

20. Cylinder Block

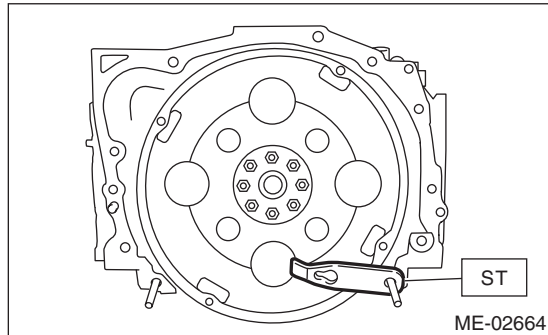
A: REMOVAL

NOTE:

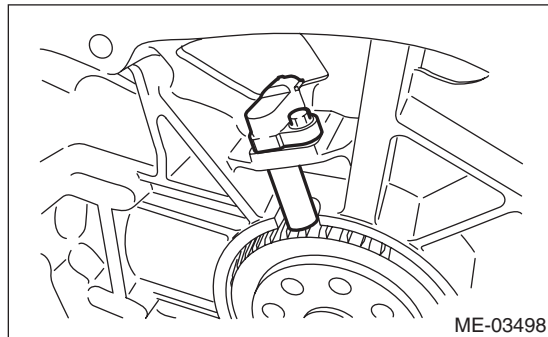
Before conducting this procedure, drain the engine oil completely.

- 1) Remove the engine unit from vehicle. <Ref. to ME(H6DO)-36, REMOVAL, Engine Assembly.>
- 2) Remove the crank pulley. <Ref. to ME(H6DO)-47, REMOVAL, Crank Pulley.>
- 3) Remove the chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Chain Cover.>
- 4) Remove the timing chain assembly. <Ref. to ME(H6DO)-54, REMOVAL, Timing Chain Assembly.>
- 5) Remove the cam sprocket. <Ref. to ME(H6DO)-73, REMOVAL, Cam Sprocket.>
- 6) Remove the crank sprocket. <Ref. to ME(H6DO)-74, REMOVAL, Crank Sprocket.>
- 7) Remove the camshaft. <Ref. to ME(H6DO)-75, REMOVAL, Camshaft.>
- 8) Remove the cylinder head. <Ref. to ME(H6DO)-82, REMOVAL, Cylinder Head.>
- 9) Using the ST, remove the drive plate.

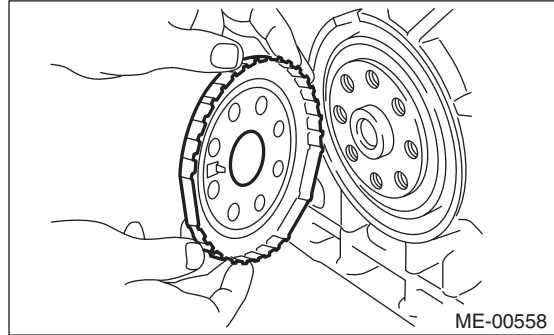
ST 498497100 CRANKSHAFT STOPPER



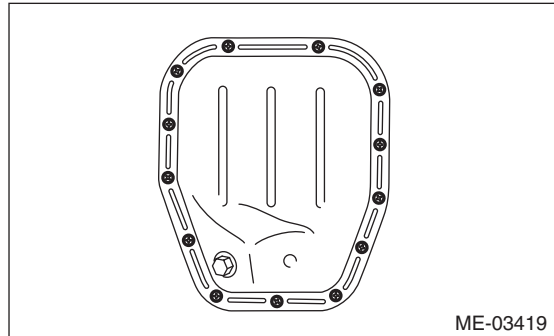
- 10) Remove the crankshaft position sensor.



- 11) Remove the crankshaft position sensor plate.



- 12) Rotate the engine to set oil pan upper.
- 13) Remove the bolts which secure oil pan lower to oil pan upper.

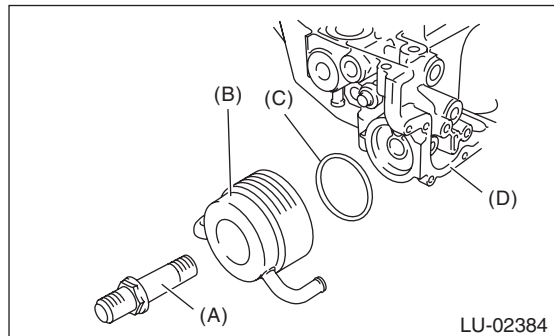


- 14) Insert an oil pan cutter blade between oil pan upper-to-oil pan lower clearance, then remove the oil pan lower.

CAUTION:

Do not use a screwdriver or similar tools in place of oil pan cutter.

- 15) Remove the oil cooler connector and remove oil cooler.



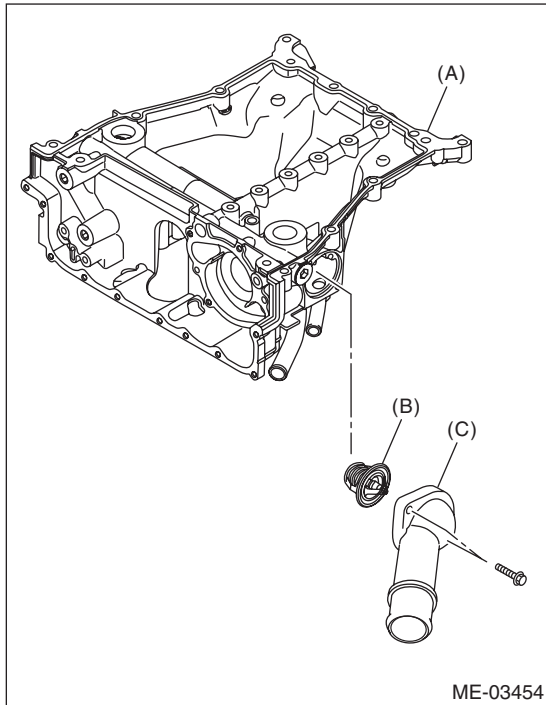
- (A) Oil cooler connector
- (B) Oil cooler
- (C) O-ring
- (D) Oil pan upper

- 16) Remove the oil pump. <Ref. to LU(H6DO)-11, REMOVAL, Oil Pump.>

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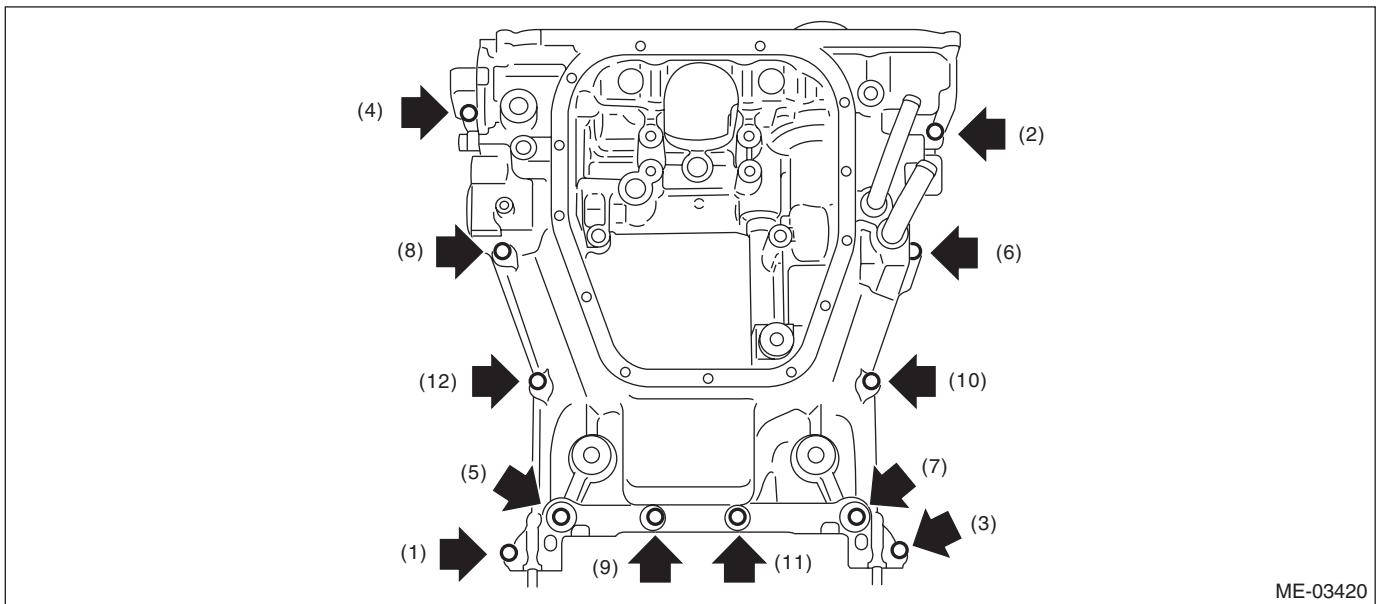
MECHANICAL

17) Remove the thermostat cover, and then remove the thermostat.

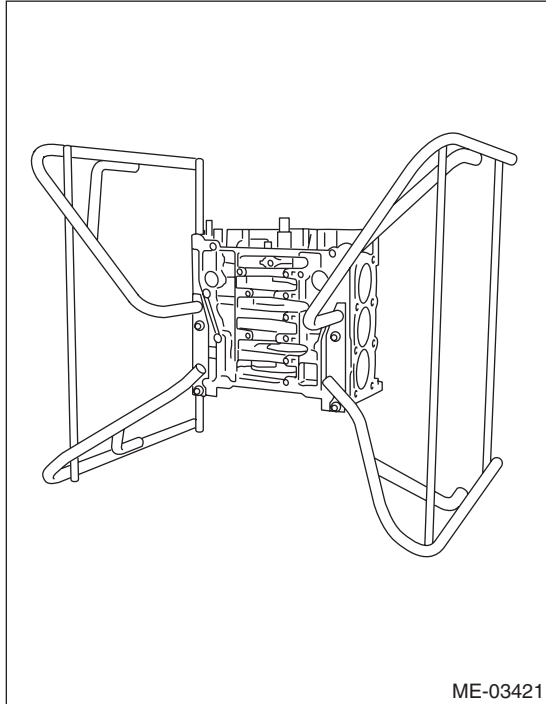


- (A) Oil pan upper
- (B) Thermostat
- (C) Thermostat cover

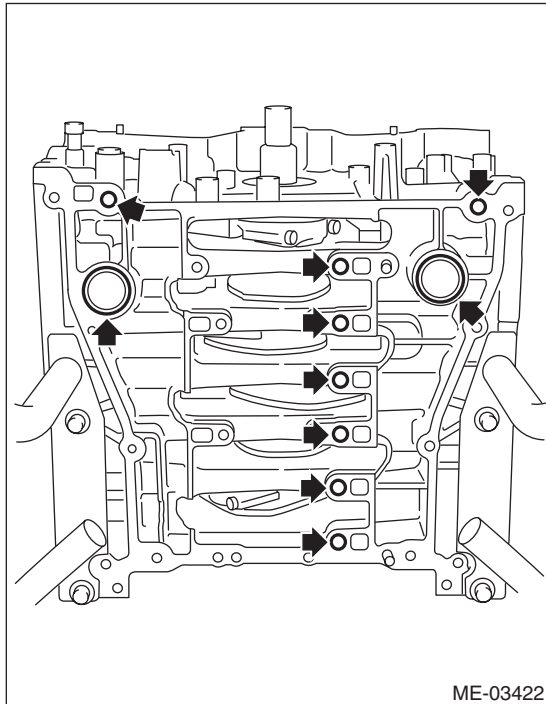
18) Remove the oil pan upper.



19) Set the engine with front side facing upward.



20) Remove the O-rings (10 pcs) under the cylinder block.



21) Mark the all connecting rod caps with the front direction and the number of cylinder from which they were removed.

