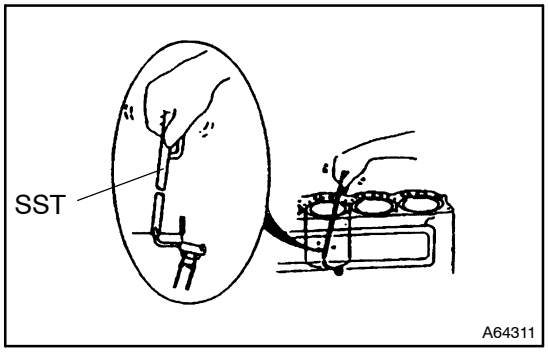
SST S0944–41630



(e) Start the oil pump, let the engine oil spray out the oil jet to check that the center of the jet flow is within the ø 7 mm (ø 0.27 in.) reference line of the gauge as well as to judge whether the jet flow is normal as shown in the illustration.

NOTICE:

- **Use new engine oil.**
- **Engine oil is flammable.**
- **This spray test should be performed in a well ventilated room and away from any open flames or electric sparks.**



If the center of the jet flow is out of the ø 7 mm (ø 0.27 in.) reference line of the gauge, adjust the jet sight using the SST.

(f) Remove the checking bolt after the inspection.
SST S0947–21620

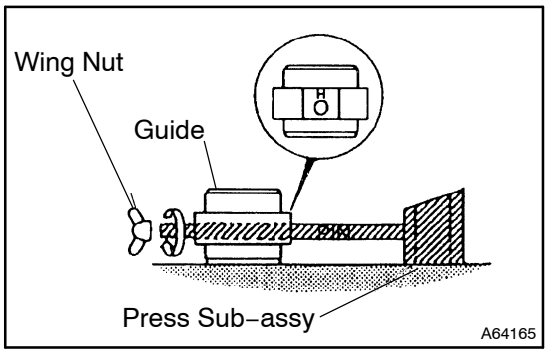
24. INSTALL CHECK VALVE AND OIL JET

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

(b) Install the jet with the check valve.
Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)

NOTICE:

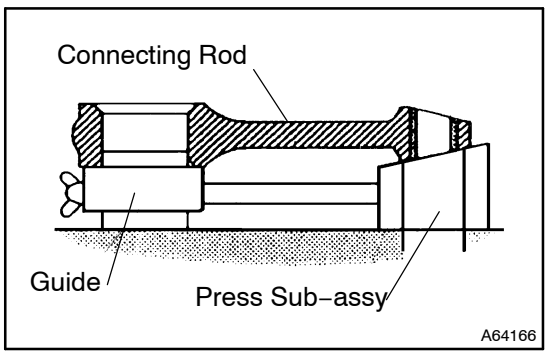
- **Always install the soft washer.**
- **When installing the piston, make sure that the oil jet is not struck by the piston when at bottom dead center.**



25. INSTALL CONNECTING ROD SMALL END BUSH

(a) Prepare the SST.
SST S0940–21480, S0948–11140, S9233–10360

(1) Assemble the guide and press sub–assy inserting its pin into the guide, then secure them with the wing nuts.

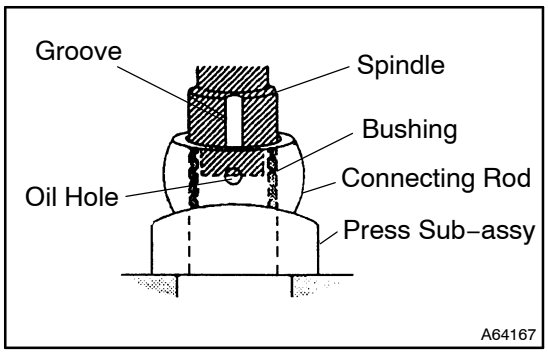


HINT:

- Bring lever ”H” punched on the guide above the pin.
- Make sure to align both supporting surfaces of the guide and press sub–assy flush on a flat plane.

