

CYLINDER BLOCK

MECHANICAL

21. Cylinder Block

A: REMOVAL

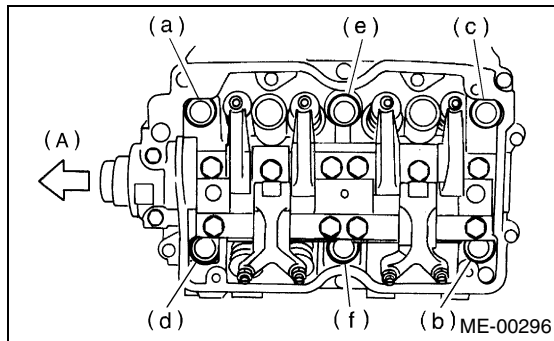
NOTE:

Before conducting this procedure, drain the engine oil completely if applicable .

- 1) Remove the intake manifold. <Ref. to FU(H4SO)-15, REMOVAL, Intake Manifold.>
- 2) Remove the V-belt. <Ref. to ME(H4SO)-42, REMOVAL, V-belt.>
- 3) Remove the crankshaft pulley. <Ref. to ME(H4SO)-44, REMOVAL, Crankshaft Pulley.>
- 4) Remove the timing belt cover. <Ref. to ME(H4SO)-45, REMOVAL, Timing Belt Cover.>
- 5) Remove the timing belt. <Ref. to ME(H4SO)-46, REMOVAL, Timing Belt.>
- 6) Remove the camshaft sprocket. <Ref. to ME(H4SO)-51, REMOVAL, Camshaft Sprocket.>
- 7) Remove the crankshaft sprocket. <Ref. to ME(H4SO)-44, REMOVAL, Crankshaft Pulley.>
- 8) Remove the generator and A/C compressor with their brackets.
- 9) Remove the rocker cover.
- 10) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

NOTE:

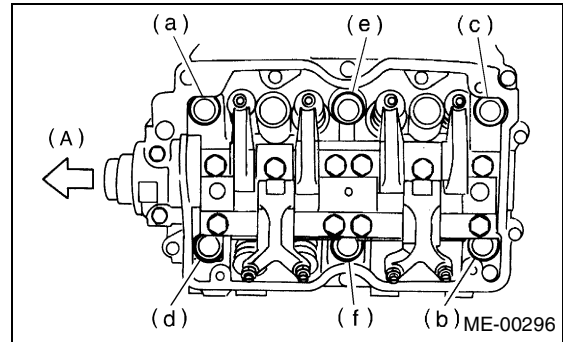
Leave bolts (a) and (c) engaged by three or four threads to prevent cylinder head from falling.



(A) Front

- 11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.

- 12) Remove bolts (a) and (c) to remove cylinder head.



(A) Front

- 13) Remove the cylinder head gasket.

NOTE:

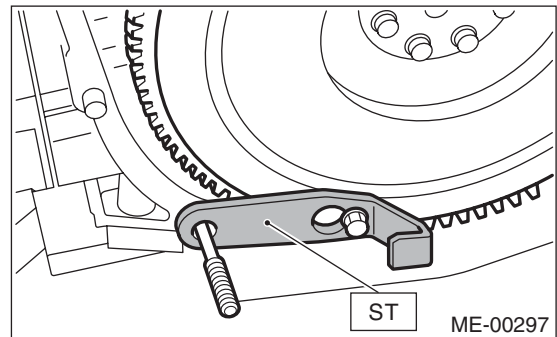
Do not scratch the mating surface of cylinder head and cylinder block.

- 14) Similarly, remove the right side cylinder head.
- 15) Remove the clutch housing cover. (MT vehicles)
- 16) Remove the flywheel (MT vehicles) or drive plate (AT vehicles).

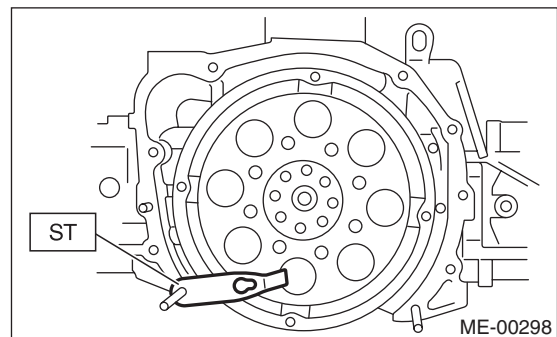
Using the ST, lock the crankshaft.

ST 498497100 CRANKSHAFT STOPPER

- MT model

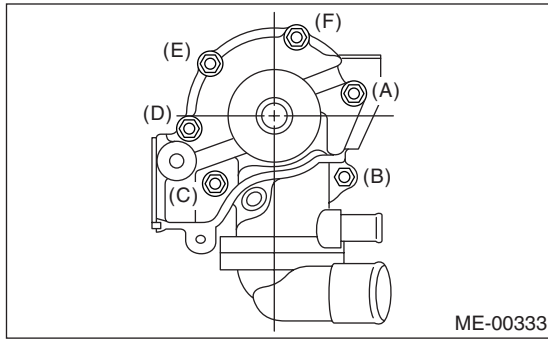


- AT model



- 17) Remove the oil separator cover.
- 18) Remove the water by-pass pipe for heater.

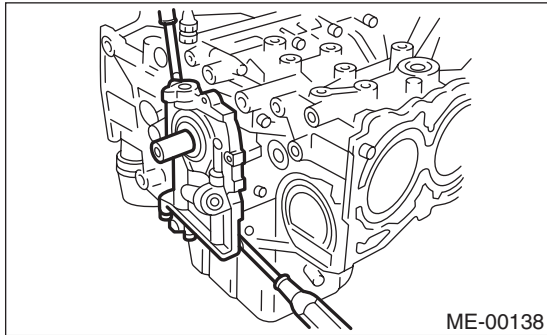
19) Loosen the bolts in alphabetical sequence as shown in the figure, and then remove water pump.



20) Remove the oil pump from cylinder block. Use a flat-bladed screwdriver as shown in the figure when removing oil pump.

NOTE:

Be careful not to scratch the mating surface of cylinder block and oil pump.

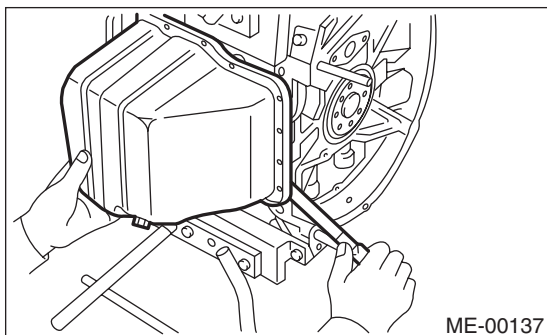


21) Removal of oil pan

- (1) Turn the cylinder block to face the #2 and #4 piston sides upward.
- (2) Remove the bolts which secure oil pan to cylinder block.
- (3) Insert a oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.

NOTE:

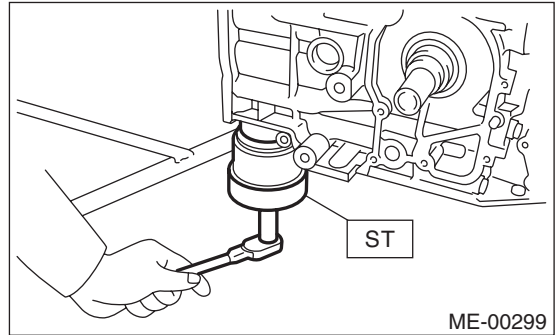
Do not use a screwdriver or similar tool in place of oil pan cutter.



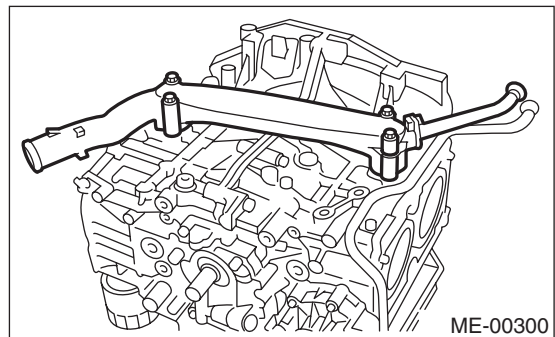
24) Remove the baffle plate.

25) Remove the oil filter with ST.

ST 498547000 OIL FILTER WRENCH



26) Remove the water pipe.