22) Remove the # 1, # 4 connecting rod caps and pistons from cylinder block.

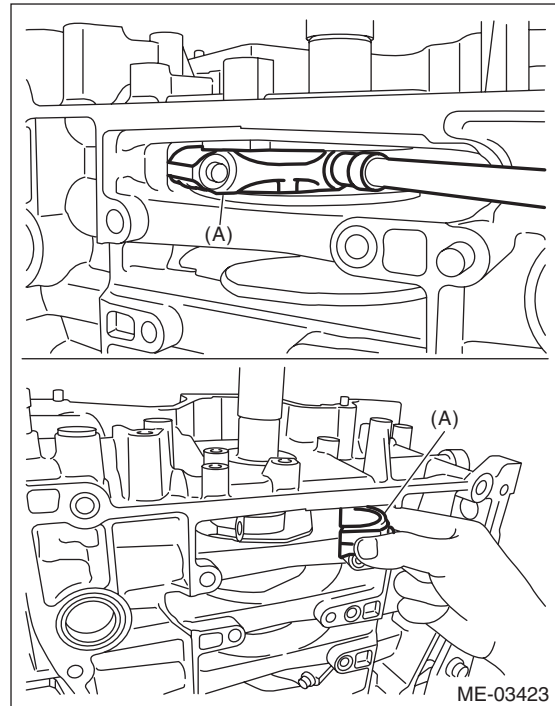
NOTE:

- Use the 3/8 inch (9.5 sq.) for extension and TORX® socket (E12).
- Remove the connecting rod cap by turning the crankshaft (ST) in counterclockwise direction after removing two connecting rod joint bolts.
- Mark the all connecting rod caps and pistons with the number of the cylinder from which they were removed.
- Removal of the connecting rod caps and pistons should be performed in three stages. First, remove the # 1, # 4 connecting rod caps and pistons at the same time, then remove the # 2, # 5 connecting rod caps and pistons at the same time, then # 3, # 6 connecting rod caps and pistons at the same time.

(1) Turn the crankshaft using ST, to set the # 1 piston at the middle position between top dead center and bottom dead center.

ST 18252AA000 CRANKSHAFT SOCKET

(2) Remove the two # 1 connecting rod cap joint bolts, and then remove the connecting rod cap.

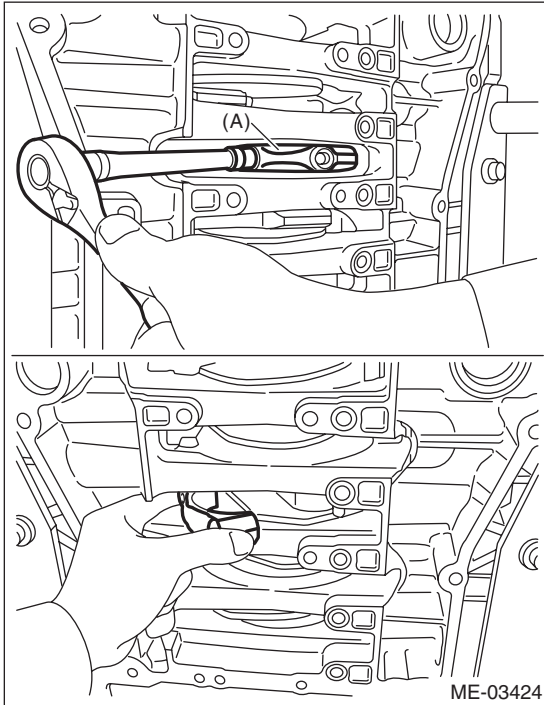


(A) # 1 connecting rod cap

Cylinder Block

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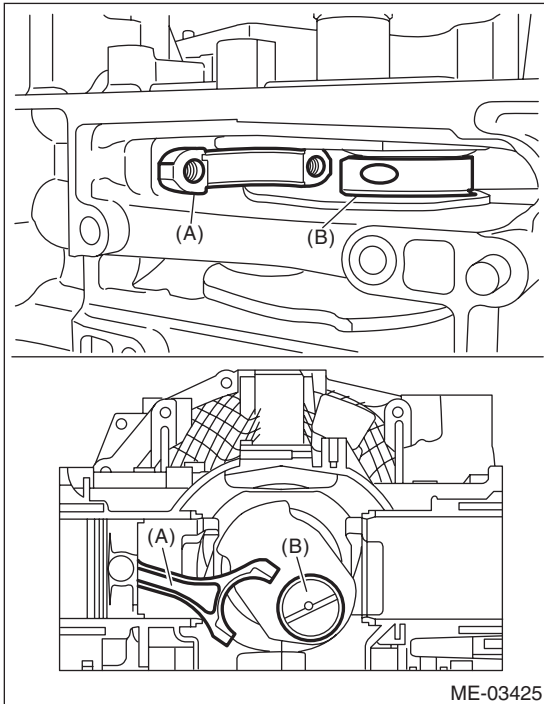
(3) Remove the two # 4 connecting rod cap joint bolts, and then remove the connecting rod cap.



(A) # 4 connecting rod cap

(4) Turn the crankshaft using ST, to set apart the crank pin and the # 1 connecting rod large end position.

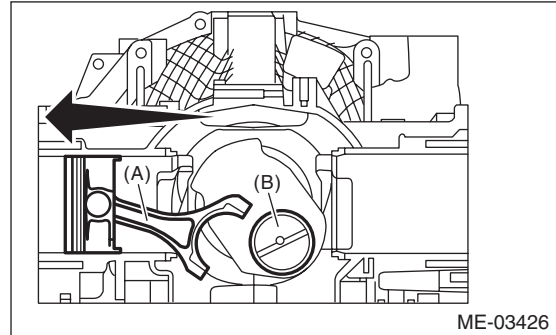
ST 18252AA000 CRANKSHAFT SOCKET



(A) # 1 connecting rod

(B) Crank pin

(5) Push the # 1 connecting rod to the arrow direction, then remove the # 1 piston and connecting rod from cylinder block.

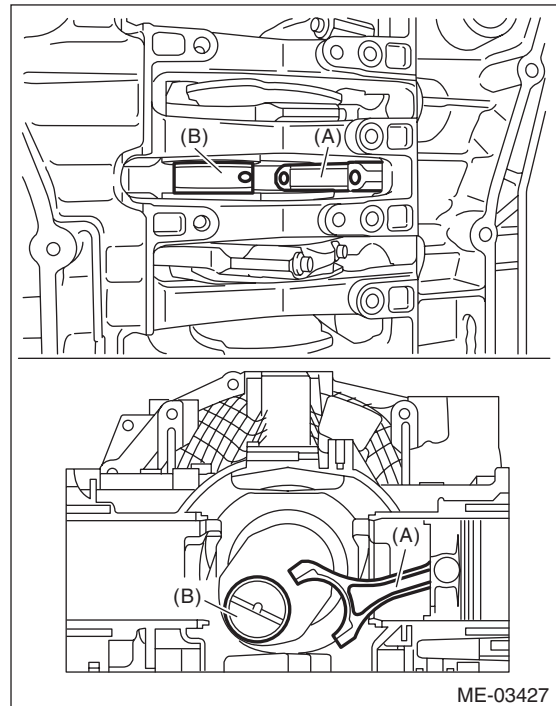


(A) # 1 connecting rod

(B) Crank pin

(6) Turn the crankshaft using ST, to set apart the crank pin and the # 4 connecting rod large end position.

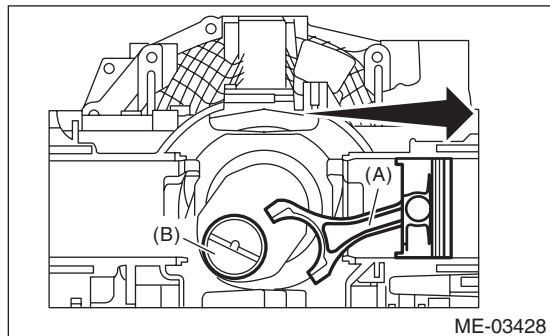
ST 18252AA000 CRANKSHAFT SOCKET



(A) # 4 connecting rod

(B) Crank pin

(7) Push the # 4 connecting rod to the arrow direction, then remove the # 4 piston and connecting rod from cylinder block.



- (A) # 4 connecting rod
- (B) Crank pin

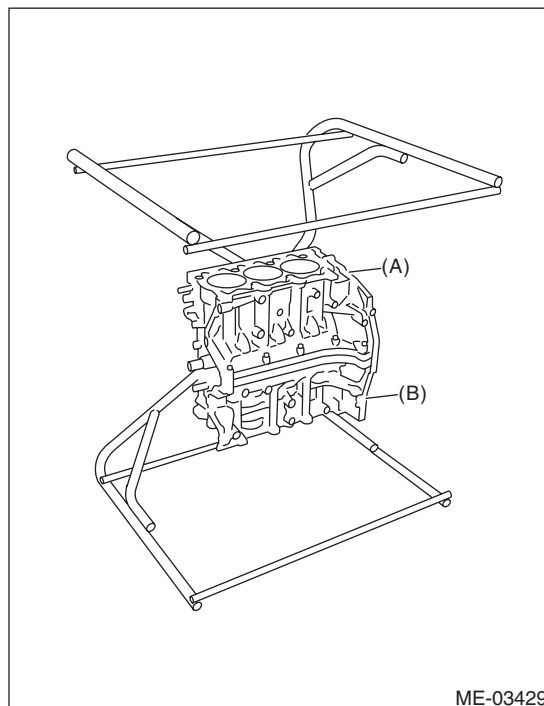
23) Remove the # 2, # 5 connecting rods and pistons from cylinder block in the same way.

ST 18252AA000 CRANKSHAFT SOCKET

24) Remove the # 3, # 6 connecting rods and pistons from cylinder block in the same way.

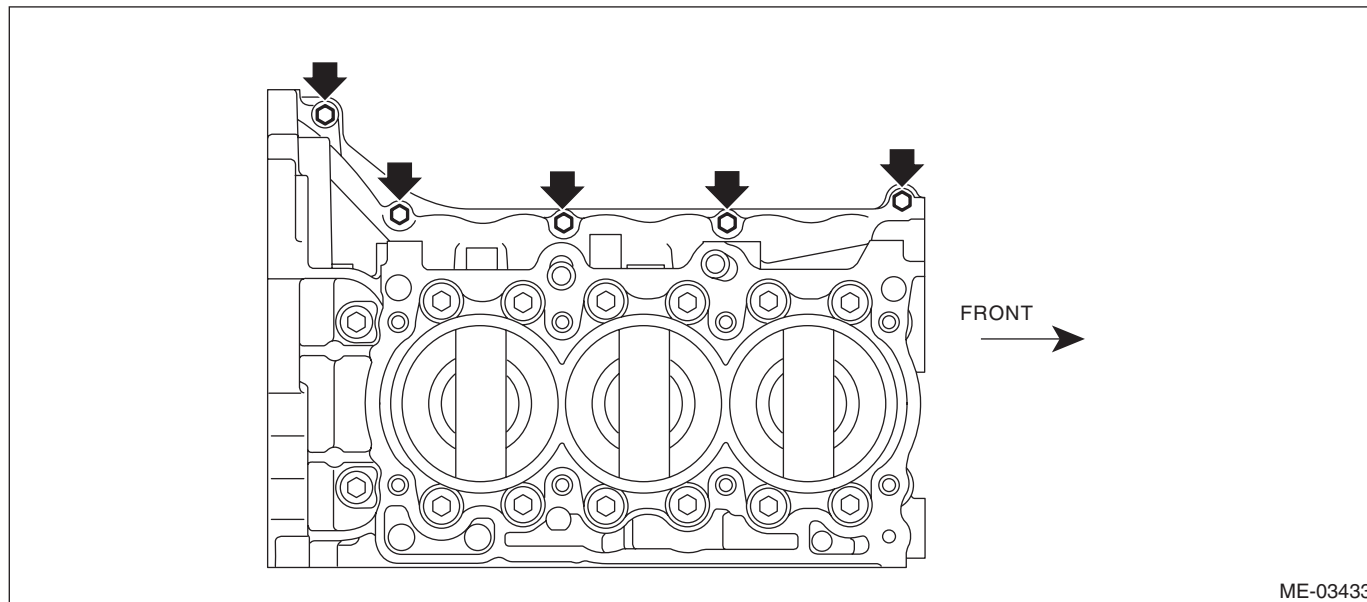
ST 18252AA000 CRANKSHAFT SOCKET

25) Set the engine with the cylinder block (RH) facing upward.



