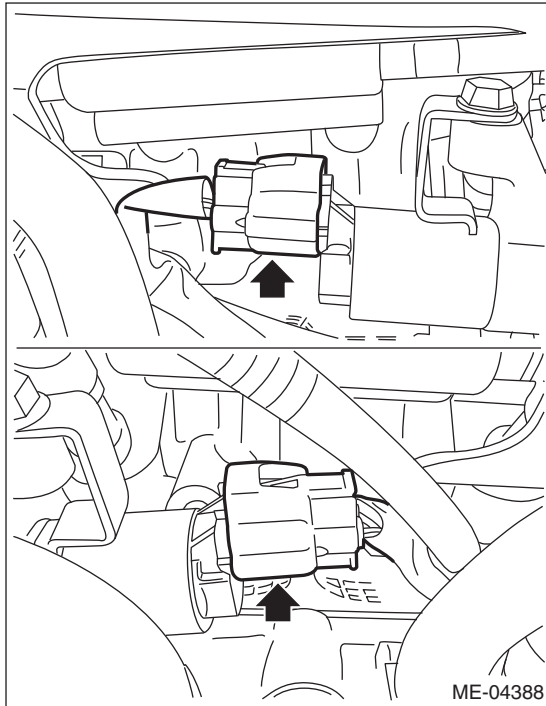


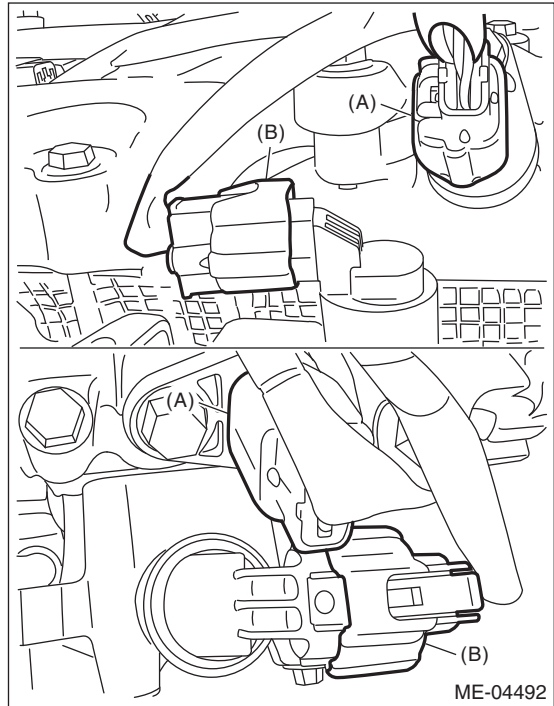
18. Camshaft

A: REMOVAL

- 1) Remove the crank pulley. <Ref. to ME(H4DOTC)-44, REMOVAL, Crank Pulley.>
- 2) Remove the timing belt cover. <Ref. to ME(H4DOTC)-46, REMOVAL, Timing Belt Cover.>
- 3) Remove the timing belt. <Ref. to ME(H4DOTC)-51, REMOVAL, Timing Belt.>
- 4) Remove the cam sprocket. <Ref. to ME(H4DOTC)-60, REMOVAL, Cam Sprocket.>
- 5) Disconnect connectors of the intake oil flow control solenoid valve.



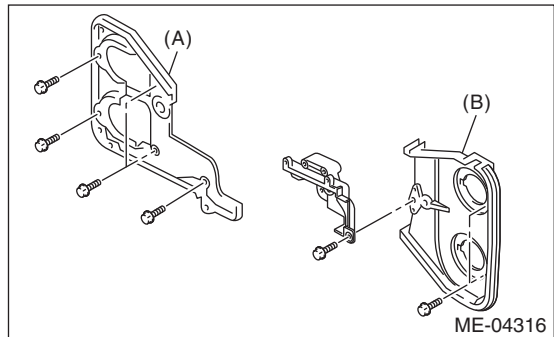
- 6) Disconnect connectors from exhaust camshaft position sensor (A) and exhaust oil flow control solenoid valve (B).