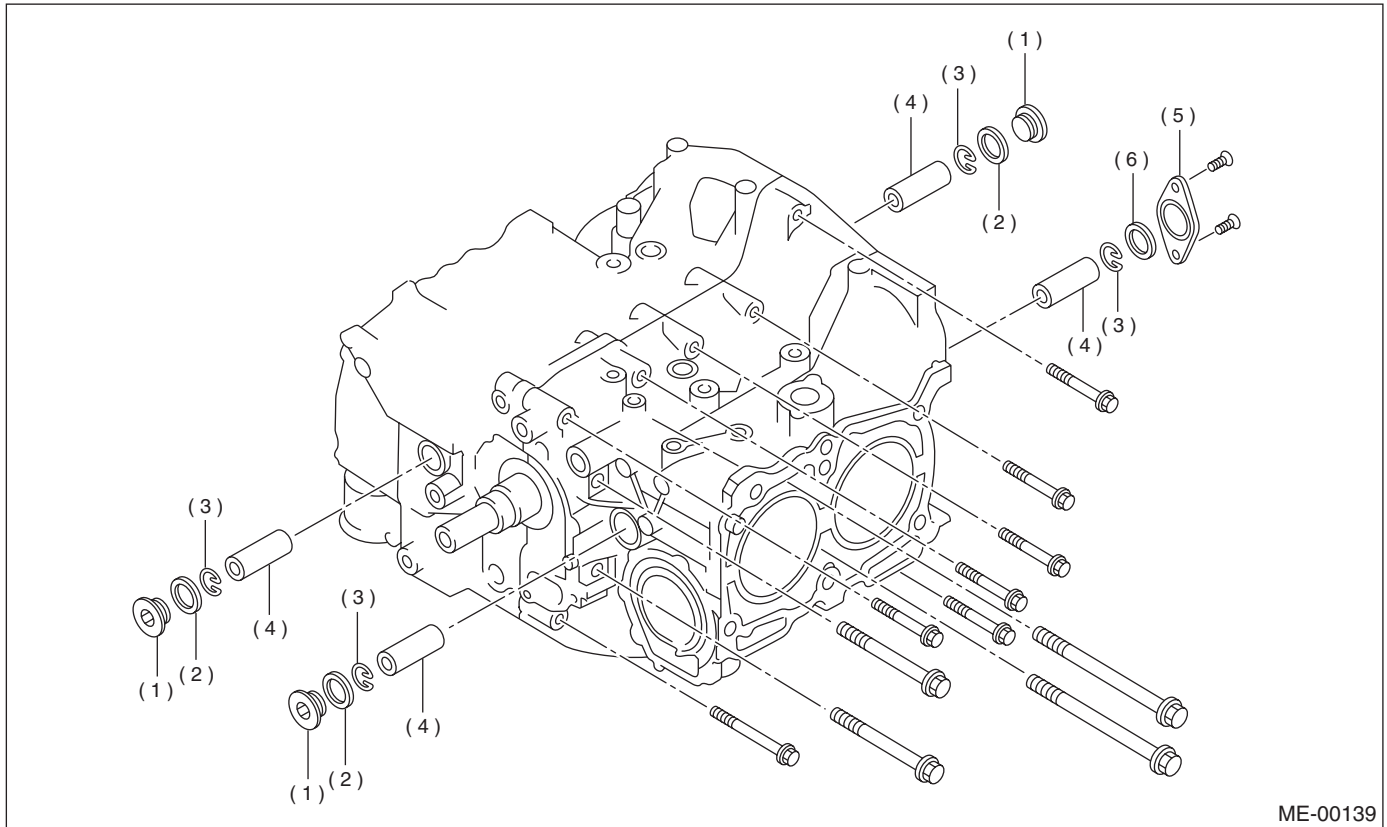


22) Remove the oil strainer stay.

23) Remove the oil strainer.

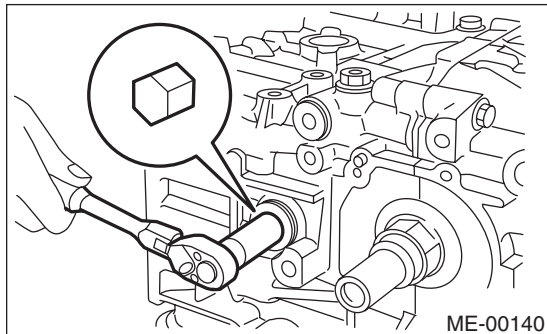
CYLINDER BLOCK

MECHANICAL



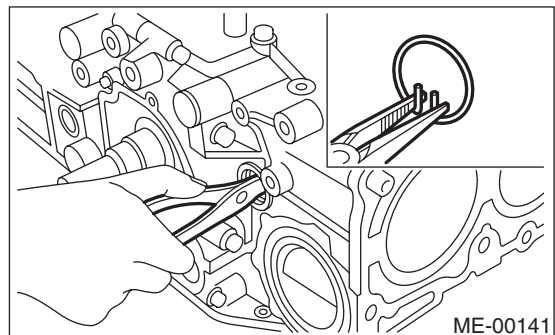
- | | | |
|-----------------------|----------------|------------------------|
| (1) Service hole plug | (3) Snap ring | (5) Service hole cover |
| (2) Gasket | (4) Piston pin | (6) O-ring |

27) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].



28) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston snap ring through service hole of #1 and #2 cylinders.

ST 499897200 PISTON SNAP RING PLIER



CYLINDER BLOCK

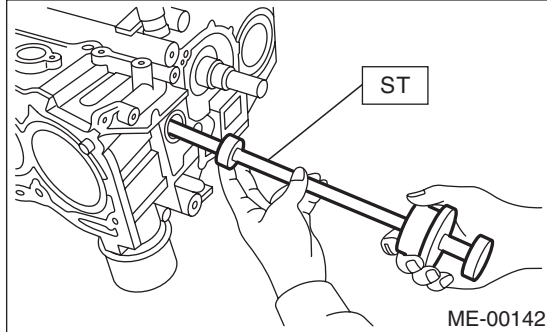
MECHANICAL

29) Draw out the piston pin from #1 and #2 pistons using ST.

ST 499097700 PISTON PIN REMOVER

NOTE:

Be careful not to confuse the original combination of piston, piston pin and cylinder.



30) Similarly remove the piston pins from #3 and #4 pistons.

31) Remove the bolts which connect cylinder block on the side of #2 and #4 cylinders.

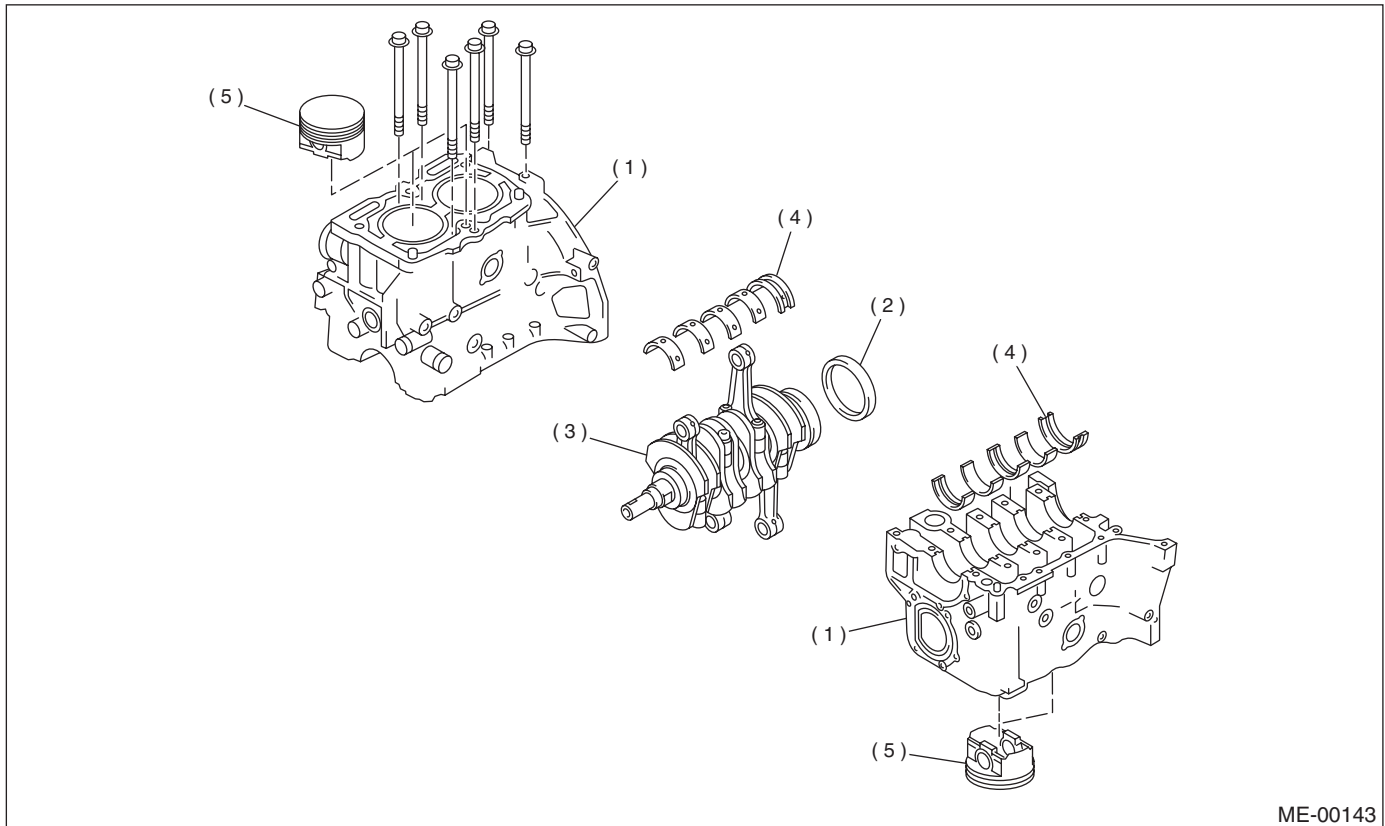
32) Back off the bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.

33) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, and then remove the cylinder block connecting bolts.

34) Separate the cylinder blocks (RH) and (LH).

NOTE:

When separating the cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



(1) Cylinder block

(2) Rear oil seal

(3) Crankshaft

(4) Crankshaft bearing

(5) Piston

35) Remove the rear oil seal.

36) Remove the crankshaft together with connecting rod.

37) Remove the crankshaft bearings from cylinder block using a hammer's handle.

NOTE:

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

38) Draw out each piston from cylinder block using a wooden bar or a hammer's handle.