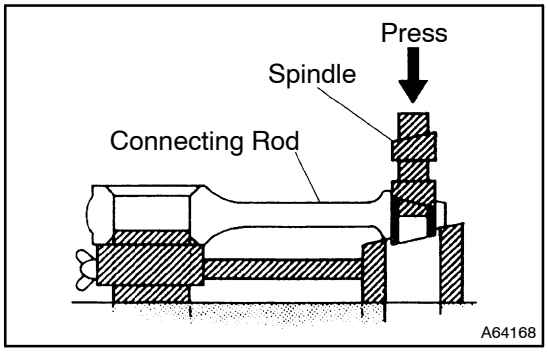
(b) Using SST, remove the bush.

(1) Set the connecting rod assembled without crankshaft pin bore bearing on the guide and press sub–assy.



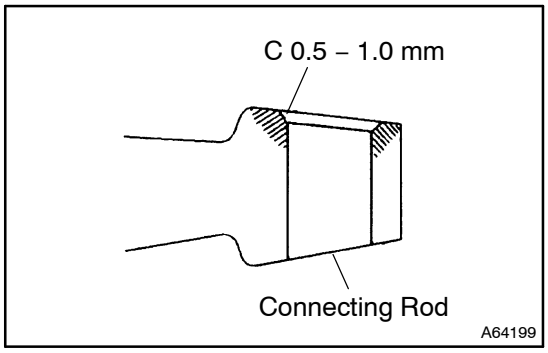
(2) Using a SST, install the spindle into the bush.
SST S0940–21540

HINT:
Align the grooving of the spindle with the oil hole of the bush.



(3) Using a press, remove the bush.

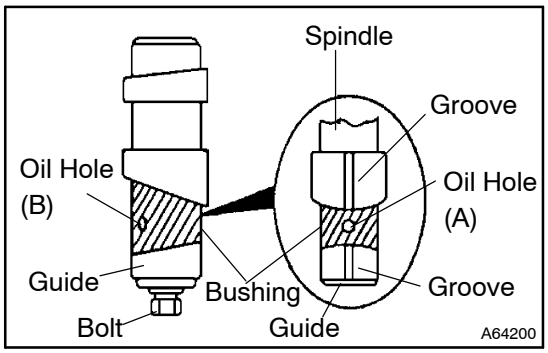
HINT:
Always operate the press slowly and smoothly.



(c) Assemble the bush.

(1) Chamfer one edge of the bush hole at the small end of the connecting rod uniformly by C 0.5 – 1.0 mm (0.0196 – 0.0393 in.)

HINT:
Irregular chamfering can cause out–of–roundness of the pressed bushing, which may result in jamming during insertion. Remove dust from the inner surface of the smaller hole.



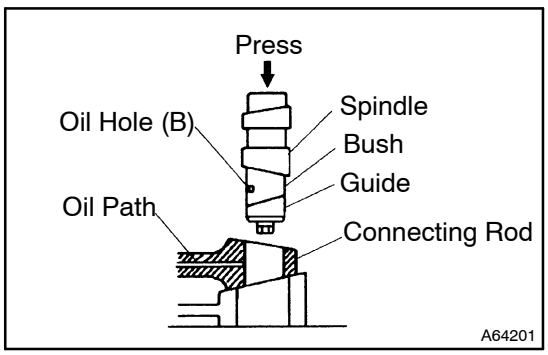
(d) Mount the bushing on the spindle.

SST S0940–21540, S0948–11540, S9191–08252

(1) Set the bushing and guide on the spindle, then secure them with the bolt.

Torque: 4.9 – 6.9 N·m (50 – 70 kgf·cm, 43 – 61 in.·lbf)

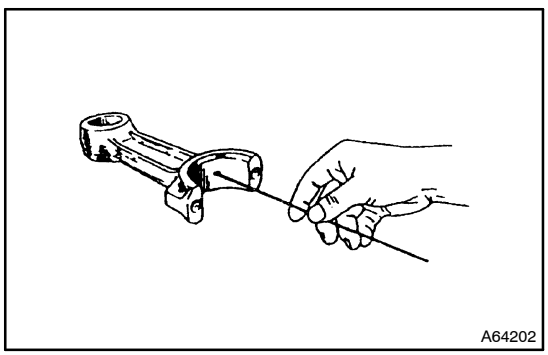
HINT:
Align oil hole (A) in the bushing with both groove or the spindle and guide, making sure that the oil hole (B) will meet with oil path in the connecting rod led from the big end bore in the rod.



(2) Apply fresh engine oil around the bush and guide.