- (A) Cylinder block (RH)
- (B) Cylinder block (LH)

26) Remove the upper bolts.



Cylinder Block

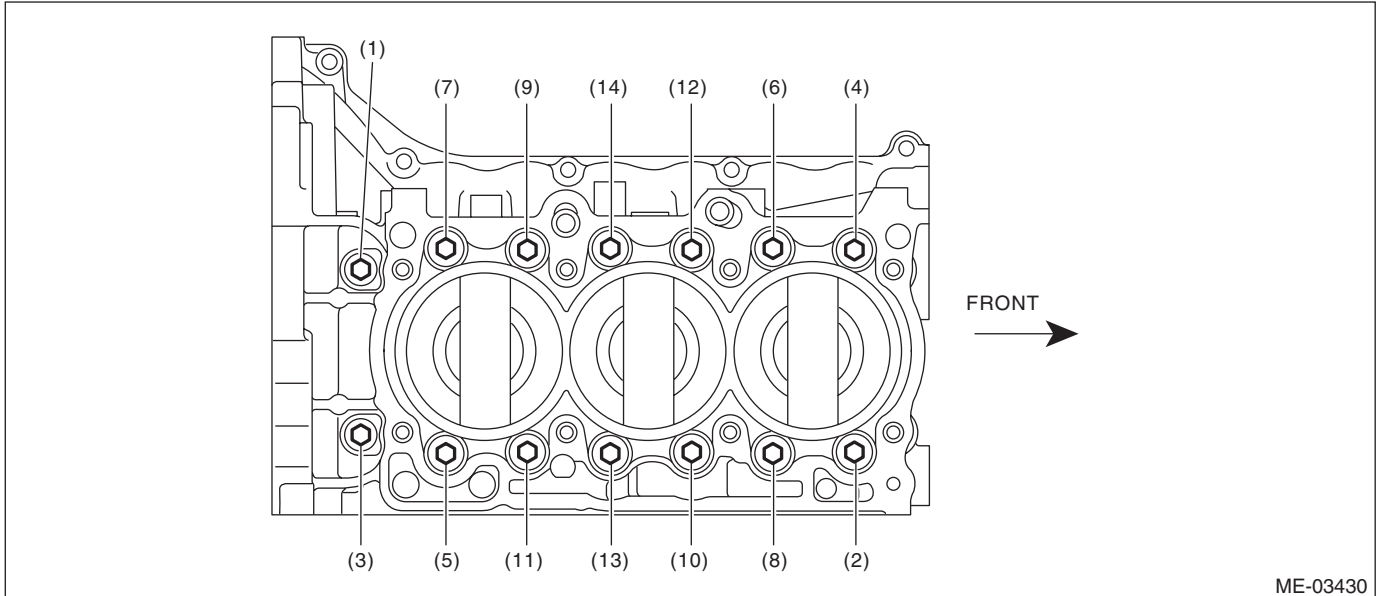
MECHANICAL

27) Loosen the cylinder block bolts in the numerical order as shown in the figure, then separate the cylinder block (RH) and (LH).

NOTE:

Make sure that the crankshaft remains in the cylinder block (LH).

Separating the cylinder block (RH) carelessly by lifting it will cause the crankshaft inside the cylinder block (RH) to fall down.



28) Remove the rear oil seal.

29) Remove the crankshaft from cylinder block (LH).

30) Remove the crankshaft bearings from cylinder block using a hammer handle.

NOTE:

- Do not confuse the combination of crankshaft bearings.
- Press the bearing at the end opposite to locking lip.

B: INSTALLATION

1) After setting the cylinder block to ST, install the crankshaft bearing.
ST 18232AA000 ENGINE STAND

NOTE:

Apply a coat of engine oil to the bearing and crankshaft journal.

2) Install the crankshaft to cylinder block (LH).

3) Apply liquid gasket to the matching surface of cylinder block (RH).

CAUTION:

Do not allow liquid gasket to run over to oil passages, bearing grooves, etc.

NOTE:

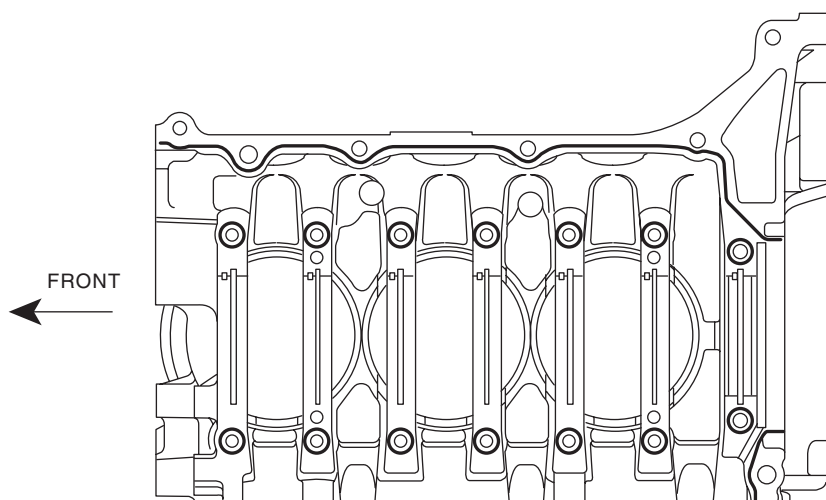
Install within 5 min. after applying liquid gasket.

Liquid gasket:

THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Applying liquid gasket diameter:

1.0 ± 0.2 mm (0.039 ± 0.008 in)



ME-03431

4) Install the cylinder block (RH) to cylinder block (LH).

5) Apply a coat of engine oil to the washer and bolt thread.

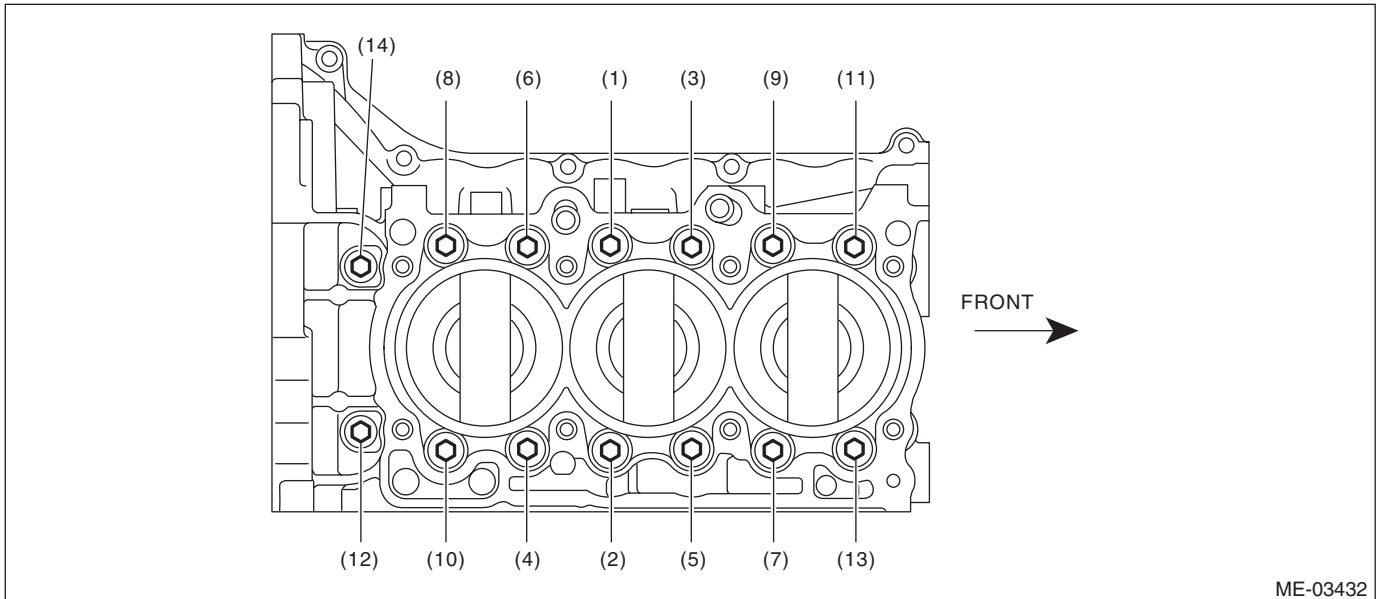
Cylinder Block

MECHANICAL

6) Tighten all bolts in the numerical order as shown in the figure.

Tightening torque:

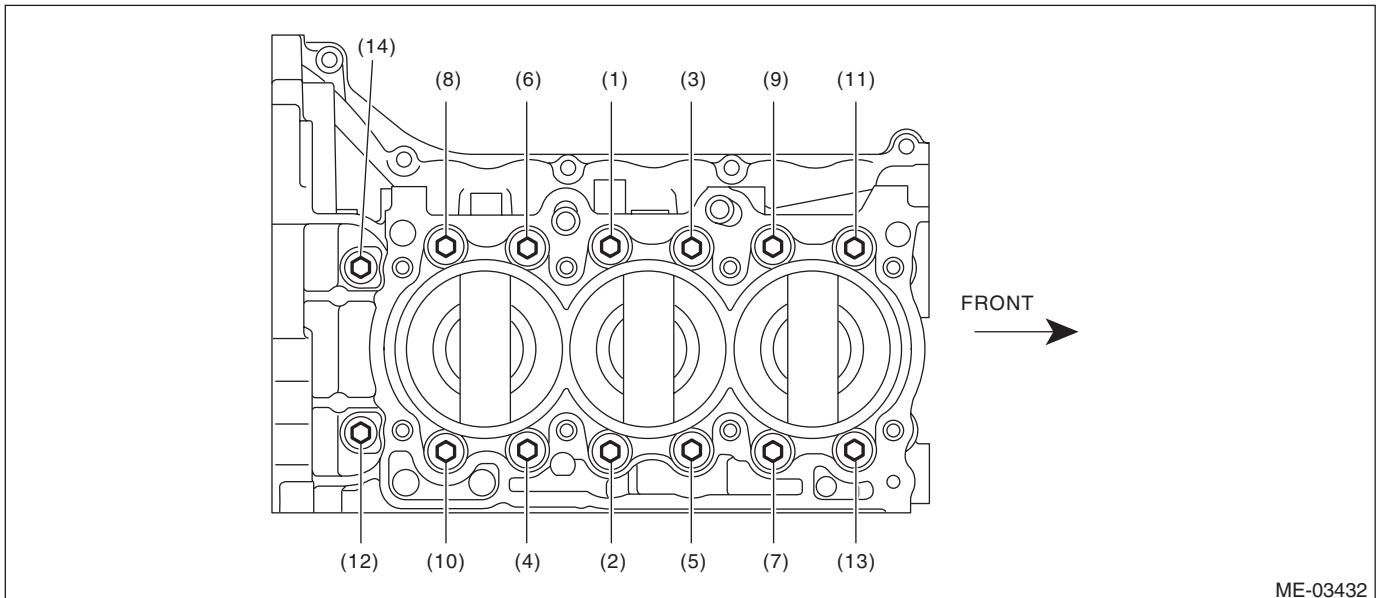
12 N·m (1.2 kgf·m, 8.9 ft·lb)