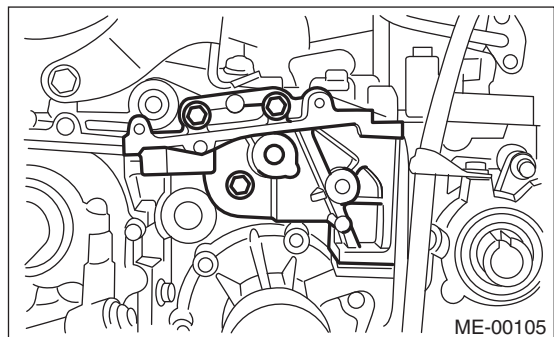
- 7) Remove the timing belt cover No. 2 (RH) (A) and timing belt cover No. 2 LH (B).

NOTE:

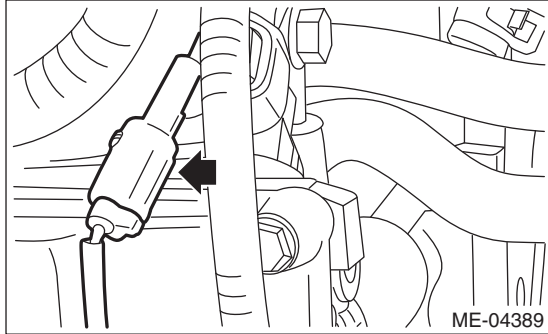
Do not damage or lose the seal rubber when removing the timing belt covers.



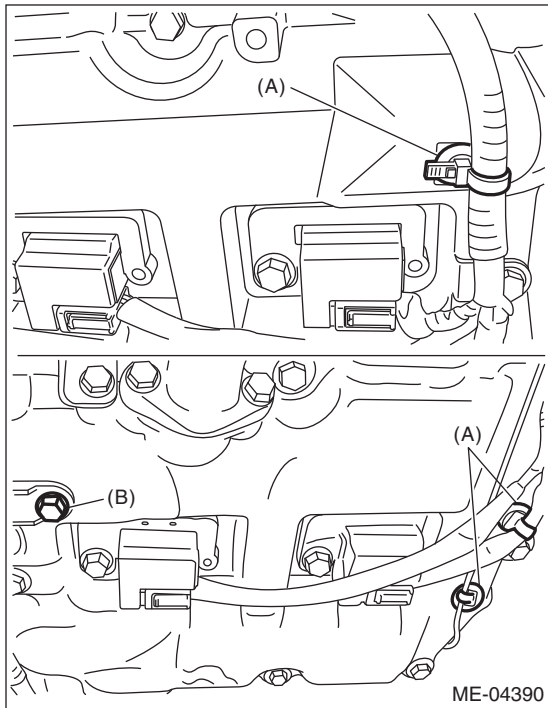
- 8) Remove the tensioner bracket.



9) Disconnect the oil level switch connector.



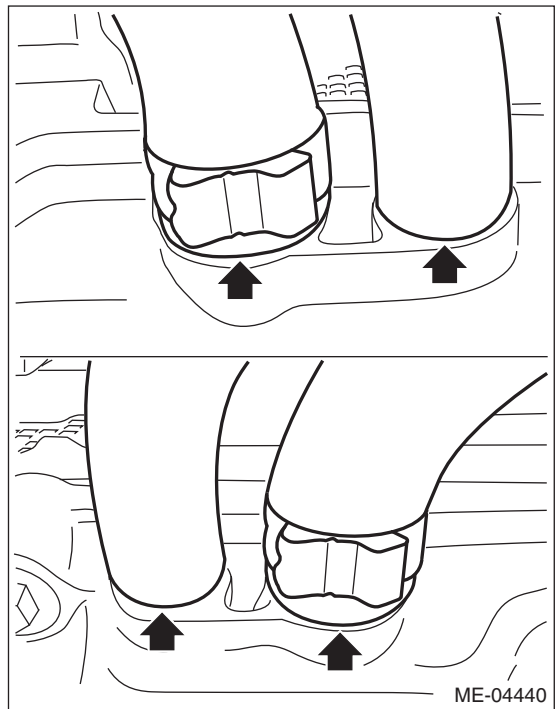
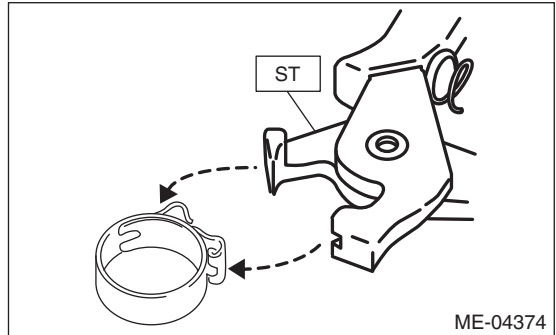
10) Remove the clip (A) and bolt (B) securing the engine harness or oil level switch harness to the rocker cover.