(e) Install the bush in the connecting rod. Position the bush tool assembly so that the oil hole (B) aligns with the oil path through the connecting rod.

HINT:
Before installing, fully coat the bore in the connecting rod with fresh engine oil.

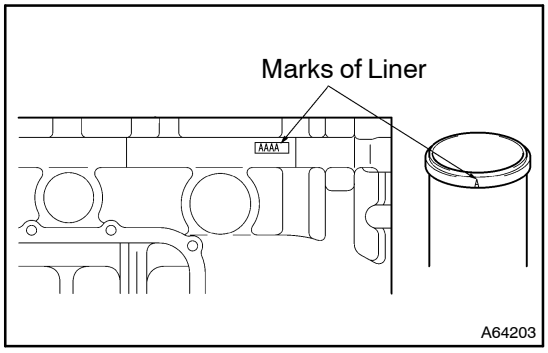


(f) Inspect the bush positioning after the installation.

(1) Make sure that the oil hole of the bush and the oil path of the connecting rod are suitably aligned allowing a 6 mm (0.23 in.) diameter rod to penetrate.

HINT:
Misalignment can lead to insufficient lubrication, which may result in seizure.

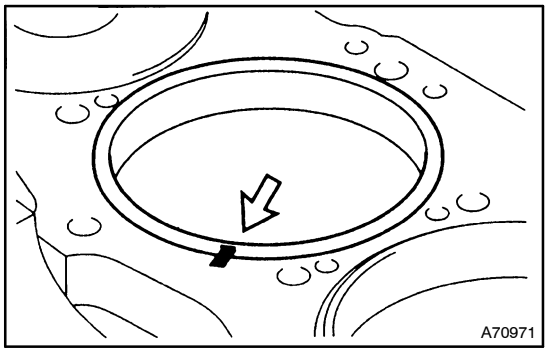
(2) Make sure that the bushing can be rotated by hand with–out rattling while a new piston pin is inserted in the piston pin.



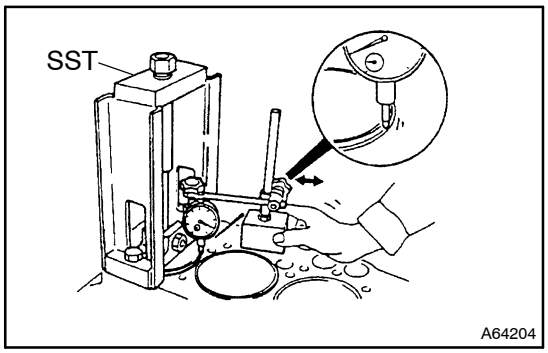
26. INSTALL CYLINDER LINER

HINT:

- When assembling the cylinder liner with the cylinder block, clearance can be set to three levels.
- When using a new cylinder liner, the upper surface and side surface of the cylinder block are stamped A, B or C. Insert a matching cylinder liner having the same symbol.



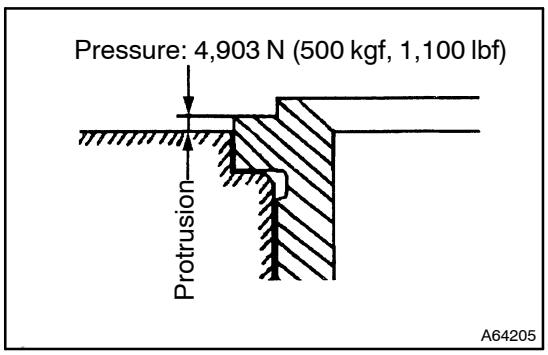
- When reusing a cylinder liner, install it according to the alignment marks made during removal. The cylinder liner is bent by ”run–in”. When reusing the cylinder liner, misalignment with the cylinder block may concentrate stress on the thin part of the cylinder liner and it may be broken.