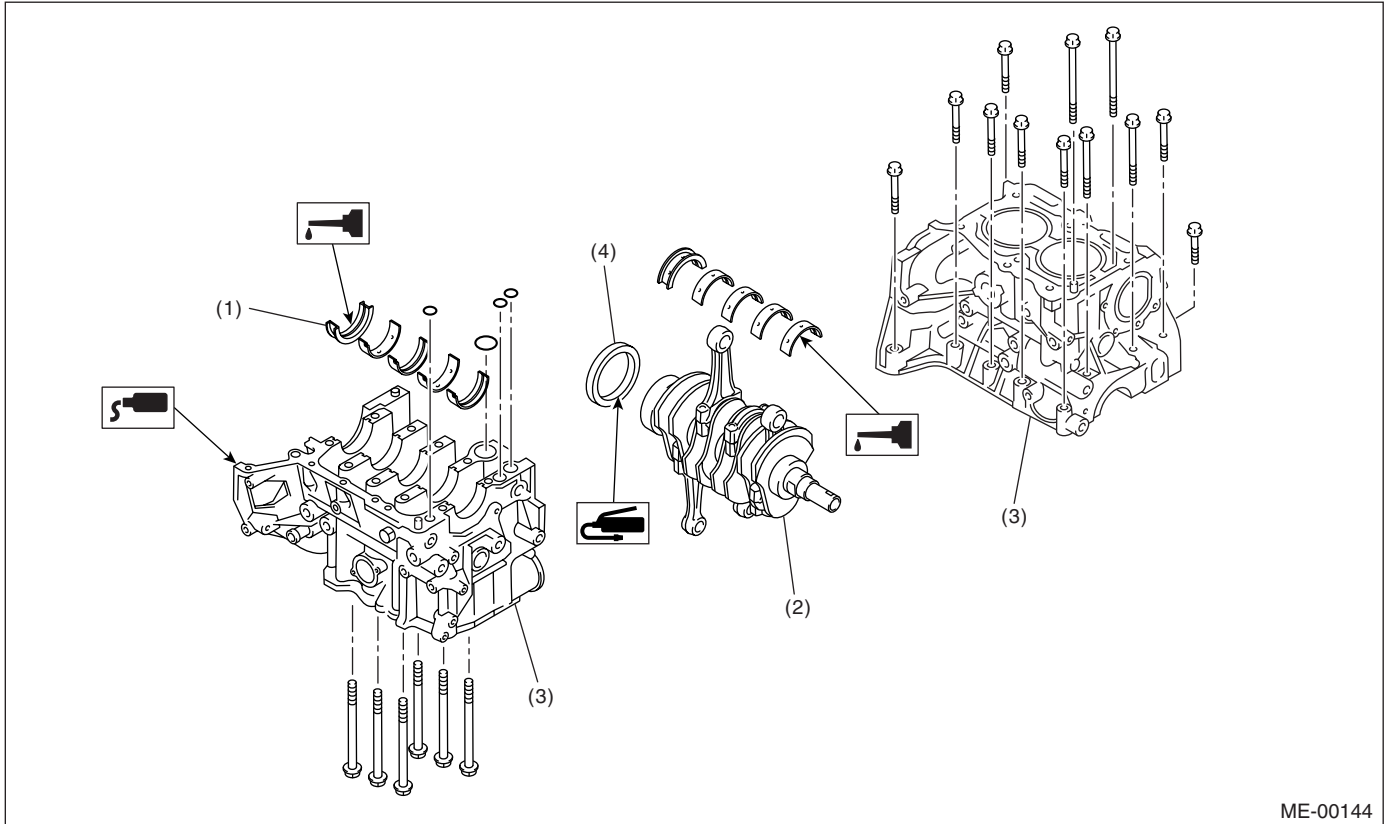
NOTE:

Do not confuse the combination of piston and cylinder.

CYLINDER BLOCK

MECHANICAL

B: INSTALLATION



ME-00144

- | | |
|------------------------|--------------------|
| (1) Crankshaft bearing | (3) Cylinder block |
| (2) Crankshaft | (4) Rear oil seal |

NOTE:

Remove oil from the mating surface of bearing and cylinder block before installation. Also apply a thin coat of engine oil to crankshaft pins.

1) Position the crankshaft on #2 and #4 cylinder block.

2) Apply liquid gasket to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

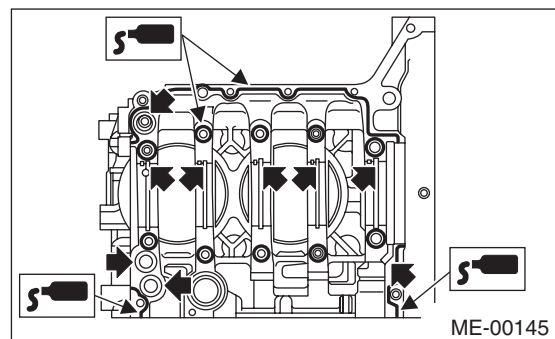
Liquid gasket:

Part No. 004403007

ThreeBond 1215 or equivalent

NOTE:

Do not allow liquid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.

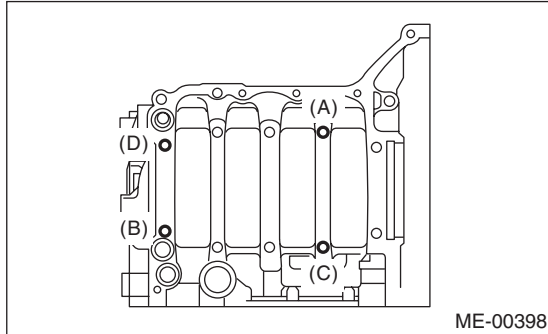


ME-00145

3) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

Tightening torque:

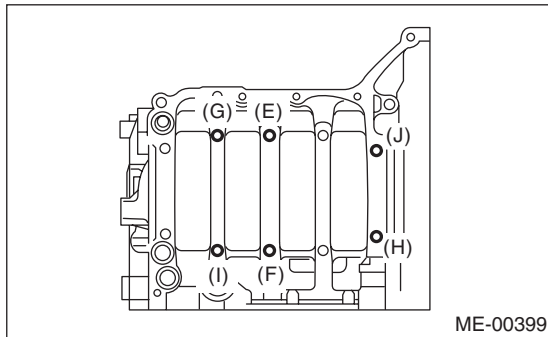
15 N·m (1.5 kgf-m, 11.1 ft-lb)



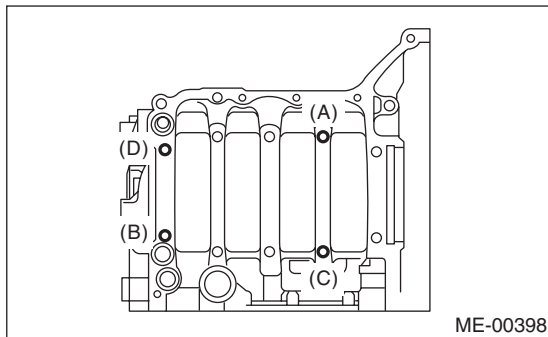
4) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

Tightening torque:

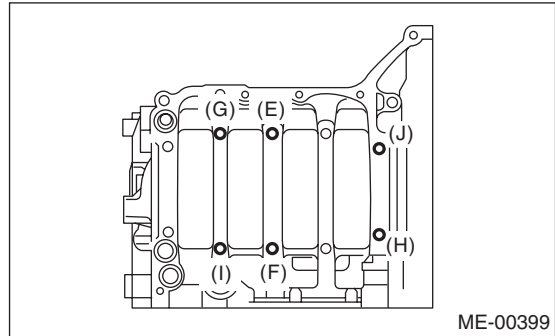
15 N·m (1.5 kgf-m, 11.1 ft-lb)



5) Further tighten LH side bolts (A) — (D) by 90° in alphabetical sequence.



6) Further tighten RH side bolts (E) — (J) by 90° in alphabetical sequence.

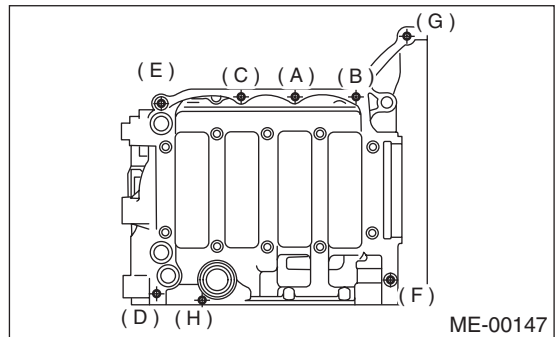


7) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:

(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)

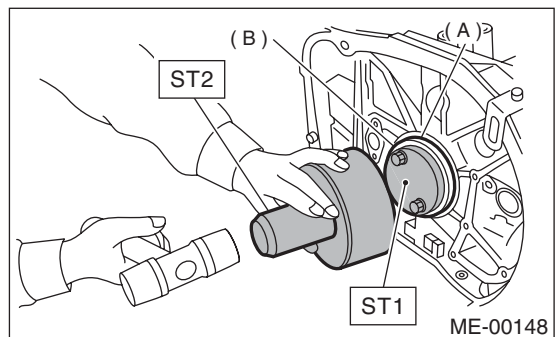
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



8) Install the rear oil seal using ST1 and ST2.

ST1 499597100 OIL SEAL GUIDE

ST2 499587200 OIL SEAL INSTALLER



(A) Rear oil seal

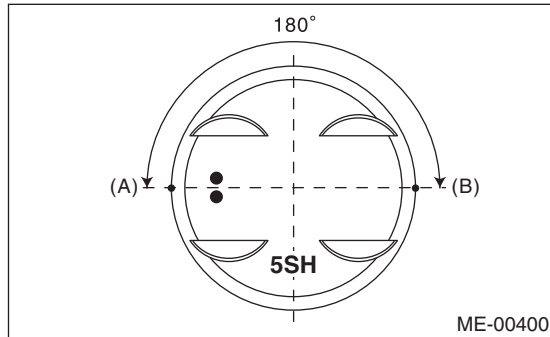
(B) Fly wheel attaching bolt

CYLINDER BLOCK

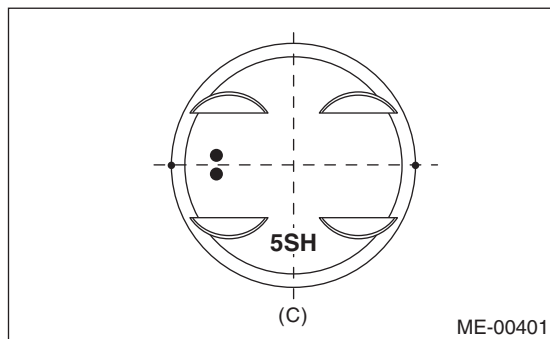
MECHANICAL

9) Position the top ring gap at (A) or (B) in the figure.