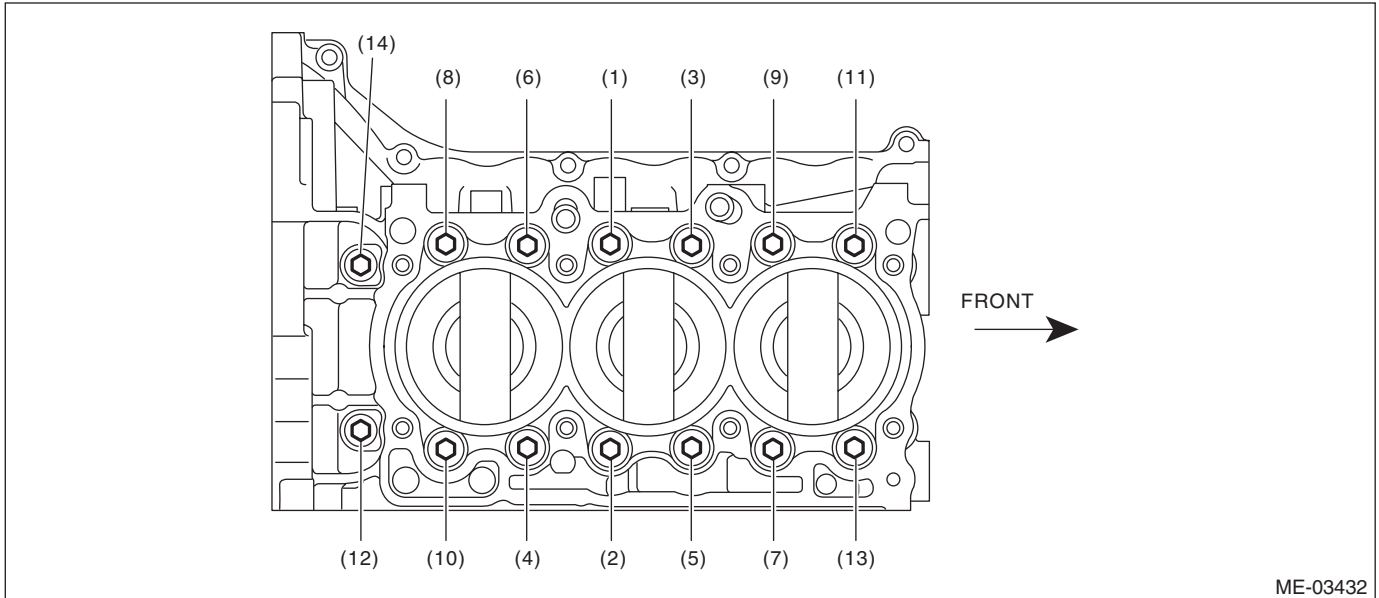
7) Retighten all bolts in the numerical order as shown in the figure.

Tightening torque:

18 N·m (1.8 kgf·m, 13.3 ft·lb)



8) Tighten all bolts 90° in the numerical order as shown in the figure.



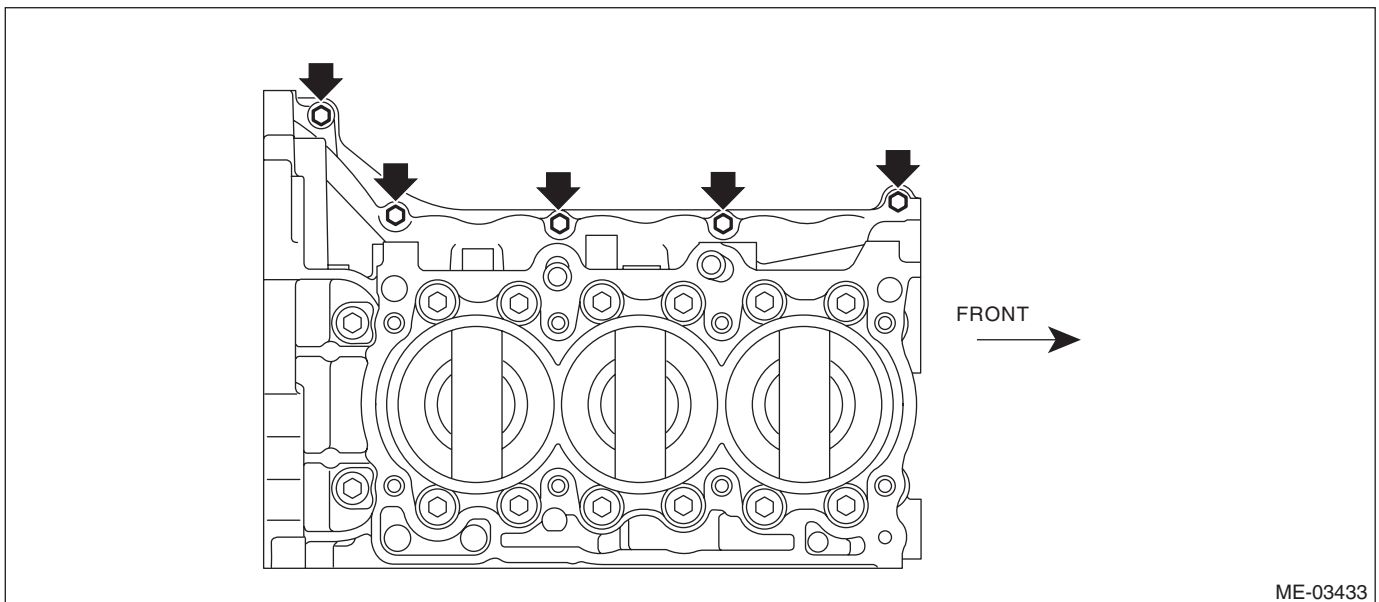
9) Install the upper bolt to cylinder block.

Tightening torque:

25 N·m (2.5 kgf-m, 18 ft-lb)

NOTE:

After tightening the cylinder block connecting bolts, remove the liquid gasket which is running over to the sealing surface for chain cover and oil pan upper.



Cylinder Block

MECHANICAL

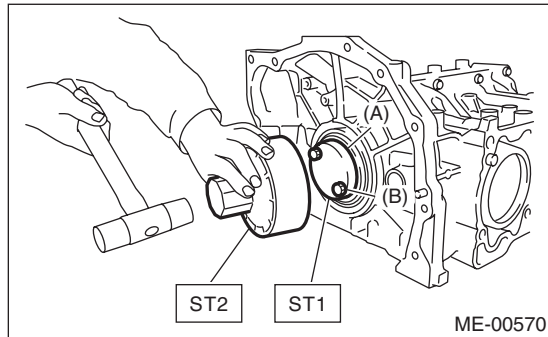
10) Apply a coat of engine oil to the oil seal periphery, then install the rear oil seal using ST1 and ST2.

NOTE:

Use new rear oil seal.

ST1 499597100 CRANKSHAFT OIL SEAL GUIDE

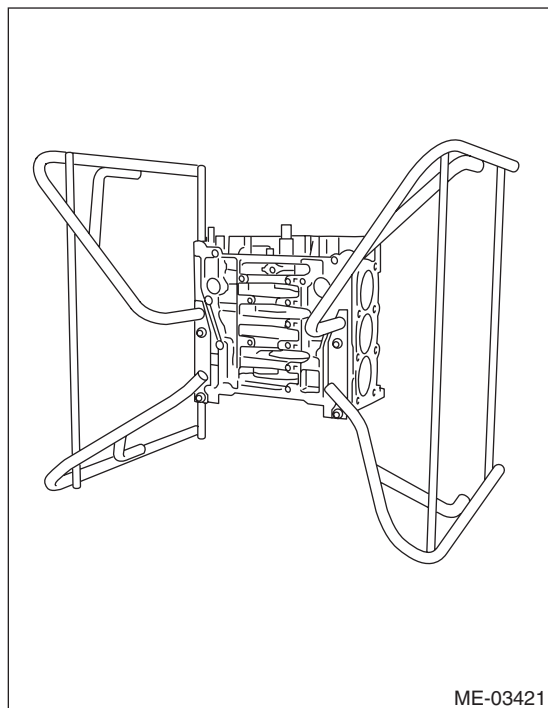
ST2 499587200 CRANKSHAFT OIL SEAL INSTALLER



(A) Rear oil seal

(B) Drive plate installation bolt

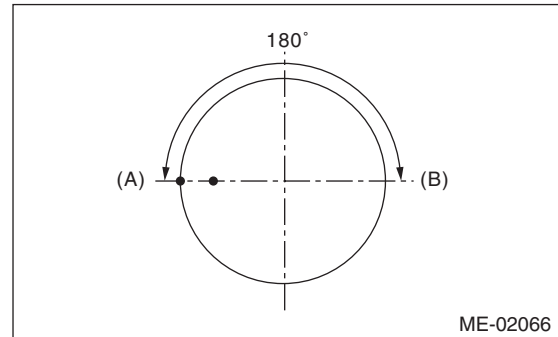
11) Set the engine with front side facing upward.



12) Install the piston ring and oil ring to the piston.

(1) Position the top ring gap at (A) in the figure.

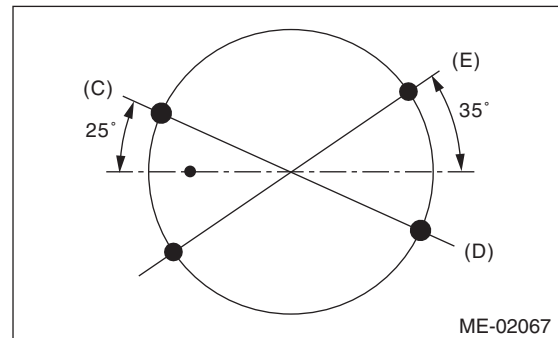
(2) Position the second ring gap at (B).



(3) Position the upper rail gap at (C) in the figure.

(4) Position the expander gap at (D) in the figure.

(5) Position the lower rail gap at (E) in the figure.



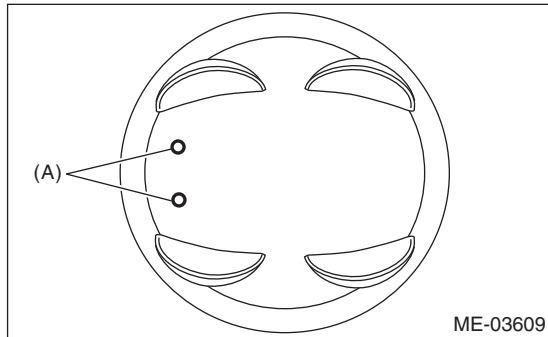
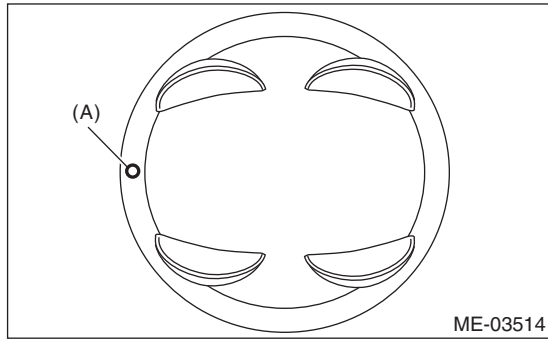
CAUTION:

- Make sure ring gaps do not face the same direction.
- Make sure ring gaps are not within the piston skirt area.
- Assemble it so that R mark faces to top side of piston.

13) Install the # 1 piston and connecting rod on the cylinder block.

(1) Apply engine oil to the periphery of piston and cylinder block inner surface.

- (2) Set the piston in the ST with the front mark (A) facing the front of engine.



- (3) Using the ST, press-fit the piston into cylinder block.