27. INSPECT PROTRUSION OF CYLINDER LINER

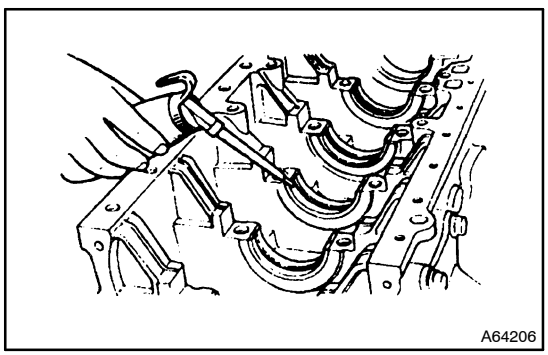
(a) Install SST onto the cylinder block.
SST S0942–01720

(b) Tighten the center bolt to the specified torque below to set the cylinder liner in the normal installation condition.
Torque: 9.8 N·m (100 kgf·cm, 87 in.·lbf)



(c) Using a dial gauge, measure the protrusion of the cylinder liner.
Standard protrusion:
0.01 – 0.08 mm (0.0004 – 0.0031 in.)
Maximum protrusion: 0.08 mm (0.0031 in.)

If the protrusion is greater than the maximum, replace the cylinder liner.



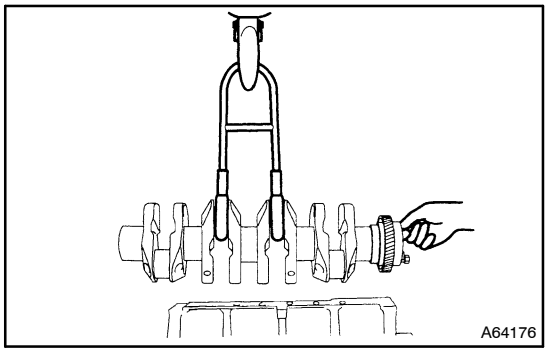
28. INSTALL CRANKSHAFT

(a) Install the main bearings onto the cylinder block and main bearing caps.

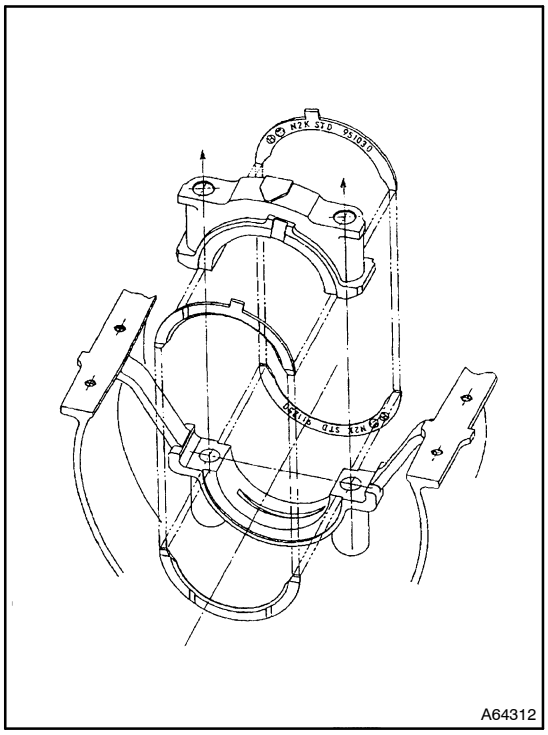
HINT:

- When reusing a bearing, make sure to reassemble the removed bearing as it was originally installed.
- Install the bearing with the oil hole on the block side and the bearing without the oil hole on the cap side.
- Match the bearing protrusion with the notch of the block or cap.

- After the installation, apply engine oil to the journal surfaces of the bearings.


A64176

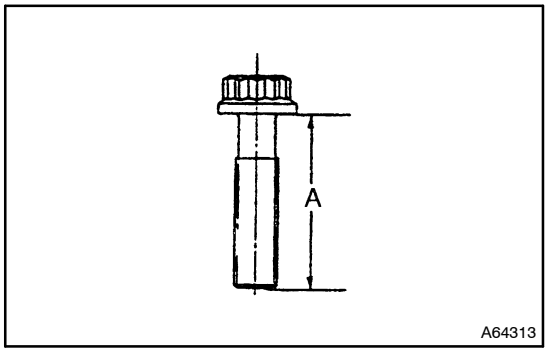
(b) Install the thrust washers onto the 4 points of the No. 2 journal of the cylinder block and either side of the bearing caps.
(c) Install the crankshaft onto the cylinder block.


A64312

HINT:
- When reusing a bearing, make sure to reassemble the removed bearing as it was originally installed.
- Install the thrust washers with the groove side (front) toward the crankshaft arm and with the part number stamp (back) toward the main bearing cap or cylinder block.
- Apply engine oil or grease to the back of the bearing to prevent looseness during installation.
- Fit the bearing to the mounting groove of the block and cap side.