NOTE:

Pinch the clamp of the PCV hose by fitting the cut out in the ST with the protrusion on the clamp as shown in the figure, and unlock the clamp.

ST 18353AA000 CLAMP PLIERS



11) Remove the ignition coil. <Ref. to IG(H4DOTC)-6, REMOVAL, Ignition Coil.>

12) Remove the scavenge pump. (RH side only) <Ref. to LU(H4SO)-28, REMOVAL, Scavenge Pump.>

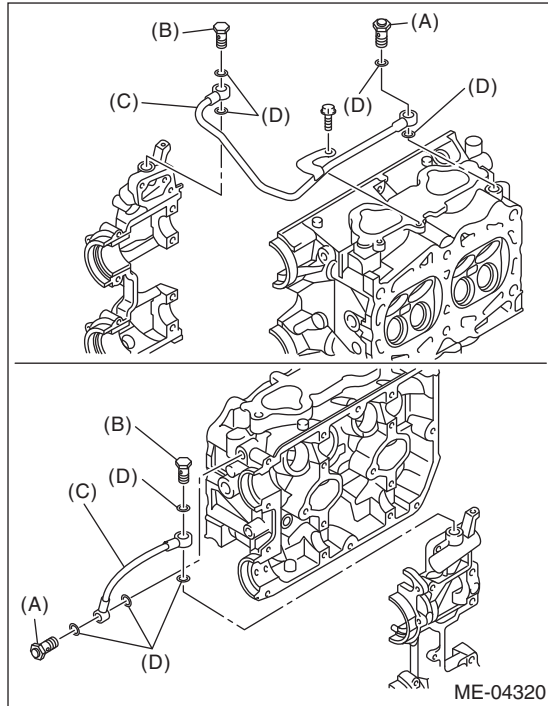
13) Disconnect PCV hose and vacuum hose from the rocker cover.

14) Remove the rocker cover.

Camshaft

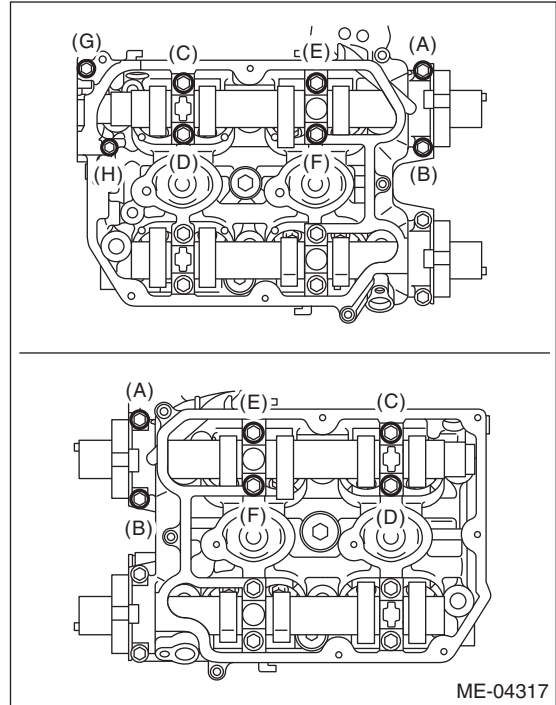
MECHANICAL

15) Remove the union bolt without filter (without protrusion) which secures the oil pipe to the front camshaft cap.