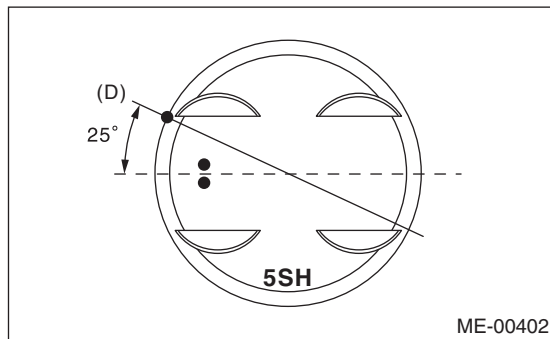
10) Position the second ring gap at 180° on the reverse side for top ring gap.



11) Position the expander gap at (C) in the figure.

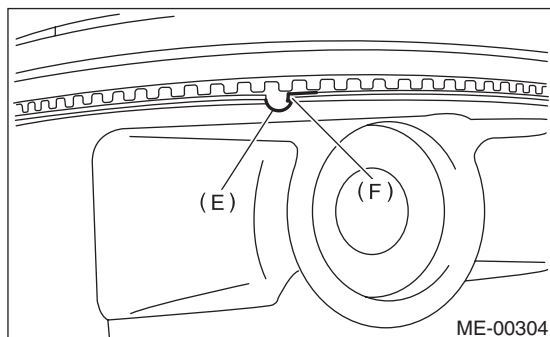


12) Position the lower rail gap at (D) in the figure.

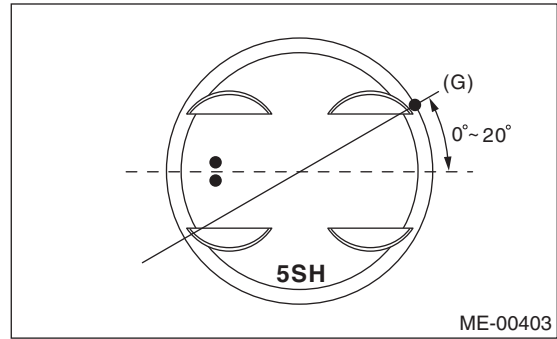


NOTE:

Align the lower rail stopper (F) to the lateral hole (E) on the piston.



13) Position the upper rail gap within (G) in the figure.



CAUTION:

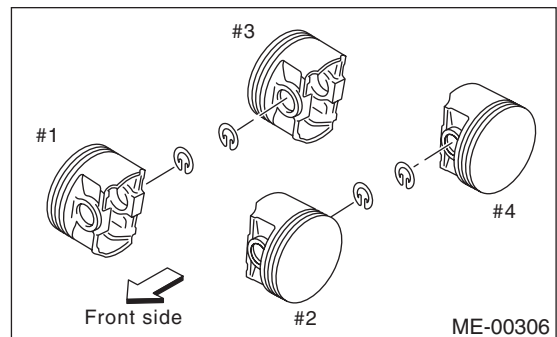
- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

14) Install snap ring.

Install snap rings in the piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

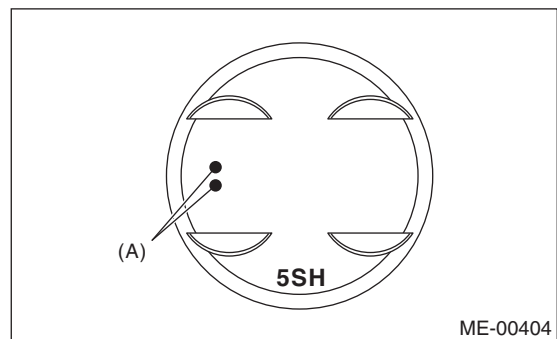
NOTE:

Use new snap rings.

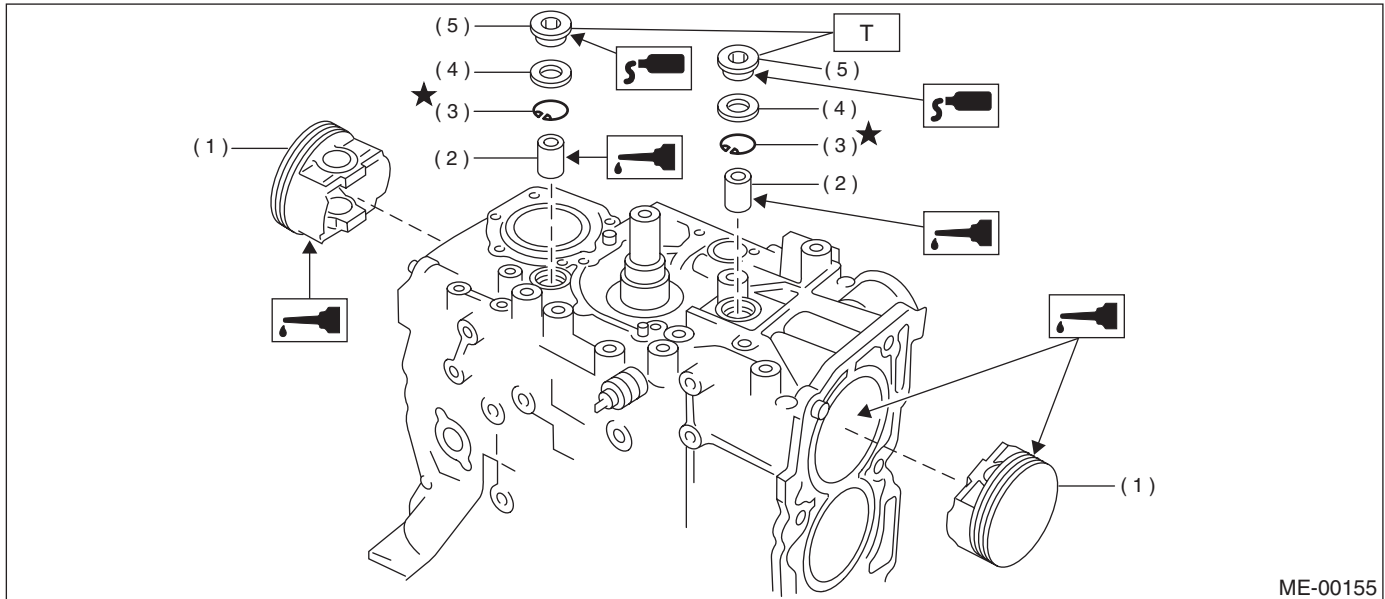


CAUTION:

Piston front mark faces towards the front of the engine.



(A) Front mark



ME-00155

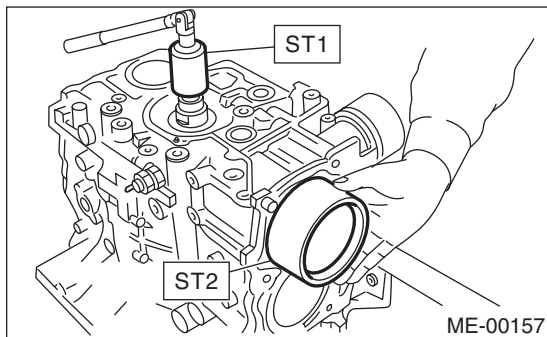
- | | |
|----------------|-----------------------|
| (1) Piston | (4) Gasket |
| (2) Piston pin | (5) Service hole plug |
| (3) Snap ring | |

Tightening torque: N·m (kgf-m, ft-lb)**T: 70 (7.1, 51.6)****15) Installing piston**

- (1) Turn the cylinder block to face the #1 and #2 piston side upward.
- (2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

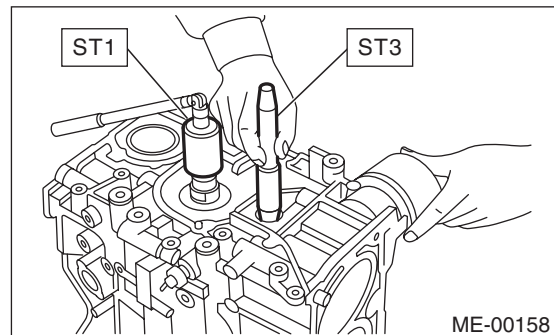
- (3) Apply a thin coat of engine oil to pistons and cylinders, and then insert the pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE

ME-00157

16) Installing piston pin

- (1) Apply a thin coat of engine oil to the ST3 before insertion.
- (2) Insert the ST3 into service hole to align piston pin hole with connecting rod small end.

ST1 499017100 PISTON GUIDE

ME-00158

- (3) Apply a thin coat of engine oil to the piston pin, and then insert the piston pin into piston and connecting rod through service hole.
- (4) Install snap ring.

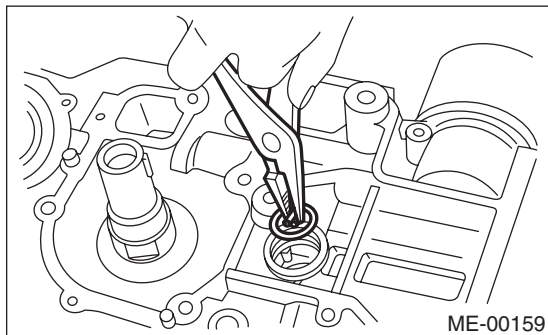
NOTE:

Use new snap rings.

CYLINDER BLOCK

MECHANICAL

ST 499897200 PISTON SNAPRING PLIER

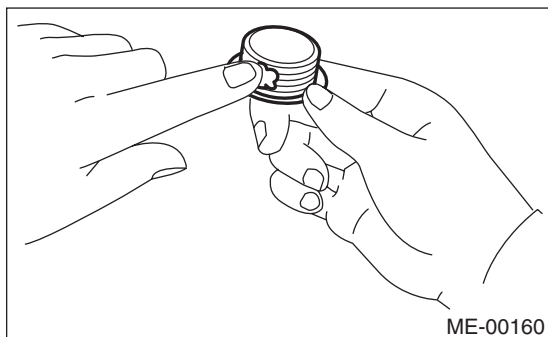


(5) Apply liquid gasket around the service hole plug.