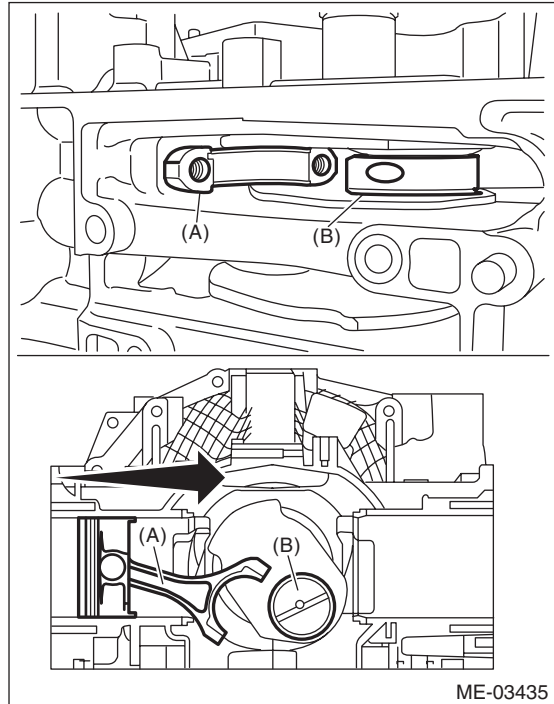
NOTE:

Follow the notes below while inserting the piston into the cylinder block.

- Insert the piston while tapping the top of piston using a plastic hammer handle.
- Insert the piston so that the connecting rod large end does not scratch the cylinder liner.

- Insert the piston so that the connecting rod large end does not touche the crankshaft.

ST 398744300 PISTON GUIDE



(A) # 1 connecting rod

(B) Crank pin

- (4) Turn the crankshaft using ST, to align the crank pin and the connecting rod large end position.

ST 18252AA000 CRANKSHAFT SOCKET

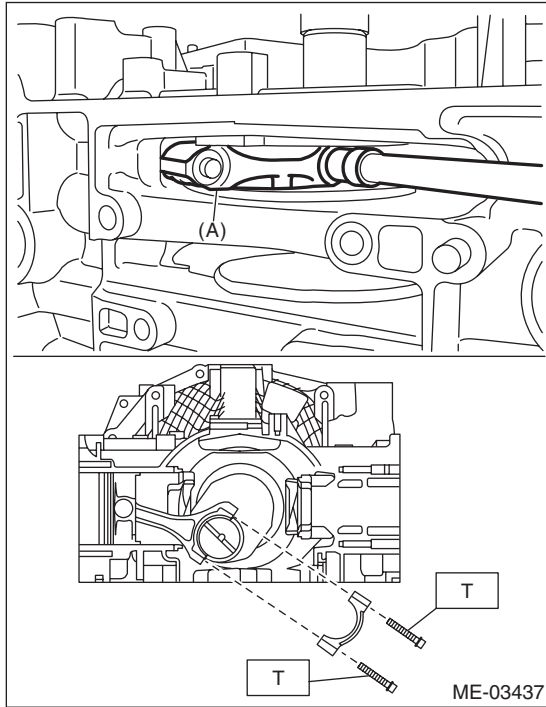
Cylinder Block

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(5) Install the connecting rod cap.

Tightening torque:

60 N·m (6.1 kgf-m, 44.3 ft-lb)



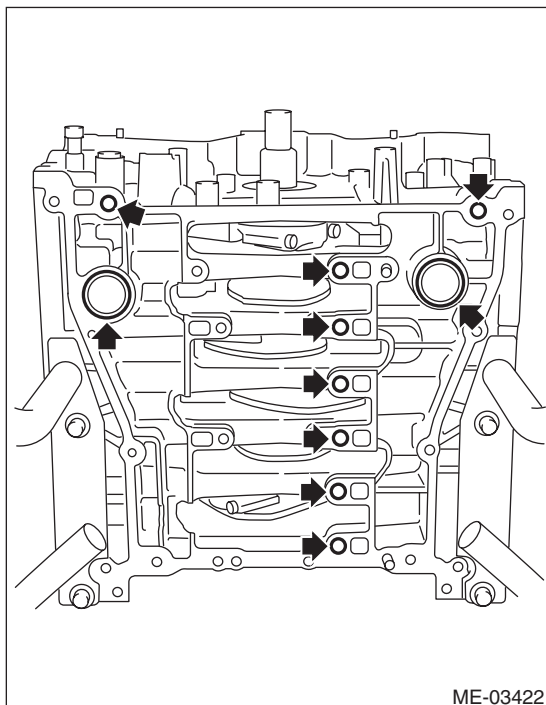
(A) # 1 connecting rod

14) In the same procedure as #1 piston, install the pistons and connecting rods to the cylinder block in the order of #2, #3, #4, #5, #6.

15) Install the O-ring under the cylinder block.

NOTE:

Use new O-rings.



16) Apply liquid gasket to the mating surface of oil pan upper.

NOTE:

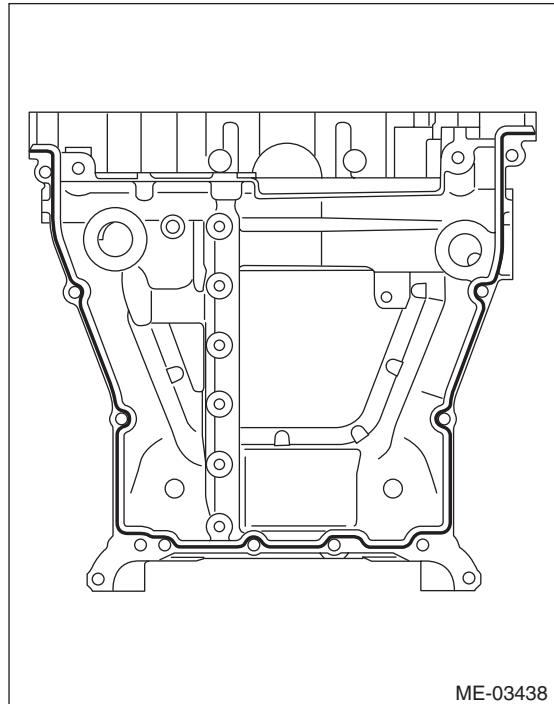
Install within 5 min. after applying liquid gasket.

Liquid gasket:

**THREE BOND 1217G (Part No. K0877Y0100)
or equivalent**

Applying liquid gasket diameter:

5.0±1.0 mm (0.20±0.04 in)

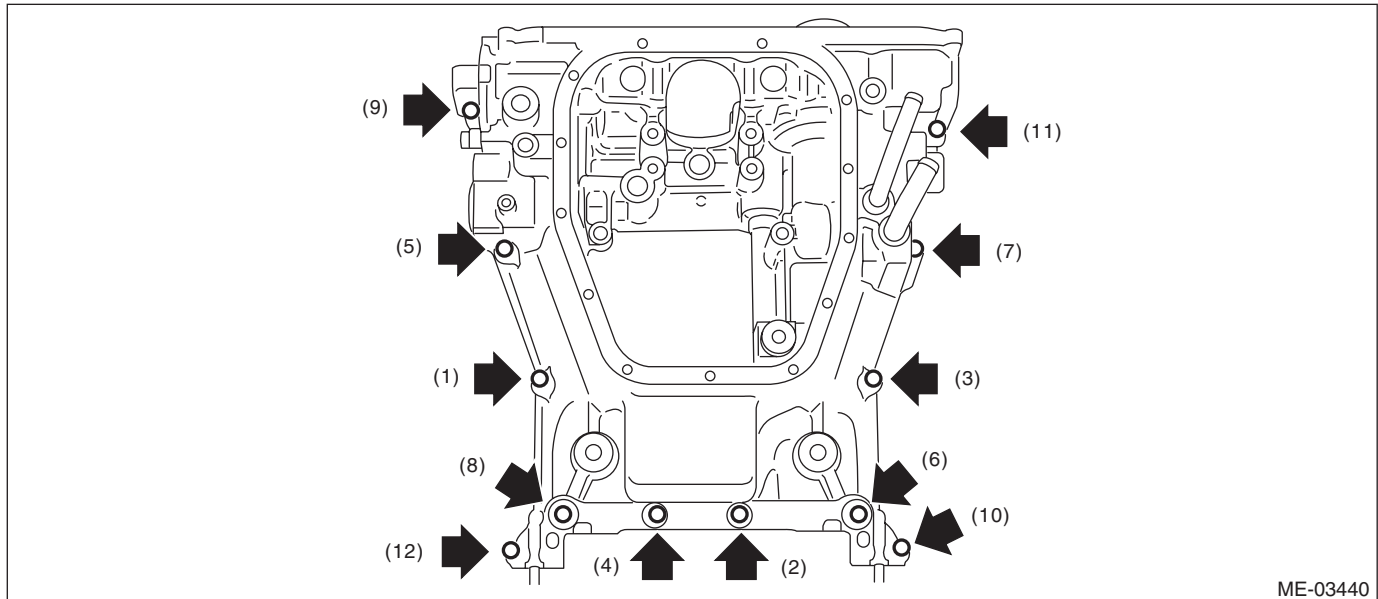


17) Temporarily tighten the oil pan upper.

18) Tighten the oil pan upper installing bolts in the numerical order as shown in the figure.

Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)



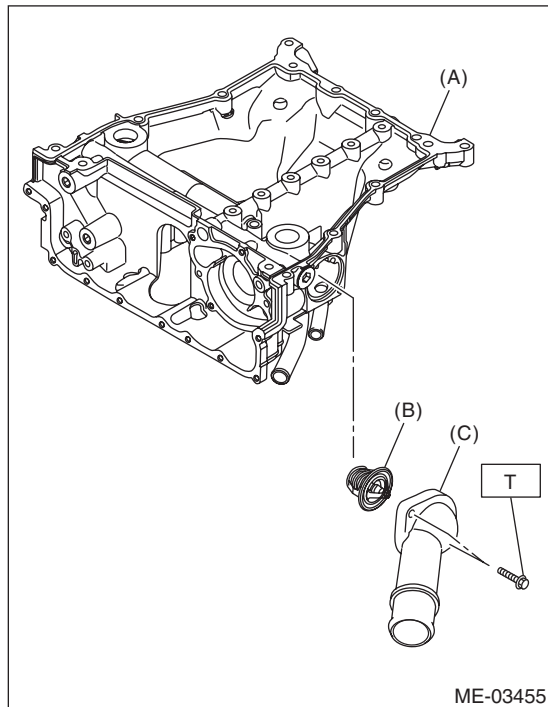
ME-03440

19) Install the oil pump. <Ref. to LU(H6DO)-11, INSTALLATION, Oil Pump.>

20) Install the thermostat and thermostat cover.

Tightening torque:

6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



ME-03455

- (A) Oil pan upper
- (B) Thermostat
- (C) Thermostat cover

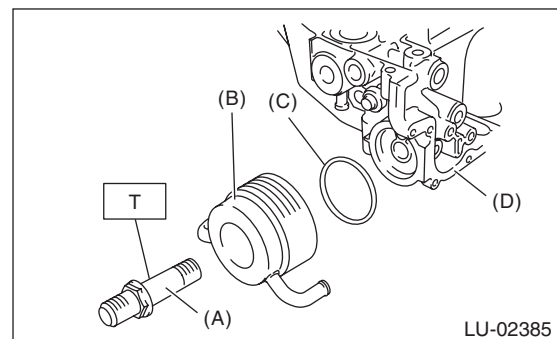
21) Install the oil cooler to oil pan upper by tightening the oil cooler connector.

Tightening torque:

54 N·m (5.5 kgf-m, 39.8 ft-lb)

NOTE:

Use new O-rings.



LU-02385

- (A) Oil cooler connector
- (B) Oil cooler
- (C) O-ring
- (D) Oil pan upper

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22) Apply liquid gasket to the matching surface of oil pan lower.