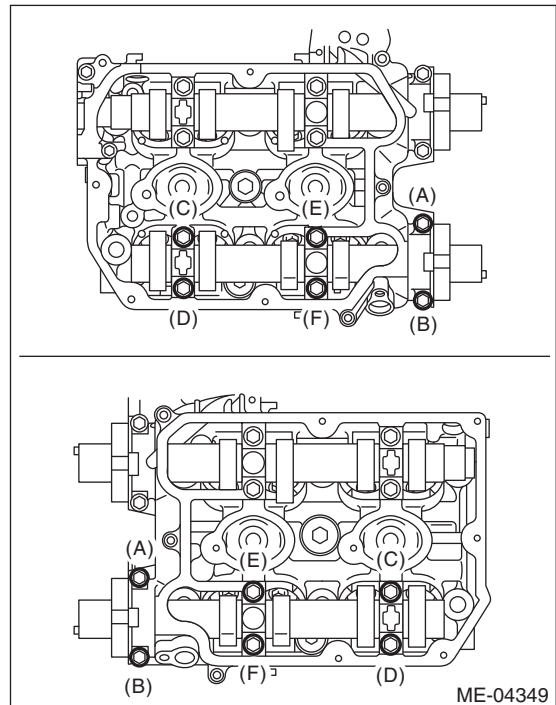


- (A) Union bolt with filter (with protrusion)
- (B) Union bolt without filter (without protrusion)
- (C) Oil pipe
- (D) Gasket

16) Loosen the bolts located on the upper side of the front camshaft cap, intake camshaft cap and rear camshaft cap (RH side only) equally, a little at a time in alphabetical order, as shown in the figure.



17) Loosen the lower side of the front camshaft cap and the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



18) Remove the front camshaft cap.
 19) Remove the intake camshaft caps, intake camshaft and rear camshaft caps (RH side only).

20) Remove the exhaust camshaft caps and exhaust camshaft.

NOTE:

Arrange camshaft caps in order so that they can be installed in their original positions.

21) Remove the oil seal.

CAUTION:

Do not scratch the journal surface when removing the oil seal.

22) Similarly, remove the camshaft RH and related parts.

B: INSTALLATION

1) Install the camshaft.

Apply engine oil to the cylinder head at camshaft journal installation location before installing the camshaft. Install the camshaft so that each valve is close to or in contact with base circle of the cam lobe.

NOTE:

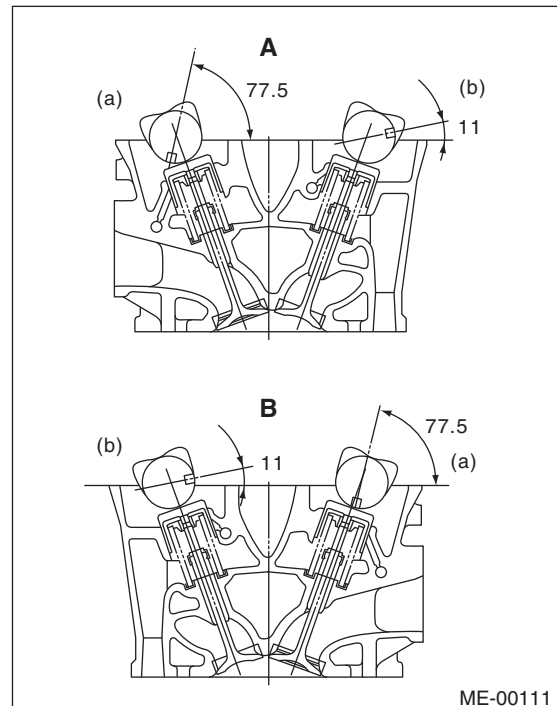
- Set the camshaft to the position shown in the figure.
- When set at the position shown in the figure, it is not necessary to rotate the camshaft RH when installing the timing belt, but it is necessary to rotate the camshaft LH slightly.