Liquid gasket:

Part No. 004403007

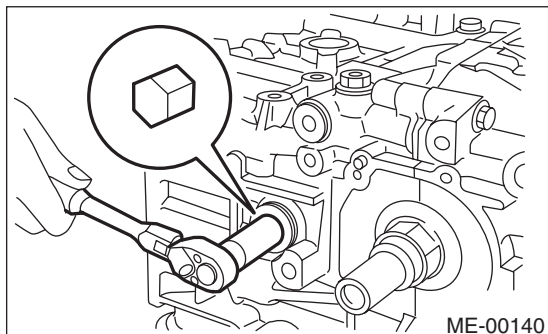
ThreeBond 1215 or equivalent

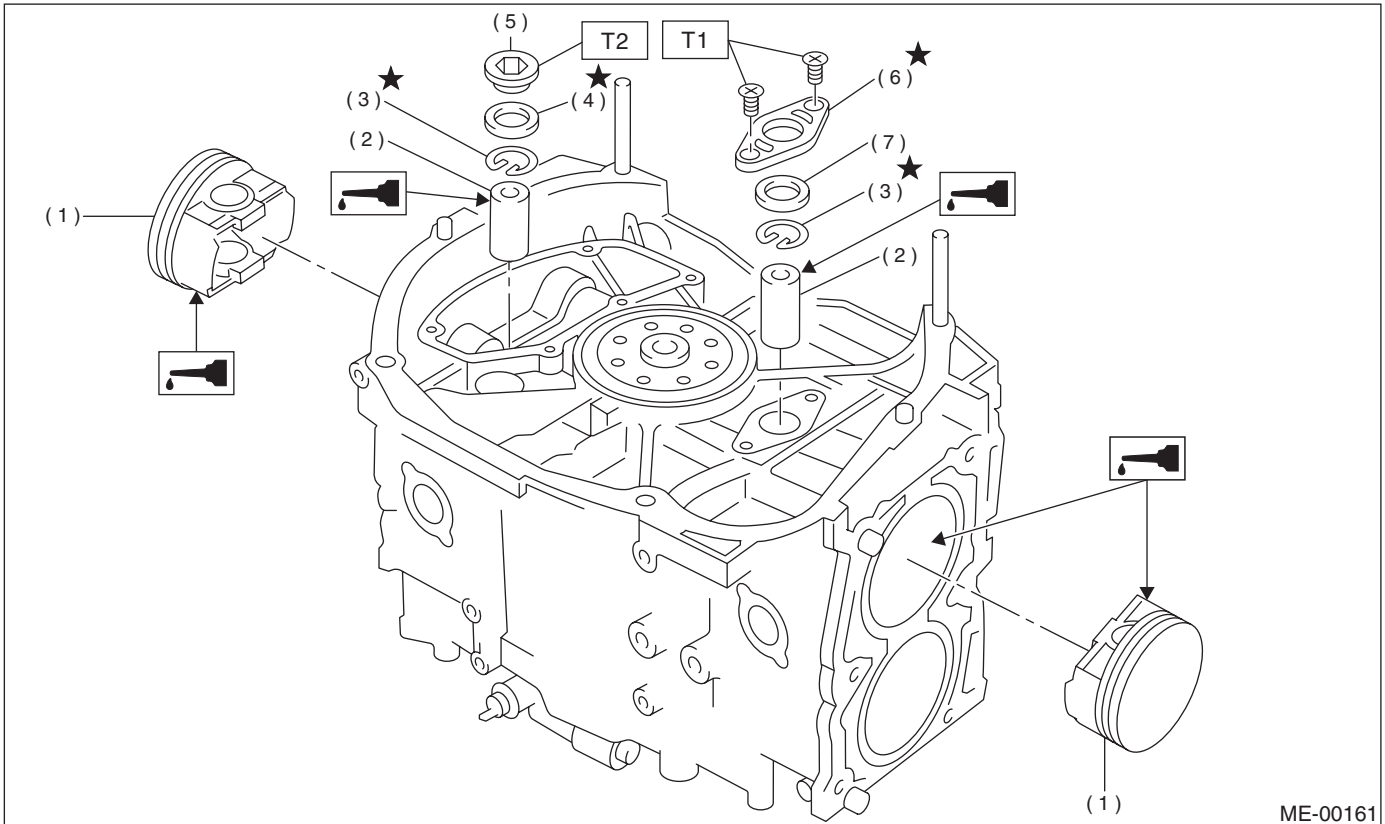


(6) Install the service hole plug and gasket.

NOTE:

Use a new gasket.





ME-00161

- | | |
|----------------|------------------------|
| (1) Piston | (5) Service hole plug |
| (2) Piston pin | (6) Service hole cover |
| (3) Snap ring | (7) O-ring |
| (4) Gasket | |

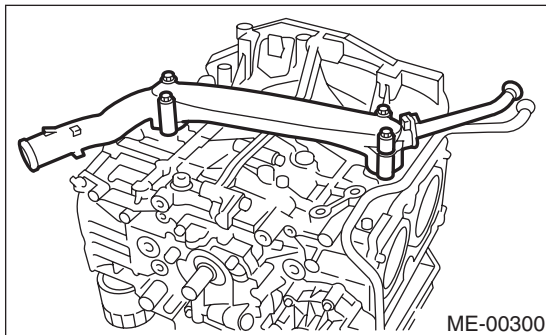
Tightening torque: N·m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)

T2: 70 (7.1, 51.6)

(7) Turn the cylinder block to face the #3 and #4 piston side upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

17) Install the water pipe.



ME-00300

18) Install the baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

19) Install the oil strainer and O-ring.

Tightening torque:

10 N·m (1.0 kgf-m, 7 ft-lb)

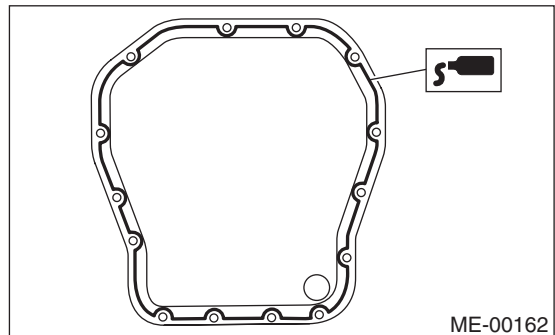
20) Install the oil strainer stay.

21) Apply liquid gasket to the matching surfaces, and then install the oil pan.

Liquid gasket:

Part No. 004403007

ThreeBond 1215 or equivalent



ME-00162

CYLINDER BLOCK

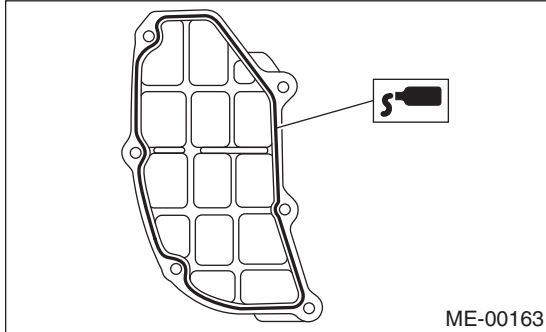
MECHANICAL

22) Apply liquid gasket to the matching surfaces, and then install the oil separator cover.

Liquid gasket:

Part No. 004403007

ThreeBond 1215 or equivalent



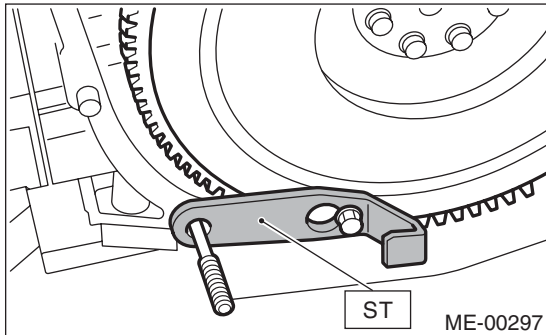
23) Install the flywheel or drive plate.
To lock the crankshaft, use ST.

ST 498497100 CRANKSHAFT STOPPER

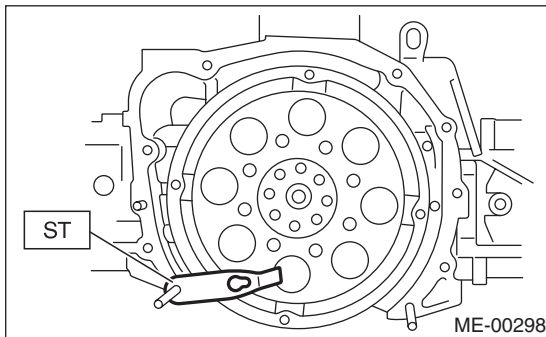
Tightening torque:

72 N·m (7.3 kgf-m, 52.8 ft-lb)

- MT model



- AT model

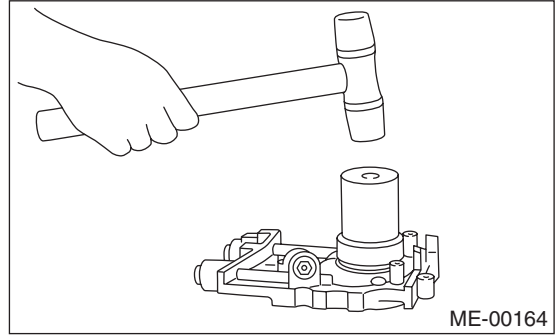


24) Install the housing cover.

25) Installation of oil pump

- (1) Discard the front oil seal after removal. Replace with a new one using the ST.

ST 499587100 OIL SEAL INSTALLER

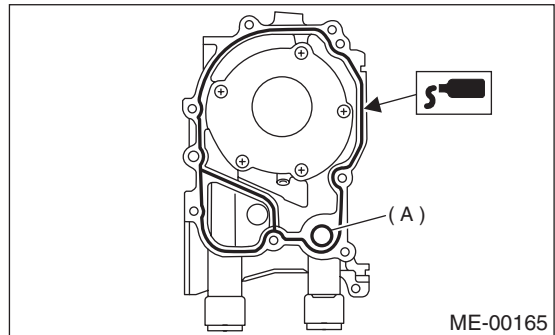


- (2) Apply liquid gasket to the matching surface of oil pump.