NOTE:

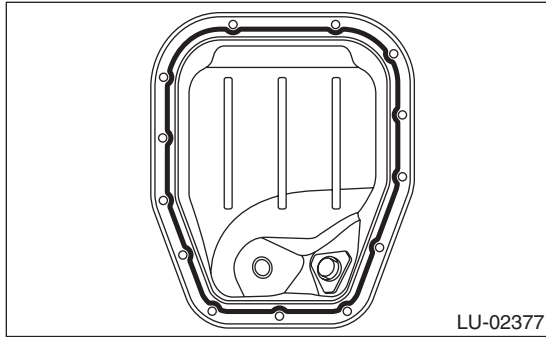
Install within 5 min. after applying liquid gasket.

Liquid gasket:

**THREE BOND 1217G (Part No. K0877Y0100)
or equivalent**

Applying liquid gasket diameter:

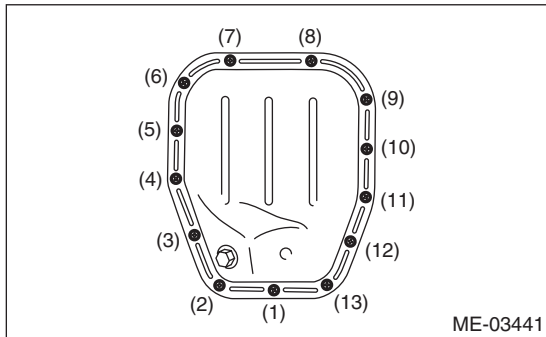
5.0 ± 1.0 mm (0.20 ± 0.04 in)



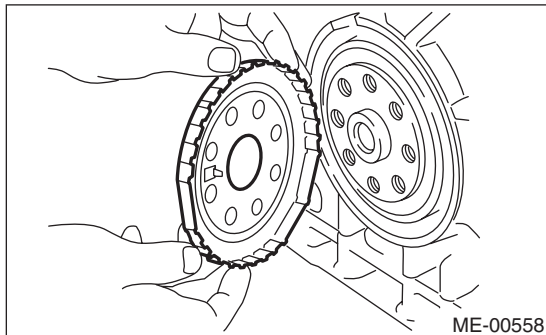
23) Tighten the oil pan lower installing bolts in the numerical order as shown in the figure.

Tightening torque:

6.4 N·m (0.7 kgf·m, 4.7 ft·lb)



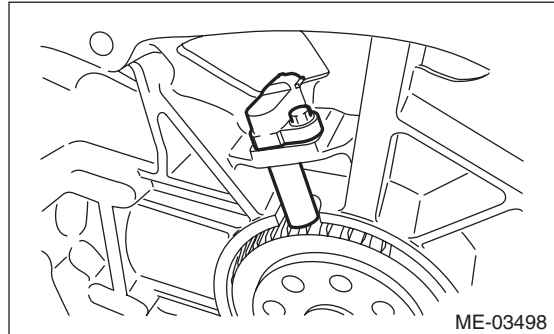
24) Install the crankshaft position sensor plate.



25) Install the crankshaft position sensor.

Tightening torque:

6.4 N·m (0.7 kgf·m, 4.7 ft·lb)

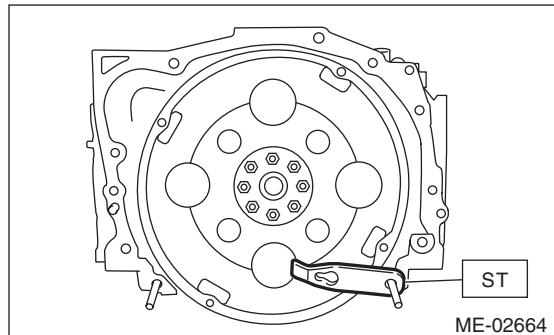


26) Using the ST, install the drive plate.

ST 498497100 CRANKSHAFT STOPPER

Tightening torque:

90 N·m (9.2 kgf·m, 66.4 ft·lb)



27) Install the cylinder head. <Ref. to ME(H6DO)-84, INSTALLATION, Cylinder Head.>

28) Install the camshaft. <Ref. to ME(H6DO)-77, INSTALLATION, Camshaft.>

29) Install the crank sprocket. <Ref. to ME(H6DO)-74, INSTALLATION, Crank Sprocket.>

30) Install the cam sprocket. <Ref. to ME(H6DO)-73, INSTALLATION, Cam Sprocket.>

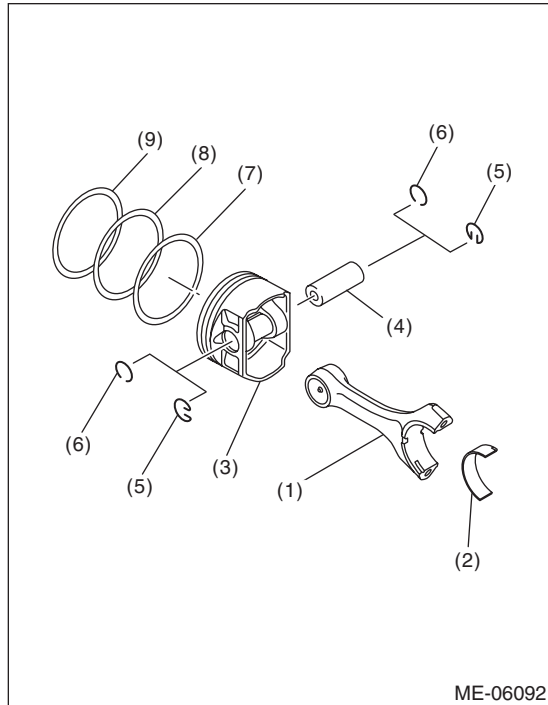
31) Install the timing chain assembly. <Ref. to ME(H6DO)-60, INSTALLATION, Timing Chain Assembly.>

32) Install the chain cover. <Ref. to ME(H6DO)-49, INSTALLATION, Chain Cover.>

33) Install the crank pulley. <Ref. to ME(H6DO)-47, INSTALLATION, Crank Pulley.>

34) Install the engine unit to vehicle. <Ref. to ME(H6DO)-40, INSTALLATION, Engine Assembly.>

C: DISASSEMBLY



- (1) Connecting rod
- (2) Connecting rod bearing
- (3) Piston
- (4) Piston pin
- (5) Snap ring
- (6) Circlip
- (7) Oil ring
- (8) Second ring
- (9) Top ring

NOTE:

To prevent confusion of various parts, mark each part.

- 1) Remove the connecting rod bearing.
- 2) Remove the piston rings using piston ring expander.
- 3) Remove the oil ring by hand.

NOTE:

Arrange the removed piston rings in proper order, to prevent confusion.

- 4) Remove the snap ring on one end from the piston using a snap ring pliers. (Snap ring type)
- 5) Remove the circlip on one end from the piston using a flat tip screwdriver. (Circlip type)

NOTE:

Be careful not to damage the piston, by wrapping the tip of flat tip screwdriver with tape.

- 6) Remove the piston pin from the piston.
- 7) Separate the piston and connecting rod.

NOTE:

Mark the direction of front side to each connecting rod.

- 8) Remove the snap ring on other end from the piston using a snap ring pliers. (Snap ring type)

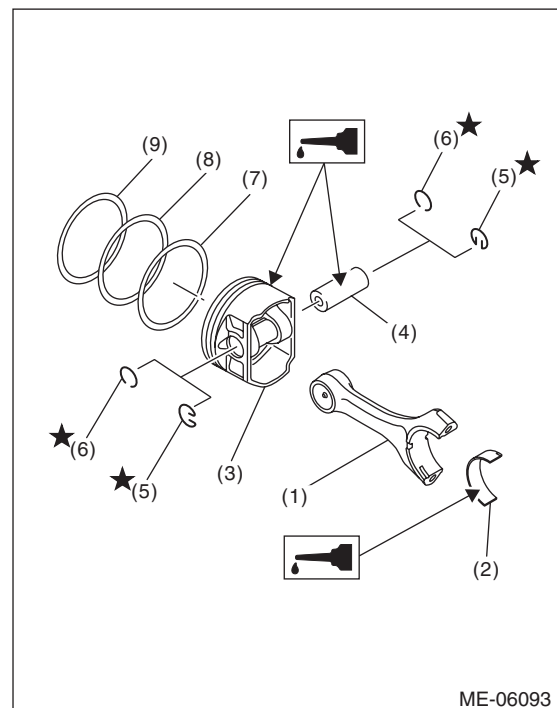
- 9) Remove the circlip on other end from the piston using a flat tip screwdriver. (Circlip type)

NOTE:

Be careful not to damage the piston, by wrapping the tip of flat tip screwdriver with tape.

- 10) Remove the plug and orifice from the cylinder block as necessary. <Ref. to ME(H6DO)-12, CYLINDER BLOCK, COMPONENT, General Description.>

D: ASSEMBLY



- (1) Connecting rod
- (2) Connecting rod bearing
- (3) Piston
- (4) Piston pin
- (5) Snap ring
- (6) Circlip
- (7) Oil ring
- (8) Second ring
- (9) Top ring

- 1) Apply engine oil to the surface of the connecting rod bearing. Attach the connecting rod bearing to the connecting rod.

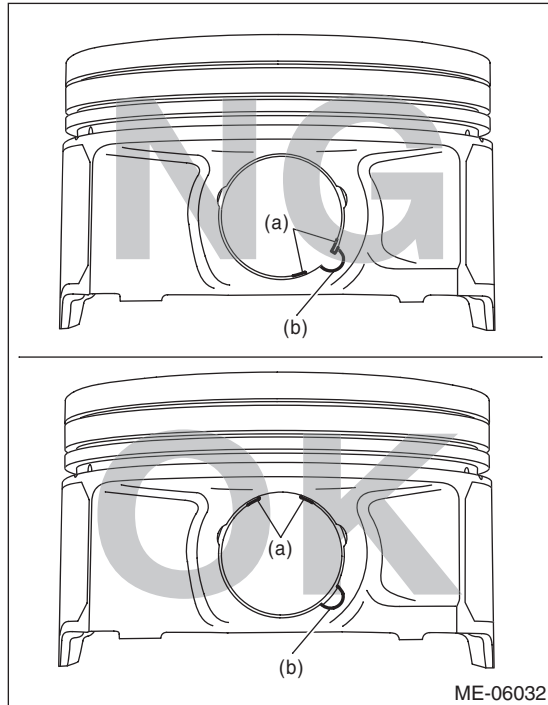
- 2) Install the circlip on one end of the piston using a flat tip screwdriver. (Circlip type)

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NOTE:

- Be careful not to damage the piston, by wrapping the tip of flat tip screwdriver with tape.
- Make sure the circlip is firmly inserted into the circlip groove.
- After installing the circlip, rotate the circlip so that its end part (a) and the cutout portion of circlip groove (b) do not match.



3) Install the snap ring on one end of the piston using a snap ring pliers. (Snap ring type)

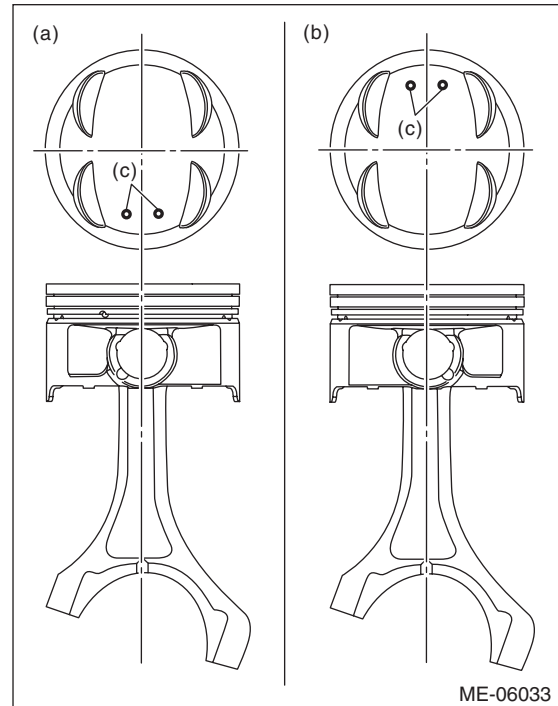
NOTE:

Make sure the snap ring is firmly inserted into the snap ring groove.