Intake camshaft LH:

Rotate 80° clockwise.

Exhaust camshaft LH:

Rotate 45° counterclockwise.



- A Cylinder head LH
- B Cylinder head RH
- (a) Intake camshaft
- (b) Exhaust camshaft

2) Install the camshaft cap.

(1) Apply small amount of liquid gasket to the mating surface of front camshaft cap and rear camshaft cap (RH side only).

NOTE:

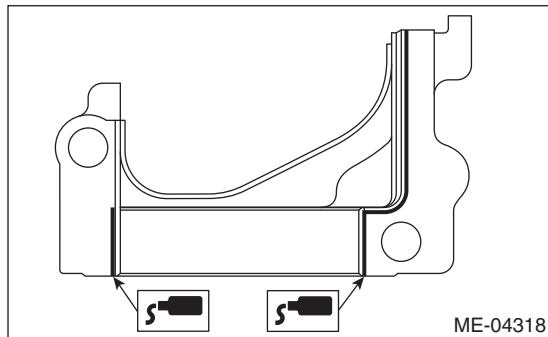
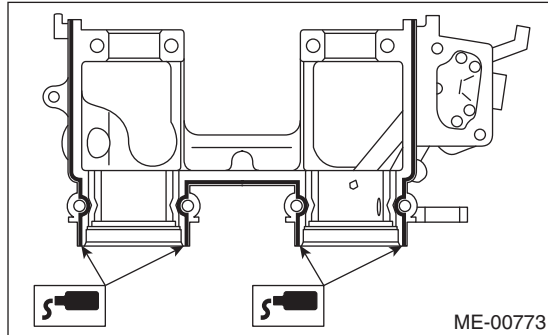
- Install within 5 min. after applying liquid gasket.
- Do not apply liquid gasket excessively. Applying excessively may cause excess gasket to come out and flow toward oil seal, resulting in oil leak.

Camshaft

MECHANICAL

Liquid gasket:

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



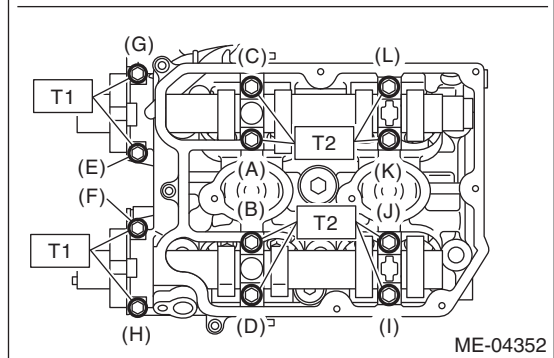
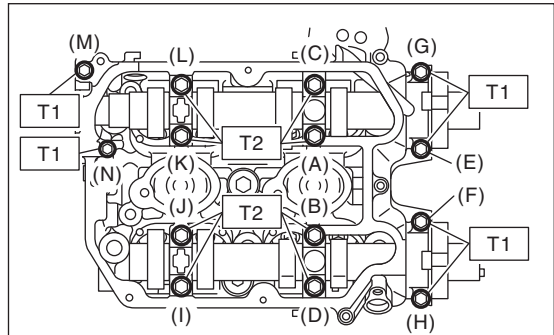
(2) Apply a thin coat of engine oil to the cap journal surface, and install the camshaft cap to the camshaft.

(3) Gradually tighten the camshaft cap in at least two steps, in alphabetical order shown in the figure, and then tighten to the specified torque.

Tightening torque:

T1: 9.75 N·m (1.0 kgf·m, 7.2 ft·lb)

T2: 20 N·m (2.0 kgf·m, 14.8 ft·lb)



(4) After tightening the camshaft cap, ensure the camshaft rotates only slightly while holding it at base circle.