(d) Install the bearing cap.

HINT:
Facing the arrow stamped on the cap forward, install it in the order of the stamped numbers.



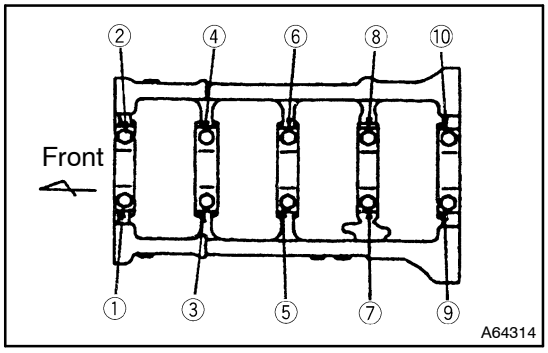
A64313

(1) Measure the length of the bearing cap bolts.
Length (A):

Standard	106.80 mm (4.2047 in.)
Maximum	108.00 mm (4.2520 in.)

If the length is greater than the maximum, replace them with new bolts.

(2) Apply clean engine oil to the bolt seat and bolt threads.



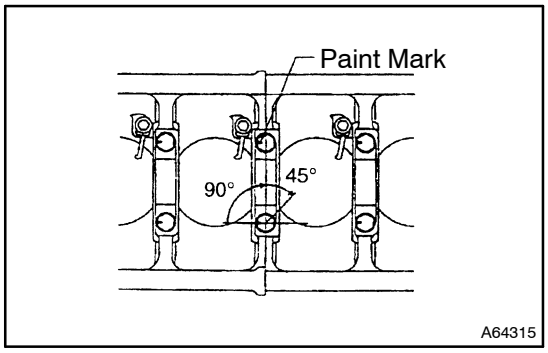
(3) Tighten the bolts in the order shown in the illustration.

Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)

(4) Loosen all the bolts.

(5) Tighten the bolts as in step (3).

Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)



(6) Mark the bolts with paint to indicate the same direction.

(7) Tighten the bolts by 90° (1/4 turn) in the same order as in step (5).

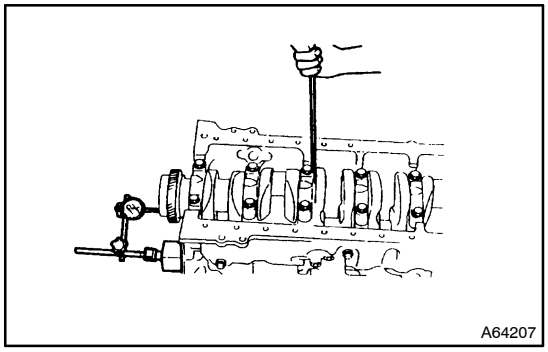
(8) Finally, retighten the bolts by 45° (1/8 turn) as in step (7).

(9) Make sure that all the paint marks face the same direction.

HINT:

When adding torque, never untighten the nuts even if they have been over tightened.

(10) After tightening, using a plastic–faced hammer, tap the front and back ends of the crankshaft to make a complete fit.



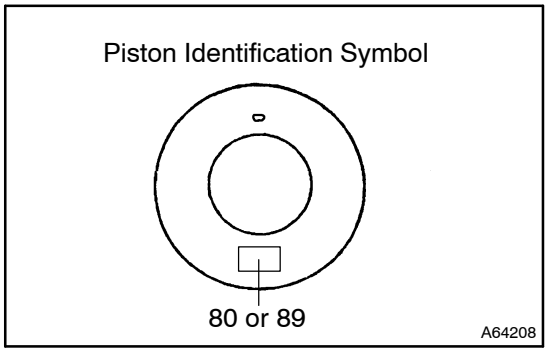
29. INSPECT CRANKSHAFT THRUST CLEARANCE

(a) Using a dial gauge, measure the crankshaft thrust clearance.

Thrust clearance:

Standard	0.050 – 0.239 mm (0.0020 – 0.0094 in.)
Maximum	0.50 mm (0.0197 in.)

If the thrust clearance is greater than the maximum, replace the thrust bearing with the oversized one of 0.25 mm (0.0098 in.).