4) Set the piston to the connecting rod.

NOTE:

Align the front mark of piston and the connecting rod direction correctly as shown in the figure.



(a) RH side (#1, #3 and #5)

(b) LH side (#2, #4 and #6)

(c) Front mark

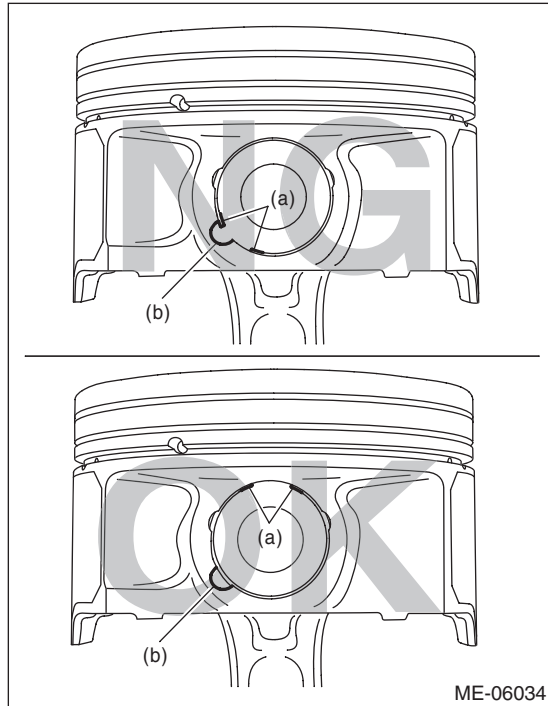
5) Apply engine oil to the piston pin, and attach the piston pin.

6) Install the circlip on the piston using a flat tip screwdriver. (Circlip type)

NOTE:

- Be careful not to damage the piston and piston pin, by wrapping the tip of flat tip screwdriver with tape.
- Make sure the circlip is firmly inserted into the circlip groove.

- After installing the circlip, rotate the circlip so that its end part (a) and the cutout portion of circlip groove (b) do not match.



- 7) Install the snap ring on the piston using a snap ring pliers. (Snap ring type)

NOTE:

Make sure the snap ring is firmly inserted into the snap ring groove.

- 8) Install the oil ring upper rail, expander and lower rail by hand.

- 9) Install the second ring and top ring using piston ring expander.

- 10) Install the plug and orifice to the cylinder block as necessary. <Ref. to ME(H6DO)-12, CYLINDER BLOCK, COMPONENT, General Description.>

E: INSPECTION

1. CYLINDER BLOCK

- 1) Visually check for cracks and damage. Especially, inspect the important parts using liquid penetrant tester.
- 2) Check the oil passages for clogging.
- 3) Inspect the cylinder block surface that mates with cylinder head for warping by using a straight edge. If the warpage exceeds limit, replace the cylinder block.

Surface warpage limit:

0.02 mm (0.0008 in)

Standard height of cylinder block:

202 mm (7.95 in)

2. CYLINDER AND PISTON

- 1) The cylinder bore size is stamped on the front upper face of the cylinder block.

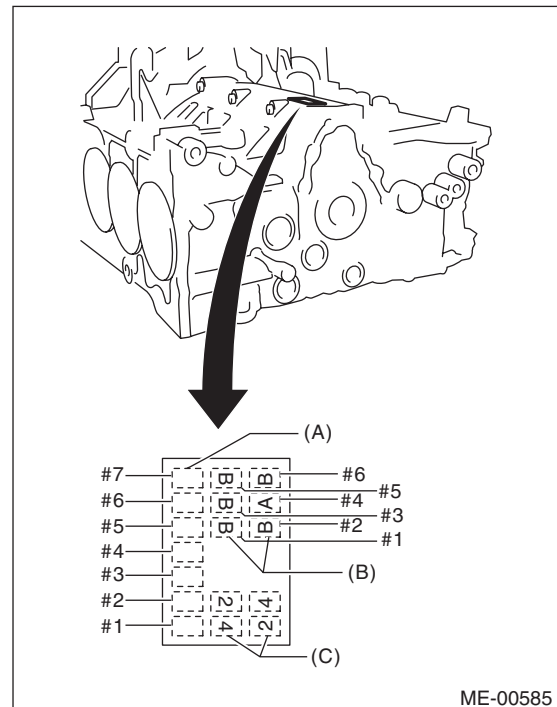
NOTE:

- Measurement should be performed at a temperature of 20°C (68°F).
- Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as guide lines in selecting a standard piston.

Standard diameter:

A: 92.005 — 92.015 mm (3.6222 — 3.6226 in)

B: 91.995 — 92.005 mm (3.6218 — 3.6222 in)



(A) Main journal size mark

(B) Cylinder bore size mark

(C) Cylinder block (RH) – (LH) combination mark

Cylinder Block

MECHANICAL

2) How to measure the inner diameter of each cylinder:

Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights as shown in the figure, using a cylinder bore gauge.

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Cylindricity:

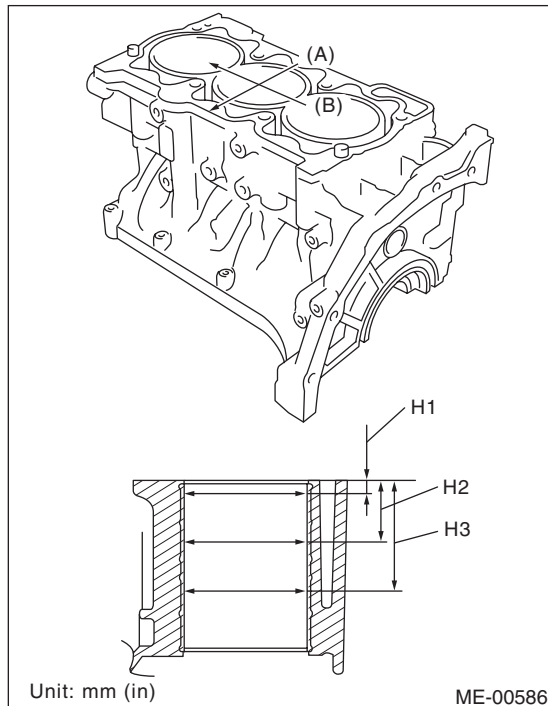
Standard:

0.030 mm (0.0012 in)

Out-of-roundness:

Standard:

0.010 mm (0.0004 in)



(A) Thrust direction

(B) Piston pin direction

H1: 10 mm (0.39 in)

H2: 45 mm (1.77 in)

H3: 80 mm (3.15 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston:

Measure the outer diameter of each piston at the height as shown in the figure. (Thrust direction)

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:

37.3 mm (1.4685 in)

Piston outer diameter:

Standard:

A: 92.005 — 92.015 mm

(3.6222 — 3.6226 in)

B: 91.995 — 92.005 mm

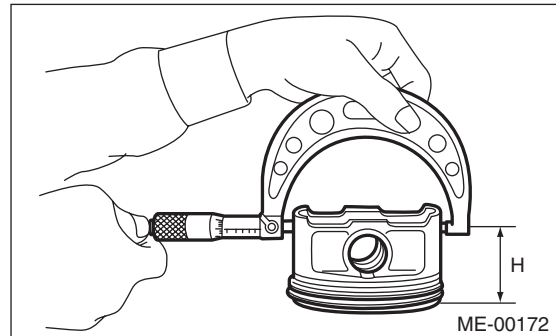
(3.6218 — 3.6222 in)

0.25 mm (0.0098 in) oversize:

92.245 — 92.265 mm (3.6317 — 3.6325 in)

0.50 mm (0.0197 in) oversize:

92.495 — 92.515 mm (3.6415 — 3.6423 in)



5) Calculate the clearance between cylinder and piston.

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):

Standard:

-0.010 — 0.010 mm (-0.00039 — 0.00039 in)

6) Boring and honing:

(1) If the value of cylindricity, out-of-roundness, or cylinder-to-piston clearance measured is out of standard or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

CAUTION:

- When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons.
- Do not perform boring on one cylinder only. Nor use an oversize piston for one cylinder only.

- (2) If the cylinder inner diameter exceeds 92.515 mm (3.6317 in) after boring and honing, replace the cylinder block.

NOTE:

Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

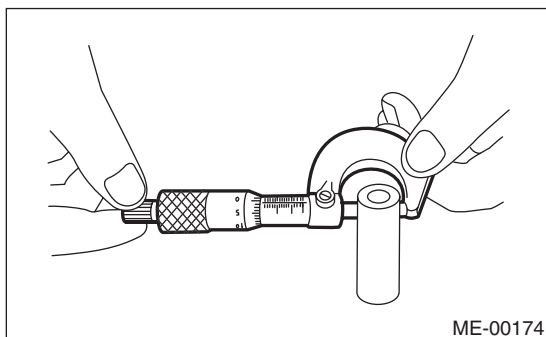
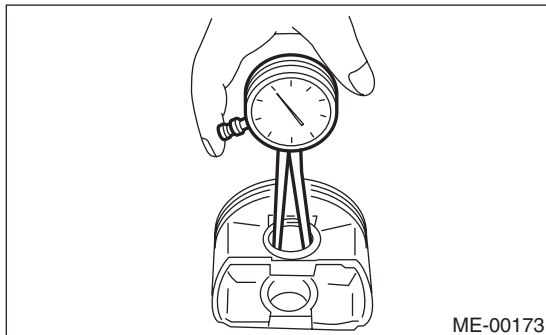
3. PISTON AND PISTON PIN

- 1) Check the pistons and piston pins for damage, cracks and wear, and the piston ring grooves for wear and damage. Replace if faulty.
- 2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H6DO)-111, CYLINDER AND PISTON, INSPECTION, Cylinder Block.>If any of the clearances is not within standard, replace the piston, or bore the cylinder to use an oversize piston.
- 3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if faulty.

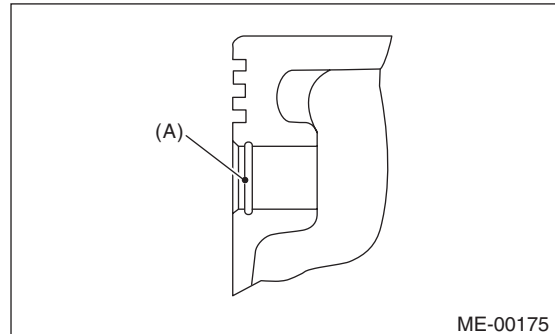
Standard clearance between piston pin and hole in piston:

Standard:

0.004 — 0.008 mm (0.0002 — 0.0003 in)



- 4) Check the snap ring installation groove (A) on the piston for burr. If necessary, remove burr from the groove so that the piston pin can lightly move.



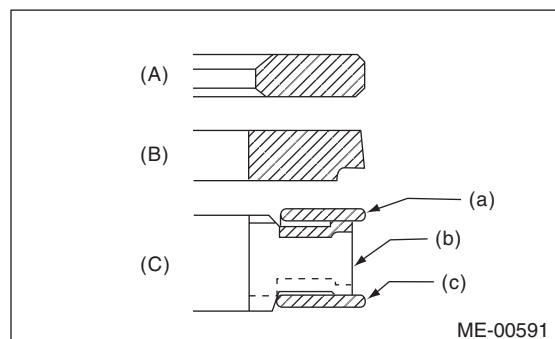
- 5) Check the piston pin snap ring for distortion, cracks and wear.

4. PISTON RING

- 1) If the piston ring is broken, damaged or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new part of the same size as piston.