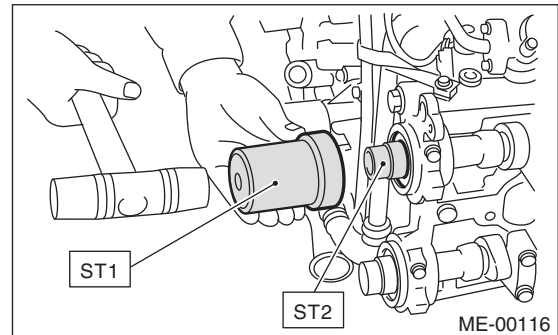
3) Apply a thin coat of engine oil to the periphery of the camshaft oil seal and oil seal lip, and install the oil seal on the camshaft using ST1 and ST2.

NOTE:

Use a new oil seal.

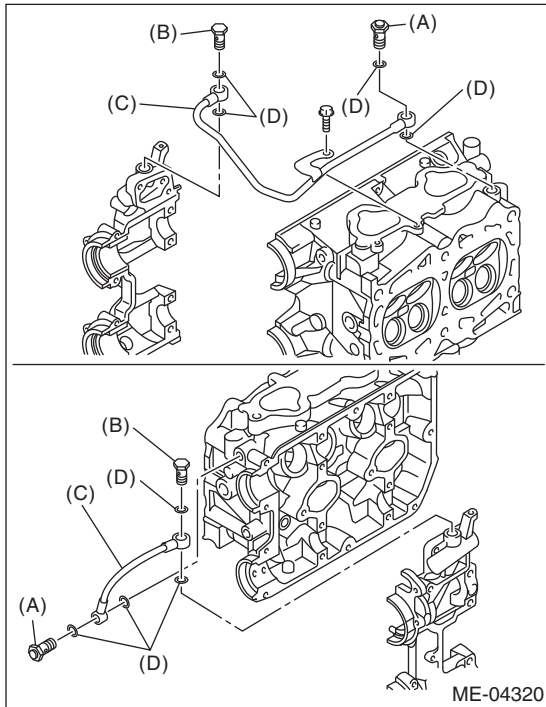
ST1 499587600 OIL SEAL INSTALLER

ST2 499597200 OIL SEAL GUIDE



4) Install the oil pipe to the front camshaft cap using the union bolt without filter (without protrusion).

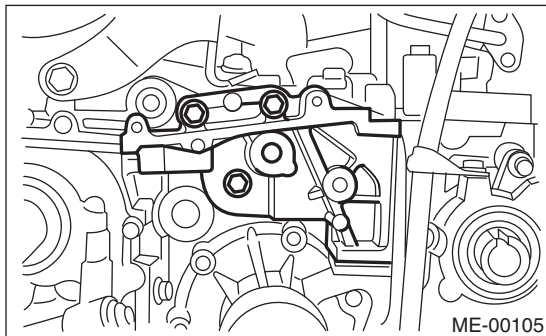
Tightening torque:
29 N·m (3.0 kgf·m, 21.4 ft·lb)



- (A) Union bolt with filter (with protrusion)
- (B) Union bolt without filter (without protrusion)
- (C) Oil pipe
- (D) Gasket

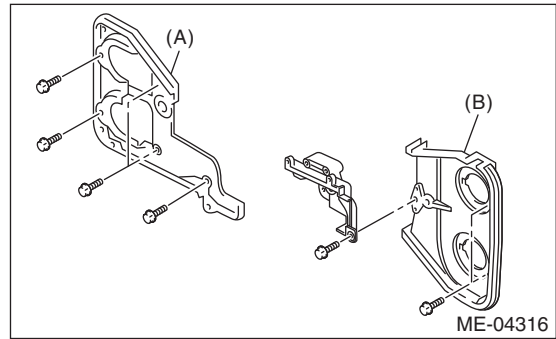
5) Install the tensioner bracket.

Tightening torque:
24.5 N·m (2.5 kgf·m, 18.1 ft·lb)



6) Install the timing belt cover No. 2 RH (A) and timing belt cover No. 2 LH (B).