30. INSTALL CONNECTING ROD SUB–ASSY

HINT:

- Before assembling the piston with the connecting rod, check whether the piston is specified for this engine
- Check should be performed using the engine compatible identification code on the top of the piston.

S05C–B:

Engine compatible identification code: 80

S05C–TA, TB:

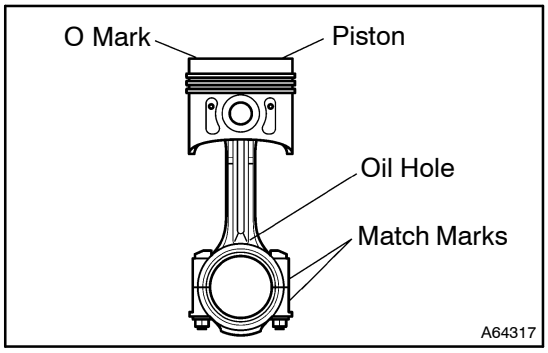
Engine compatible identification code: 89

(a) Install a new retainer ring onto one end of the piston boss.

HINT:

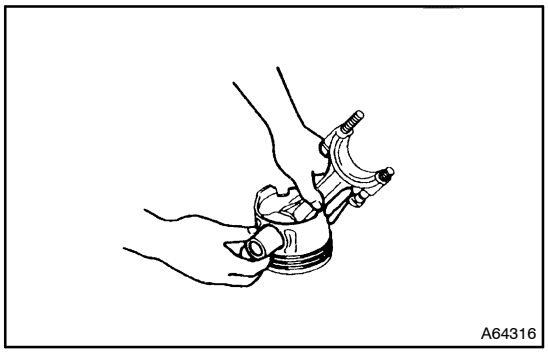
Installing the retainer ring may cause it to fly up. Be sure to wear protective goggles.

(b) Immerse the piston in hot water, 80 – 90°C (176 – 194°F) for approximately 5 minutes.



(c) Assemble the piston with the O mark being opposite to the connecting rod matchmark.

CAUTION:
Never touch the piston with your bare hands while it is hot.



(d) Insert the piston pin into the piston.

HINT:

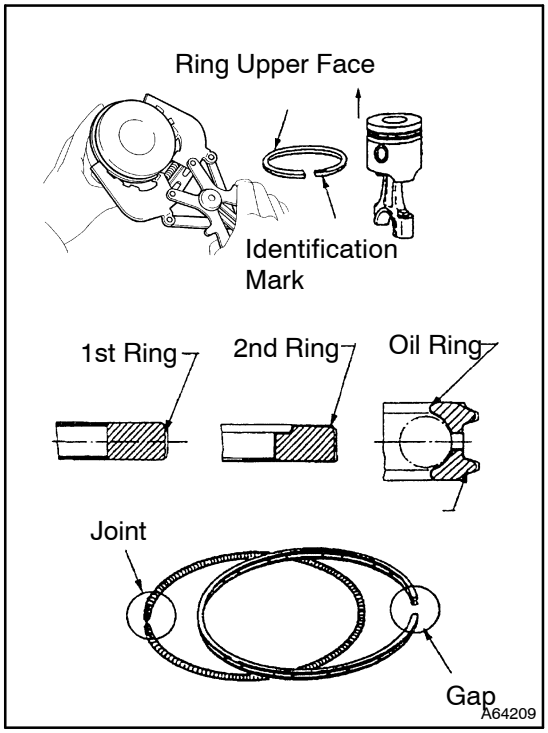
- Insert the piston pin from the piston boss attached to the retainer ring so that the ring groove is not damaged.

(e) Install a new retainer ring to the other end of the piston boss.

CAUTION:
Installing the retainer ring may cause it to fly up. Be sure to wear protective goggles.

HINT:

- When using an oversized piston, hone the liner so that the clearance between the cylinder liner and the piston.
- Prevent parts from damage by wrapping them in a cloth while they are being installed onto the cylinder block.
- Measure the entire length of the connecting rod bolt (see step 34).