Liquid gasket:

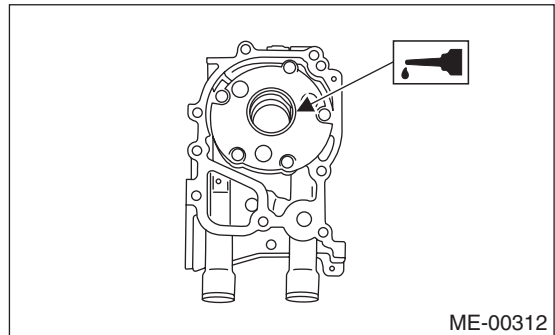
Part No. 004403007

ThreeBond 1215 or equivalent



(A) O-ring

- (3) Apply a thin coat of engine oil to the inside of oil seal.



- (4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

CAUTION:

- Do not forget to install the O-ring and seal when installing oil pump.
- Align flat surface of oil pump's inner rotor with crankshaft before installation.

26) Install the water pump and gasket.

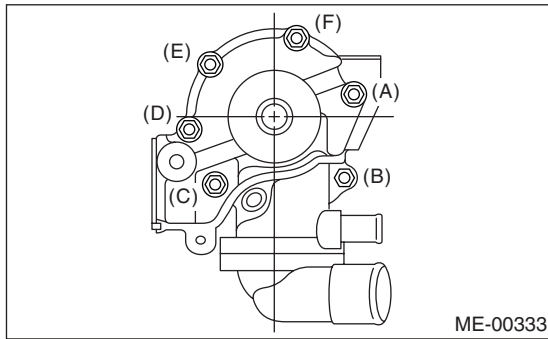
Tightening torque:

First; 12 (1.2 kgf-m, 8.7 ft-lb)

Second; 12 (1.2 kgf-m, 8.7 ft-lb)

CAUTION:

- Be sure to use a new gasket.
- When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.



27) Install the water by-pass pipe for heater.

28) Install the oil filter using ST.

ST 498547000 OIL FILTER WRENCH

29) Tighten the cylinder head bolts.

- (1) Apply a thin coat of engine oil to the washers and bolt threads.
- (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
- (3) Back off all bolts by 180° first; back them off by 180° again.
- (4) Tighten the bolts (a) and (b) to 34 N·m (3.5 kgf-m, 25 ft-lb).
- (5) Tighten bolts (c), (d), (e) and (f) to 15 N·m (1.5 kgf-m, 11 ft-lb).
- (6) Tighten all bolts by 80 to 90° in alphabetical sequence.

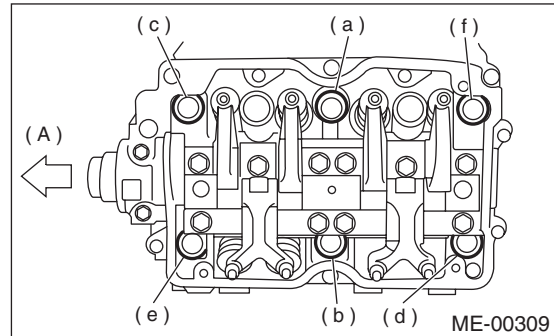
CAUTION:

Do not tighten bolts more than 90°.

- (7) Further tighten all bolts by 80 to 90° in alphabetical sequence.

CAUTION:

Ensure that the total “re-tightening angle” [in the former two steps], do not exceed 180°.



(A) Front

30) Install the oil level gauge guide, and then tighten the attaching bolt (left side only).

31) Install the rocker cover.

32) Install the crankshaft sprocket. <Ref. to ME(H4SO)-53, INSTALLATION, Crankshaft Sprocket.>

33) Install the camshaft sprocket. <Ref. to ME(H4SO)-51, INSTALLATION, Camshaft Sprocket.>

34) Install the timing belt. <Ref. to ME(H4SO)-47, INSTALLATION, Timing Belt.>

35) Install the timing belt cover. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt Cover.>

36) Install the crankshaft pulley. <Ref. to ME(H4SO)-44, INSTALLATION, Crankshaft Pulley.>

37) Install the generator and A/C compressor brackets on cylinder head.

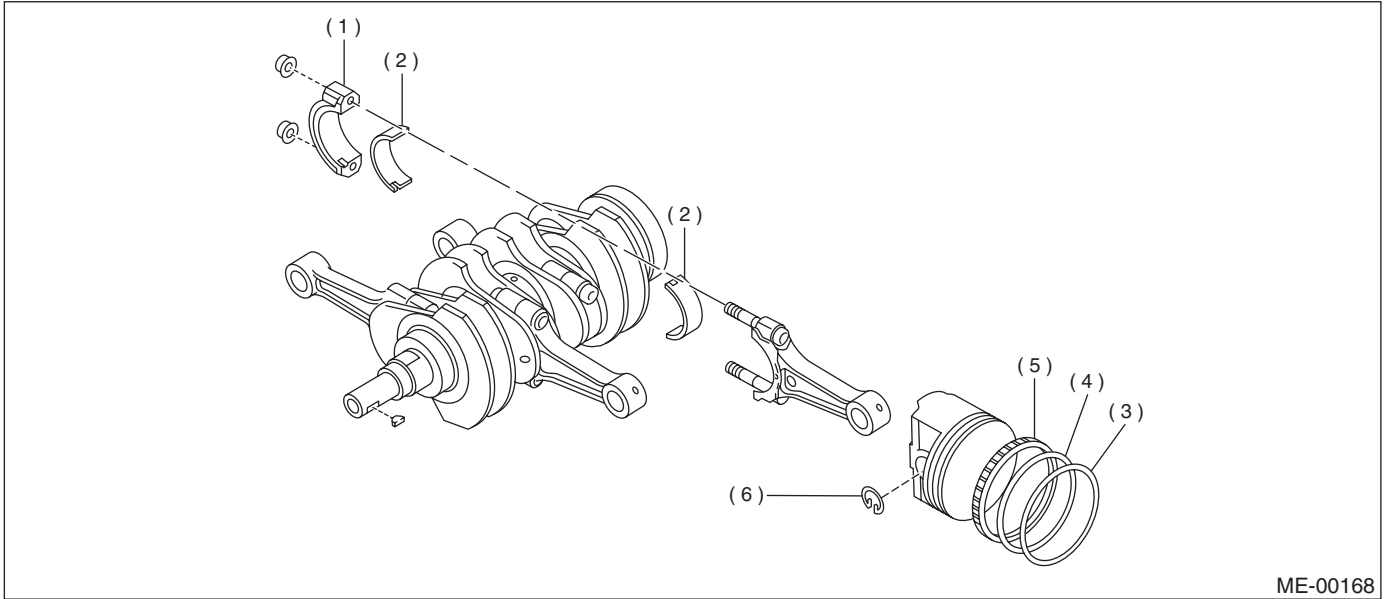
38) Install the V-belt. <Ref. to ME(H4SO)-42, INSTALLATION, V-belt.>

39) Install the intake manifold. <Ref. to FU(H4SO)-18, INSTALLATION, Intake Manifold.>

CYLINDER BLOCK

MECHANICAL

C: DISASSEMBLY



- (1) Connecting rod cap
- (2) Connecting rod bearing

- (3) Top ring
- (4) Second ring

- (5) Oil ring
- (6) Snap ring

- 1) Remove the connecting rod cap.
- 2) Remove the connecting rod bearing.

NOTE:

Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

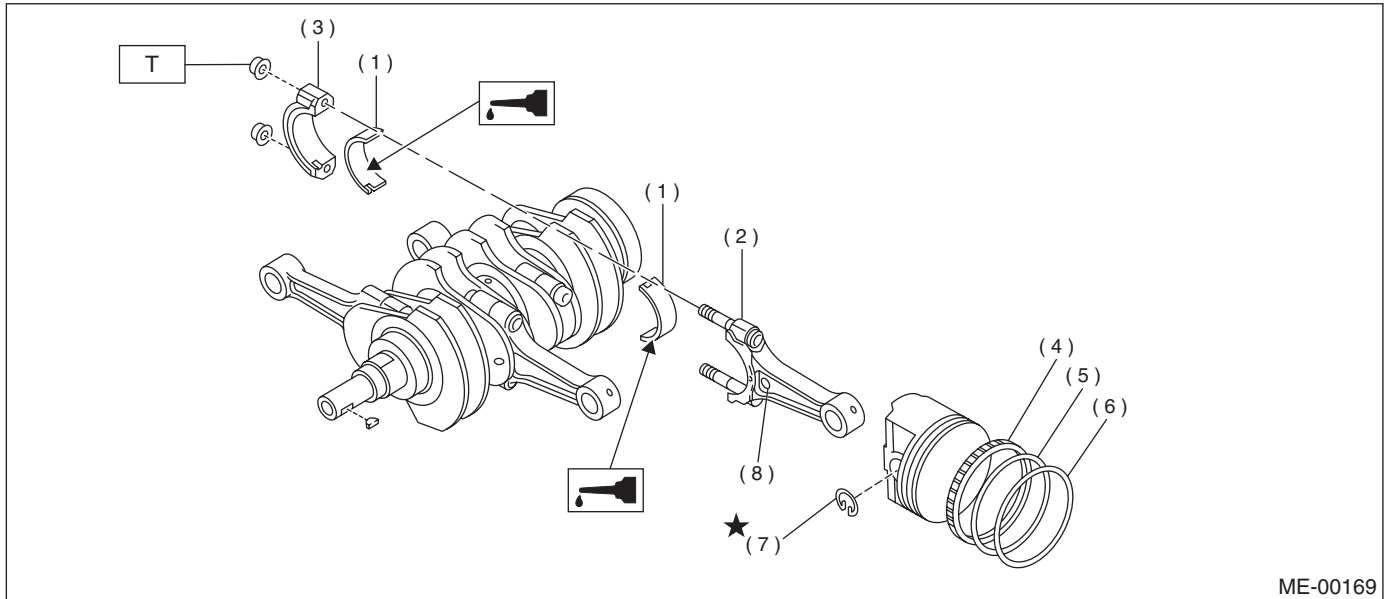
- 3) Remove the piston rings using a piston ring expander.