Tightening torque:
5 N·m (0.5 kgf·m, 3.7 ft·lb)



7) Install the cam sprocket. <Ref. to ME(H4DOTC)-60, INSTALLATION, Cam Sprocket.>

8) Install the timing belt. <Ref. to ME(H4DOTC)-53, INSTALLATION, Timing Belt.>

9) Adjust the valve clearance. <Ref. to ME(H4DOTC)-29, ADJUSTMENT, Valve Clearance.>

10) Install the rocker cover.

(1) Install the rocker cover gasket to the rocker cover. (Outer periphery and ignition coil section)

NOTE:

Use a new rocker cover gasket.

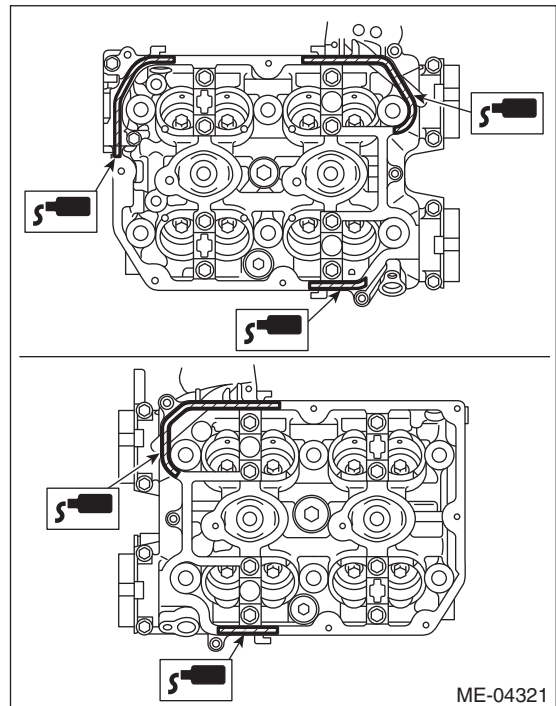
(2) Apply liquid gasket to the specified point of the cylinder head.

NOTE:

Install within 5 min. after applying liquid gasket.

Liquid gasket:

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



Camshaft

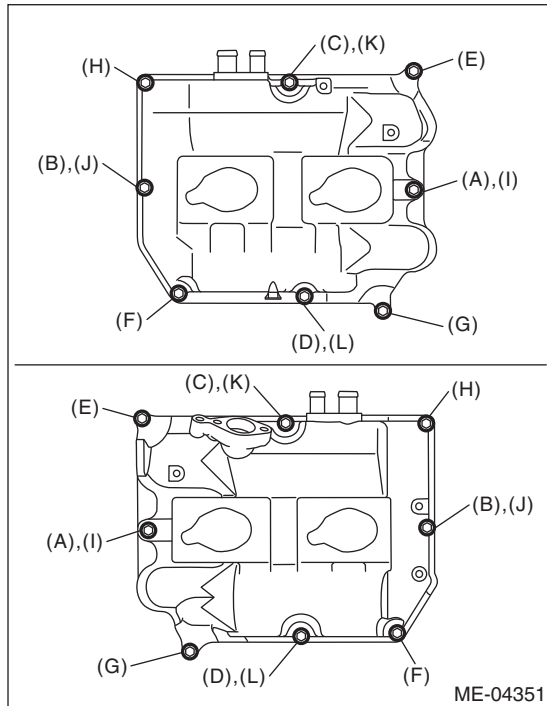
MECHANICAL

(3) Install the rocker cover to cylinder head. Ensure the gasket is properly positioned during installation.

(4) Temporarily tighten the rocker cover bolts in alphabetical order shown in the figure, and then tighten to specified torque in alphabetical order.