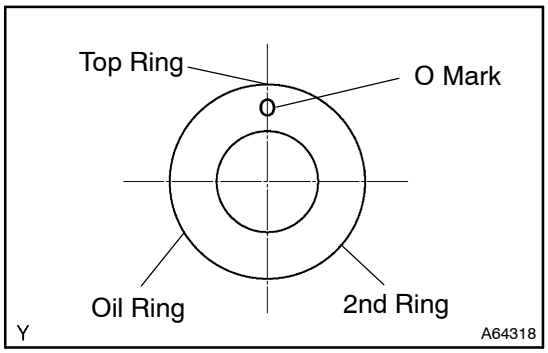


31. INSTALL PISTON RING

(a) Facing the identification marks on the piston ring upper surface, install them in the order of oil ring, 2nd ring and 1st ring using a piston ring expander.

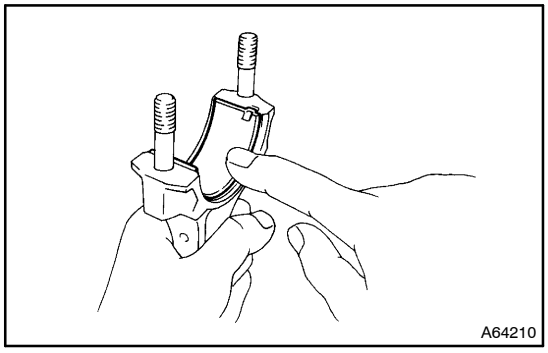
HINT:

- Never change the combination of the coil and oil ring.
- Connect the joint of the coil expander for the oil ring and install it inside the piston ring. Assemble the ring with the joint 180˚opposite to the matching point of the ring.



HINT:

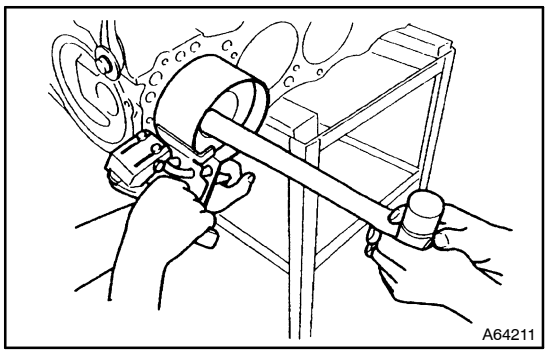
Position the matching points of the piston ring at an even distance. Be careful not to position at the piston boss.



32. INSTALL CONNECTING ROD BEARING

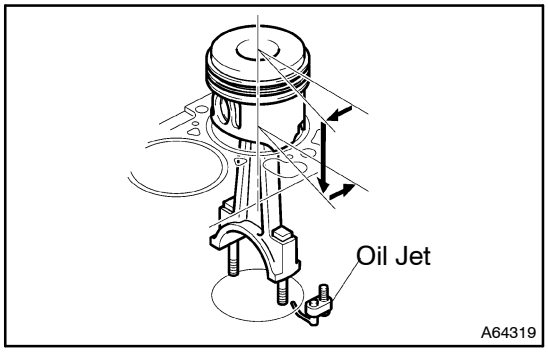
NOTICE:

- **When reusing the bearing, make sure to reassemble the removed bearing as it was originally installed.**
- **Install the bearing with the oil hole on the connecting rod side and the bearing without the oil hole on the cap side.**
- **Match the bearing protrusion with the notch of the connecting rod or cap.**



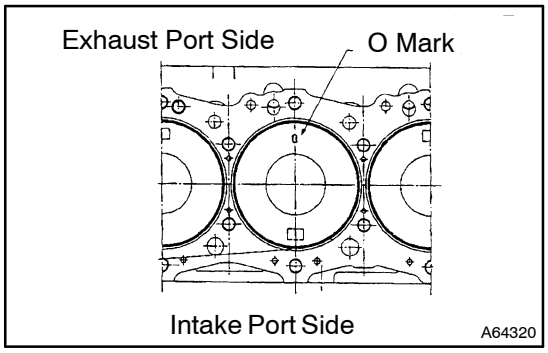
33. INSTALL PISTON AND CONNECTING ROD

(a) Using a piston ring compressor and a hammer handle, insert the piston through the connecting rod assembly into the cylinder block.