- 4) Remove the oil ring by hand.

NOTE:

Arrange the removed piston rings in good order to prevent confusion.

- 5) Remove the snap ring.

D: ASSEMBLY

ME-00169

- | | |
|----------------------------|-----------------|
| (1) Connecting rod bearing | (5) Second ring |
| (2) Connecting rod | (6) Top ring |
| (3) Connecting rod cap | (7) Snap ring |
| (4) Oil ring | (8) Side mark |

Tightening torque: N·m (kgf-m, ft-lb)
T: 45 (4.6, 33.2)

1) Apply oil to the surfaces of the connecting rod bearings.

2) Install the connecting rod bearings on connecting rods and connecting rod caps.

3) Position each connecting rod with the marked side facing forward, and then install them.

4) Install the connecting rod cap with connecting rod nut.

Ensure the arrow on connecting rod cap faces the front during installation.

CAUTION:

- Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
- When tightening the connecting rod nuts, apply oil on the threads.

5) Install the expander, lower rail and upper rail in this order by hand. Then install the second ring and top ring with a piston ring expander.

E: INSPECTION**1. CYLINDER BLOCK**

1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.

2) Check the oil passages for clogging.

3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:

0.05 mm (0.0020 in)

Grinding limit

0.1 mm (0.004 in)

Standard height of cylinder block:

201.0 mm (7.91 in)

CYLINDER BLOCK

MECHANICAL

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on cylinder block's front upper surface.

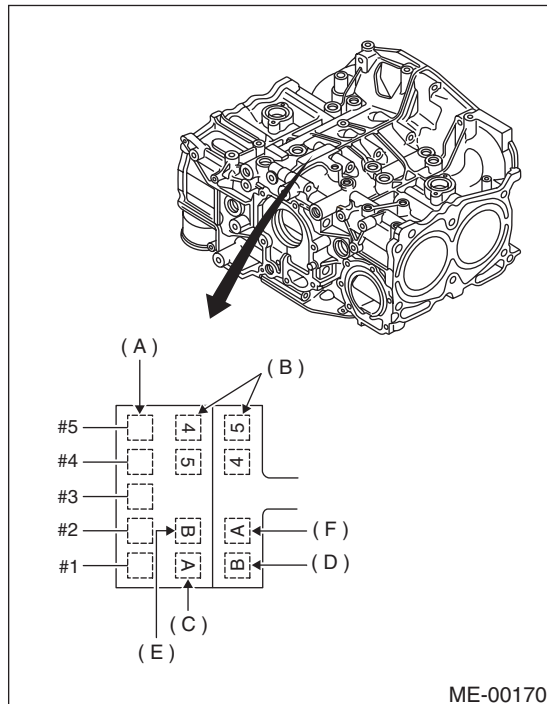
NOTE:

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

Standard diameter:

A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)

B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



- (A) Main journal size mark
- (B) Cylinder block RH-LH combination mark
- (C) #1 cylinder bore size mark
- (D) #2 cylinder bore size mark
- (E) #3 cylinder bore size mark
- (F) #4 cylinder bore size mark

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 shown in the figure, using a cylinder bore gauge.

NOTE:

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

Taper:

Standard

0.015 mm (0.0006 in)

Limit

0.050 mm (0.0020 in)

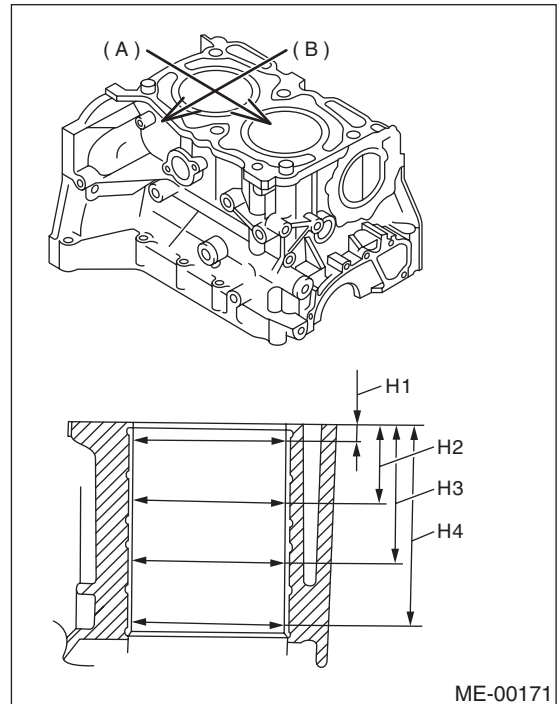
Out-of-roundness:

Standard

0.010 mm (0.0004 in)

Limit

0.050 mm (0.0020 in)



- (A) Piston pin direction
- (B) Thrust direction
- H1 10 mm (0.39 in)
- H2 45 mm (1.77 in)
- H3 80 mm (3.15 in)
- H4 115 mm (4.53 in)

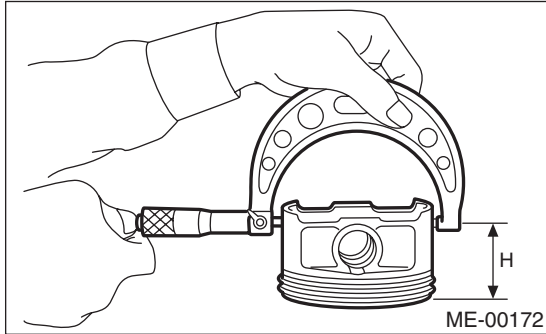
3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston

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

NOTE:

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

Piston grade point H:**37.0 mm (1.457 in)****Standard****A: 99.485 — 99.495 mm****(3.9167 — 3.9171 in)****B: 99.475 — 99.485 mm****(3.9163 — 3.9167 in)****0.25 mm (0.0098 in) oversize****99.725 — 99.735 mm****(3.9262 — 3.9266 in)****0.50 mm (0.0197 in) oversize****99.975 — 99.985 mm****(3.9360 — 3.9364 in)**

5) Calculate the clearance between cylinder and piston.

NOTE:

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

Cylinder to piston clearance at 20°C (68°F):**Standard****0.010 — 0.030 mm (0.0004 — 0.0012 in)****Limit****0.050 mm (0.0020 in)**

6) Boring and honing

(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, rebores 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. Also, do not use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

NOTE:

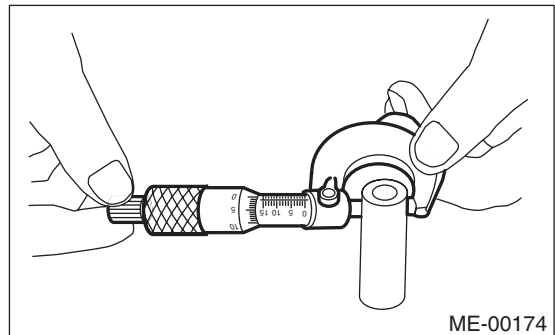
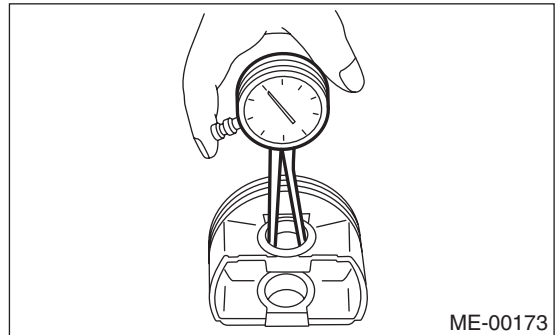
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

Limit of cylinder enlarging (boring):**0.5 mm (0.020 in)****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 defective.

2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4SO)-82, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not to specification, replace the piston or bore the cylinder to use an oversize piston.

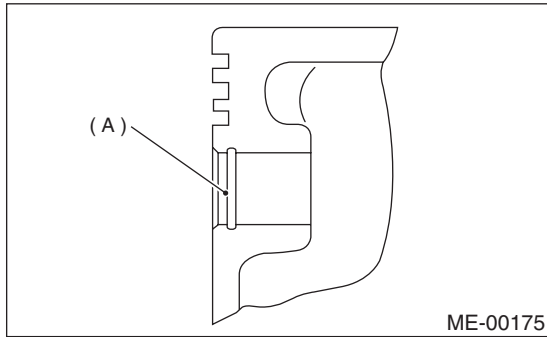
3) Make the sure that piston pin can be inserted into piston pin hole with a thumb at 20°C (68°F). Replace if defective.

Standard clearance between piston pin and hole in piston:**Standard****0.004 — 0.008 mm (0.0002 — 0.0003 in)****Limit****0.020 mm (0.0008 in)**

CYLINDER BLOCK

MECHANICAL

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



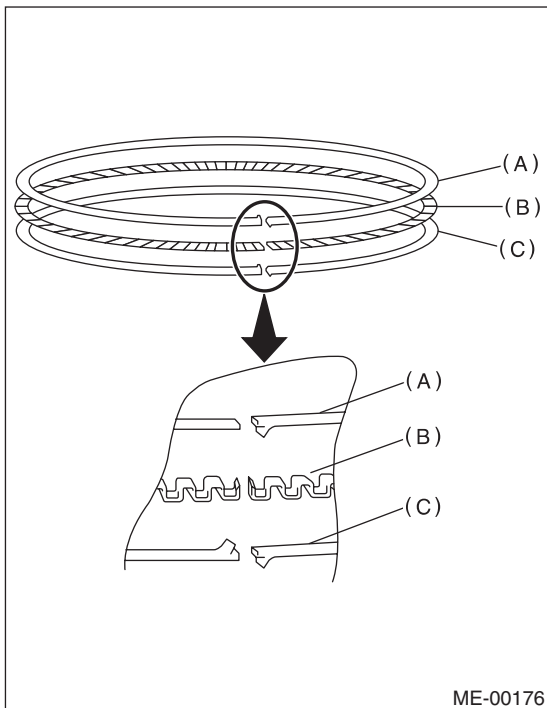
5) Check the piston pin snap ring for distortion, cracks and wear.