CAUTION:

- Marks are displayed on the end of top and second rings. When installing the ring to piston, face this mark upward.
- Oil ring consists of the upper rail, expander and lower rail. When installing on the piston, be careful of the direction of each rail



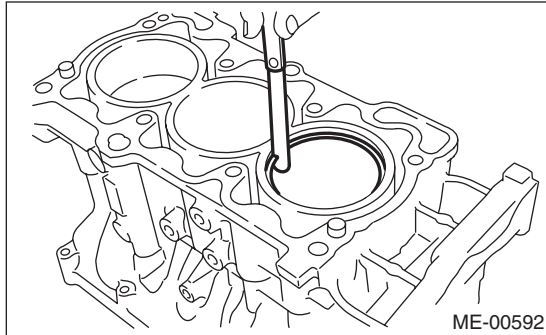
- (A) Top ring
- (B) Second ring
- (C) Oil ring
- (a) Upper rail
- (b) Expander
- (c) Lower rail

Cylinder Block

MECHANICAL

2) Squarely place the piston ring and oil ring in cylinder, and measure the piston ring gap with a thickness gauge.

		Standard mm (in)
Piston ring gap	Top ring	0.20 — 0.35 (0.0079 — 0.0138)
	Second ring	0.40 — 0.50 (0.0157 — 0.0197)
	Oil ring	0.20 — 0.50 (0.0079 — 0.0197)

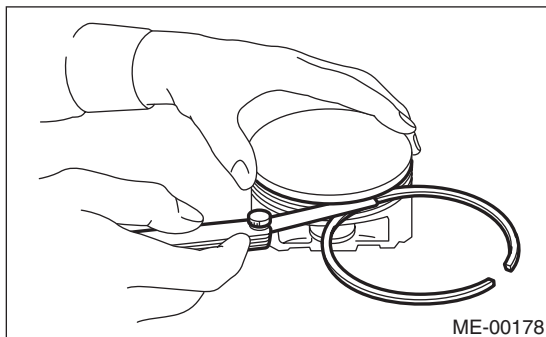


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:

Before measuring the clearance, clean the piston ring groove and piston ring.

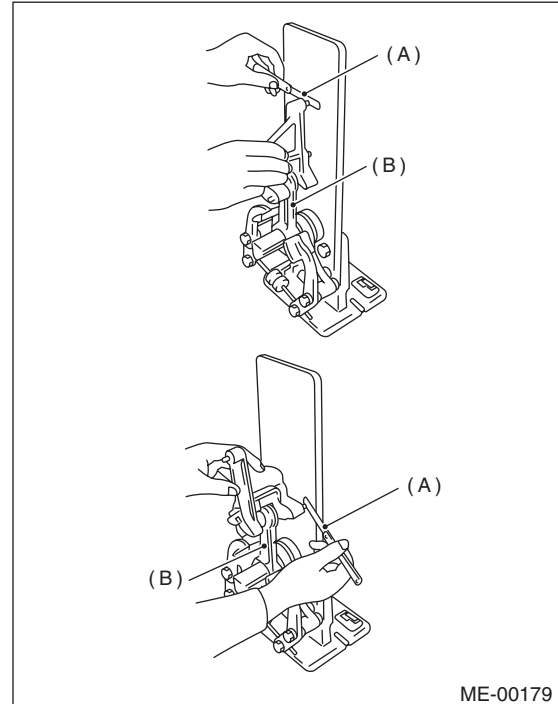
		Standard mm (in)
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)
Clearance between oil ring and oil ring groove		0.065 — 0.165 (0.0026 — 0.0065)



5. CONNECTING ROD

1) Replace the connecting rod, if the large or small end thrust surface is damaged.

2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if it has the bend or twist.



(A) Thickness gauge

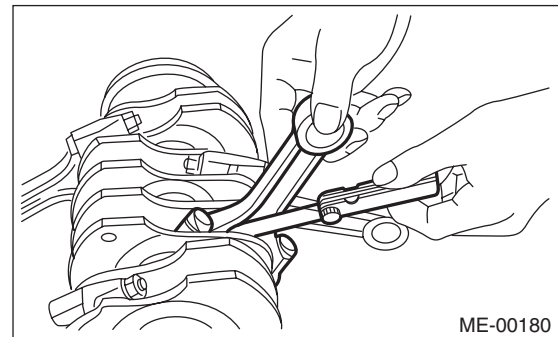
(B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft and measure the thrust clearance. If the clearance exceeds the standard or offset wear occurs, replace the connecting rod.

Connecting rod thrust clearance:

Standard:

0.070 — 0.330 mm (0.0028 — 0.0130 in)



4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

5) Measure the oil clearance on each connecting rod bearing using plastigauge. If any oil clearance is not within the standard, replace the defective bearing with a new part of standard size or under-size as necessary. (See the table below.)

Connecting rod oil clearance:

Standard:

0.016 — 0.043 mm (0.0006 — 0.0017 in)

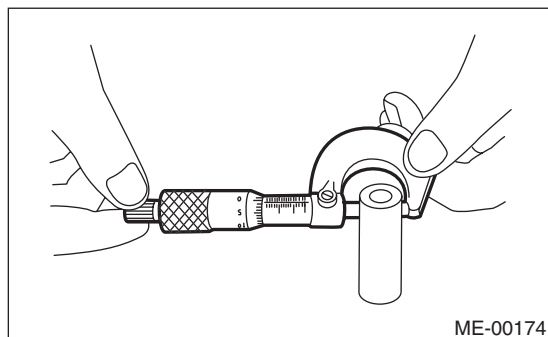
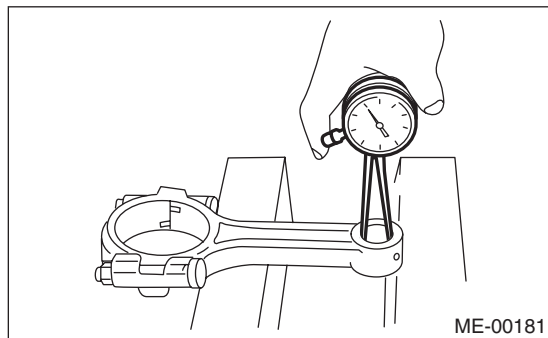
Unit: mm (in)		
Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.489 — 1.501 (0.0586 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.507 — 1.515 (0.0593 — 0.0596)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.517 — 1.525 (0.0597 — 0.0600)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.617 — 1.625 (0.0637 — 0.0640)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

Clearance between piston pin and bushing:

Standard:

0 — 0.022 mm (0 — 0.0009 in)

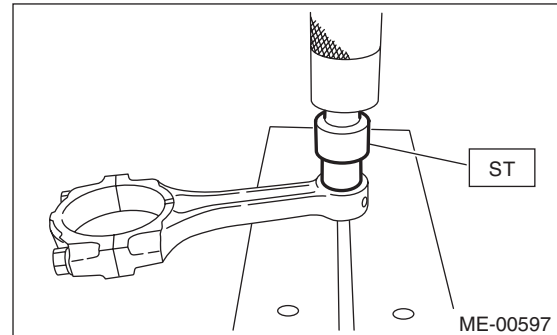


7) Replacement procedure is as follows.

(1) Remove the bushing from connecting rod with ST and press.

(2) Press the bushing with ST after applying oil on the periphery of the new bushing.

ST 18350AA000 CONNECTING ROD
BUSHING REMOVER AND
INSTALLER



(3) Make two 3 mm (0.12 in) holes in the pressed bushing by aligning with the pre-manufactured holes on the connecting rod. Ream the inside of bushing.

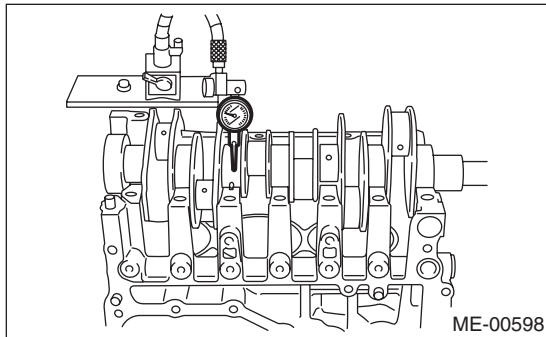
(4) After completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

- 1) Clean the crankshaft completely, and check it for cracks using liquid penetrant tester. Replace if defective.
- 2) Check the crankshaft for bend, and repair or replace if needed. Repair or replace if bended.

NOTE:

If a suitable V-block is not available, install #1 and #7 crankshaft bearing on cylinder block, position the crankshaft on these bearings, and then check the crankshaft bend using a dial gauge.



- 3) Inspect the crank journal and crank pin for wear. If they are not within the specification, replace the bearing with a suitable (undersize) one, and replace or readjust crankshaft as necessary. When grinding the crank journal or crank pin, finish them to the specified dimensions according to the undersize bearing to be used.

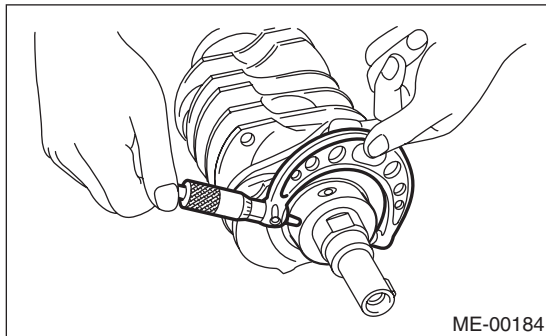
Crank pin and crank journal:

Out-of-roundness:

0.005 mm (0.0002 in)

Cylindricity:

0.006 mm (0.0002 in)



Cylinder Block

MECHANICAL

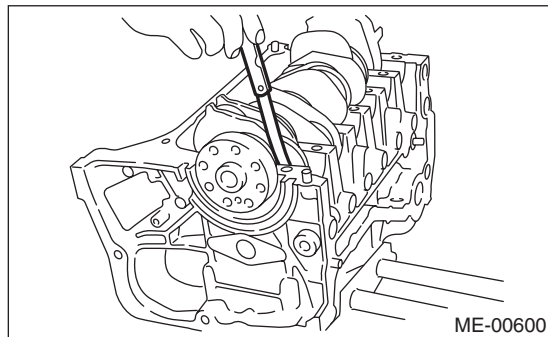
Unit: mm (in)					
		Crank journal diameter			Crank pin outer diameter
		#1, #3, #5	#7	#2, #4, #6	
Standard	Journal O.D.	63.992 — 64.008 (2.5194 — 2.5200)			51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	2.000 — 2.013 (0.0787 — 0.0793)	1.996 — 2.009 (0.0786 — 0.0791)	2.000 — 2.013 (0.0787 — 0.0793)	1.489 — 1.501 (0.0586 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	63.962 — 63.978 (2.5182 — 2.5188)			51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.011 — 2.014 (0.0792 — 0.0793)		2.015 — 2.018 (0.0793 — 0.0794)	1.507 — 1.515 (0.0593 — 0.0596)
0.05 (0.0020) undersize	Journal O.D.	63.942 — 63.958 (2.5174 — 2.5180)			51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.021 — 2.024 (0.0796 — 0.0797)		2.025 — 2.028 (0.0797 — 0.0798)	1.517 — 1.525 (0.0597 — 0.0600)
0.25 (0.0098) undersize	Journal O.D.	63.742 — 63.758 (2.5095 — 2.5102)			51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.121 — 2.124 (0.0835 — 0.0836)		2.125 — 2.128 (0.0837 — 0.0838)	1.617 — 1.625 (0.0637 — 0.0640)

4) Measure the thrust clearance of crankshaft at center bearing by using thickness gauge. If clearance exceeds the standard, replace the bearing.

Crankshaft thrust clearance:

Standard:

0.030 — 0.115 mm (0.0012 — 0.0045 in)



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting and wear.

6) Measure the oil clearance on each crankshaft bearing using plastigauge. If the measured value is out of standard, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

Crankshaft oil clearance:

Standard:

0.010 — 0.030 mm (0.0004 — 0.0012 in)