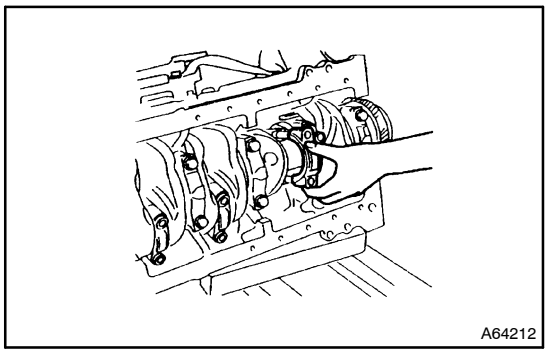


HINT:

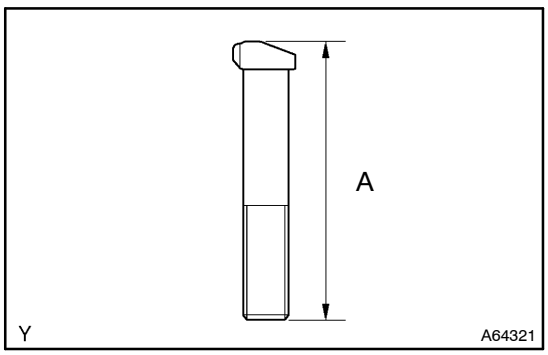
- Before the installation, apply engine oil to the piston pin, piston ring, cylinder liner and connecting rod bearing.
- Recheck the matching point of each piston ring.



- Make sure that the O mark on the piston is at the exhaust side.
- When inserting the piston, be careful that the oil jet is not struck by the connecting rod. If struck, make sure to re-check the sight of the oil jet.
- Also, do not damage the inside of the liner.



34. INSTALL CONNECTING ROD CAP

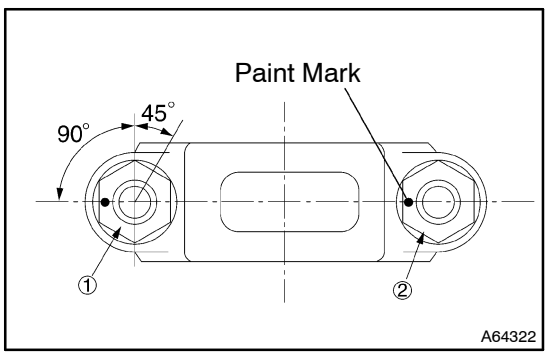


(a) Measure the length of the bolts.
Length (A):

Standard	81.5 mm (3.2086 in.)
Maximum	82.5 mm (3.2480 in.)

If the length is greater than the maximum, replace them with new ones.

(b) Apply clean engine oil to the nut seat surface and bolt thread of the connecting rod cap.



(c) Tighten the connecting rod nut in the order shown in the illustration to the specified torque below.
(1) Tighten the connecting rod nuts 1 and 2 temporarily, dividing into small amount.
Torque: 69 N·m (700 kgf·cm, 50 ft·lbf)

(d) Mark the cap nut with paint to indicate the same direction.

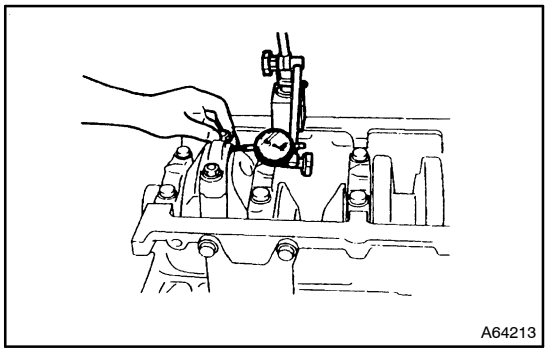
(e) Tighten the cap nut by 90° (1/4 turn) in the same order as in step (c).

(f) Tighten the cap nut by 45° (1/8) turn as in step (e).

(g) Make sure that all paint marks face the same direction.

(h) Turn the crank to make the piston in the bottom dead center, and then check that the piston and oil jet nozzle of the block do not interfere each other.

HINT:
When adding torque, never untighten the nuts even if they have been overtightened.


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35. INSPECT CONNECTING ROD THRUST CLEARANCE

(a) Using a dial gauge, measure the clearance between the connecting rod and crank pin end surface.
Standard thrust clearance:
0.20 – 0.52 mm (0.0079 – 0.0204 in.)
Maximum thrust clearance: 1.00 mm (0.0393 in.)

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