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 one of the same size as the piston.

CAUTION:

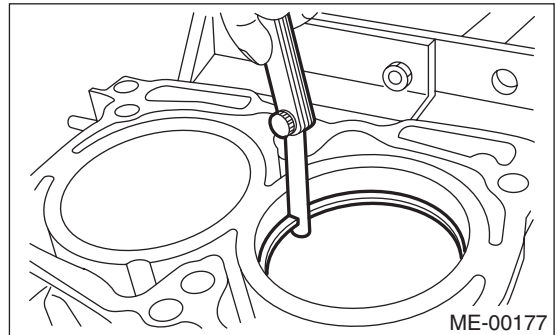
- Marks are shown on the end of top and second rings. When installing the rings to piston, face these marks upward.
- Oil ring is composed of upper rail, expander and lower rail. Be careful of the rail direction when installing oil ring to the piston.



- (A) Upper rail
- (B) Expander
- (C) Lower rail

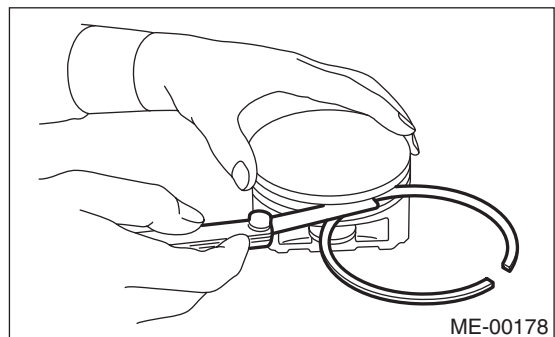
2) Clean the piston ring groove and piston ring.
3) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring gap with a thickness gauge.

		Unit: mm (in)	
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.35 (0.0079 — 0.0138)	1.0 (0.039)
	Second ring	0.37 — 0.52 (0.0146 — 0.0205)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)



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

		Unit: mm (in)	
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)

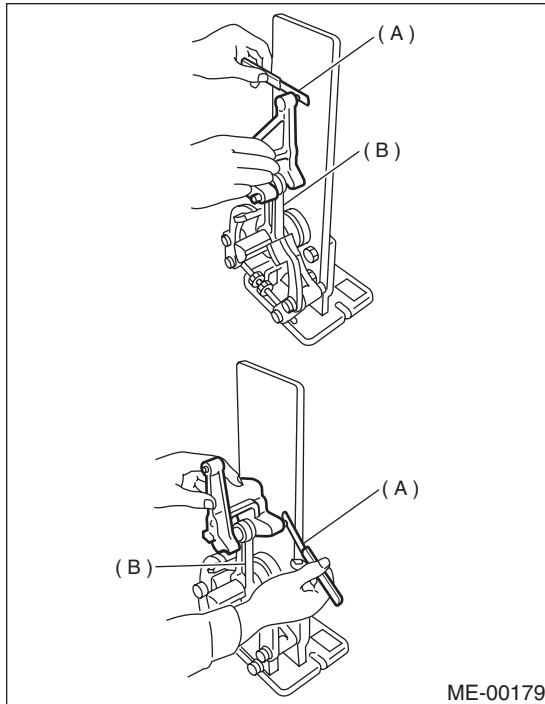


5. CONNECTING ROD

- 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 the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:

0.10 mm (0.0039 in)



(A) Thickness gauge

(B) Connecting rod

- 3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

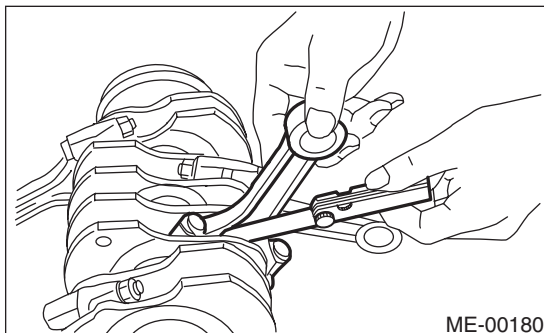
Connecting rod side clearance:

Standard

0.070 — 0.330 mm (0.0028 — 0.0130 in)

Limit

0.4 mm (0.016 in)



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

- 5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

Connecting rod oil clearance:

Standard

0.012 — 0.038 mm (0.0005 — 0.0015 in)

Limit

0.05 mm (0.0020 in)

Unit: mm (in)		
Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	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.

CYLINDER BLOCK

MECHANICAL

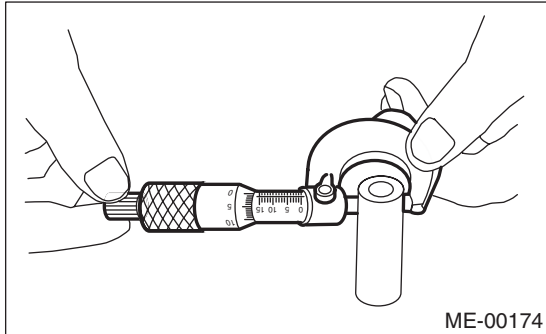
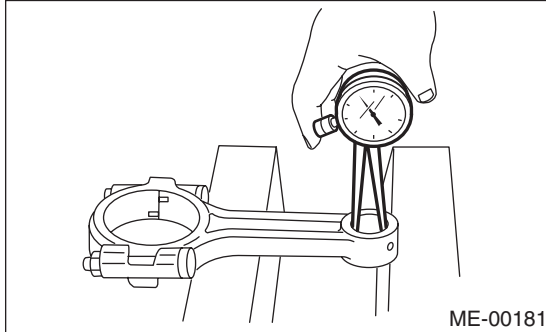
Clearance between piston pin and bushing:

Standard

0 — 0.022 mm (0 — 0.0009 in)

Limit

0.030 mm (0.0012 in)

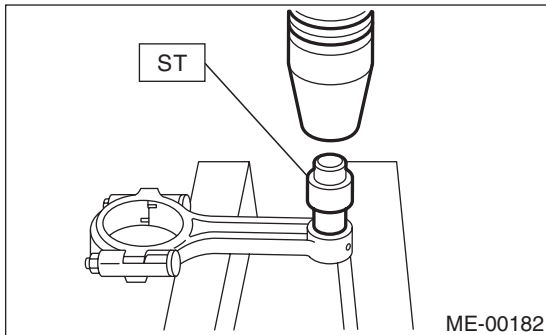


7) Replacement procedure is as follows.

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

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

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.

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

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely and check for cracks by means of red lead check etc., and replace if defective. Replace if defective.

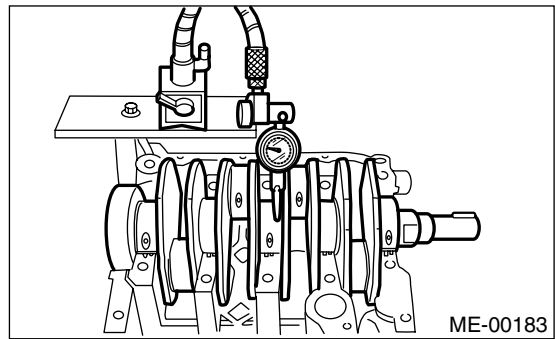
2) Measure the crankshaft bend. Repair or place if the value exceeds the specified limit.

NOTE:

If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:

0.035 mm (0.0014 in)



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

Crank pin and crank journal:

Out-of-roundness

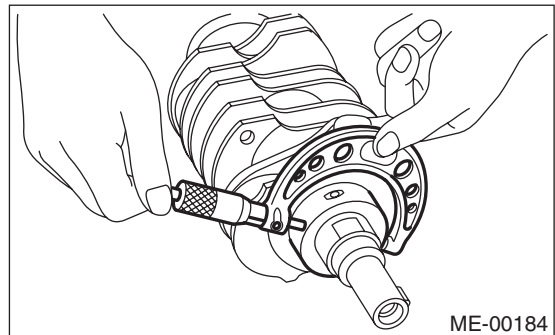
Less than 0.020 mm (0.0008 in)

Taper limit

0.07 mm (0.0028 in)

Grinding limit

0.250 mm (0.0098 in)



		Unit: mm (in)		
		Crank journal diameter		Crank pin diameter
		#1, #3	#2, #4, #5	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.490 — 1.502 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace bearing.

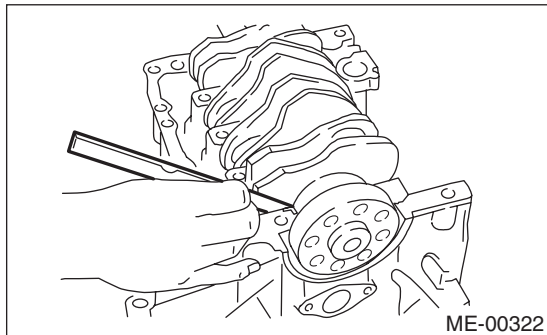
Crankshaft thrust clearance:

Standard

0.030 — 0.115 mm (0.0012 — 0.0045 in)

Limit

0.25 mm (0.0098 in)



Unit: mm (in)		
Crankshaft oil clearance		
#1	Standard	0.003 — 0.030 (0.0001 — 0.0012)
	Limit	0.040 (0.0016)
#2	Standard	0.012 — 0.033 (0.0005 — 0.0013)
	Limit	0.045 (0.0018)
#3	Standard	0.003 — 0.030 (0.0001 — 0.0012)
	Limit	0.040 (0.0016)
#4	Standard	0.012 — 0.033 (0.0005 — 0.0013)
	Limit	0.045 (0.0018)
#5	Standard	0.010 — 0.031 (0.0004 — 0.0012)
	Limit	0.040 (0.0016)

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

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specified range, replace the defective bearing with an undersize one, and then replace or recondition the crankshaft as necessary.