Tightening torque:

6.4 N·m (0.7 kgf·m, 4.7 ft·lb)



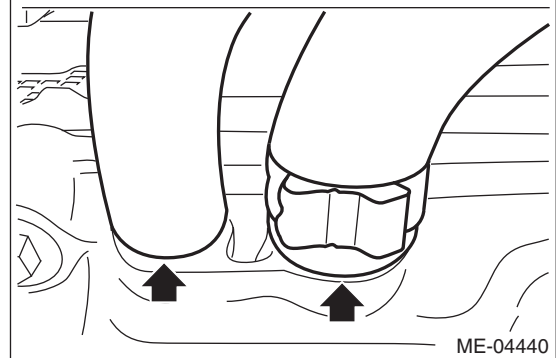
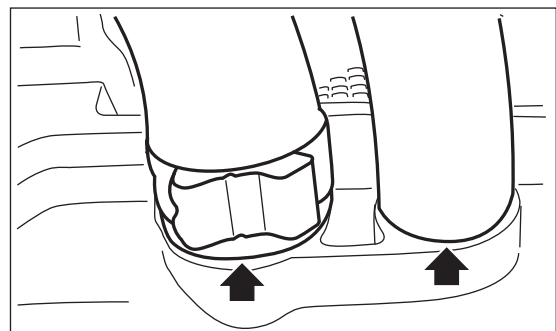
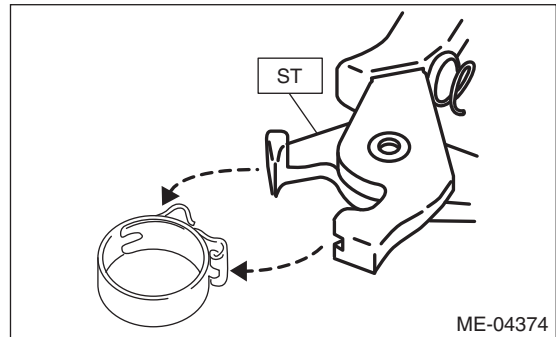
11) Install the scavenge pump. <Ref. to LU(H4SO)-28, INSTALLATION, Scavenge Pump.>

12) Connect the PCV hose and vacuum hose to the rocker cover.

NOTE:

Use a new clamp for the PCV hose clamp, fit the cut out in the ST with the protrusion on the clamp as shown in the figure, and lock the clamp.

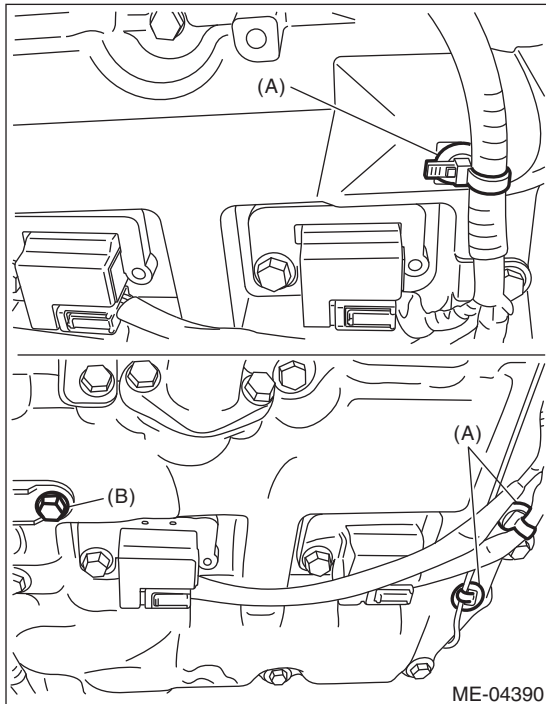
ST 18353AA000 CLAMP PLIERS



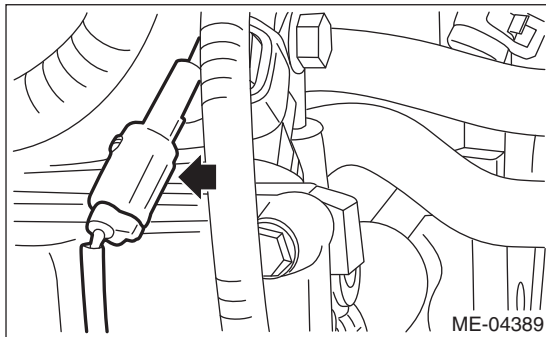
13) Install the ignition coil. <Ref. to IG(H4DOTC)-6, INSTALLATION, Ignition Coil.>

14) Secure the engine harness or oil level switch harness to the rocker cover with the clip (A) and bolt (B).

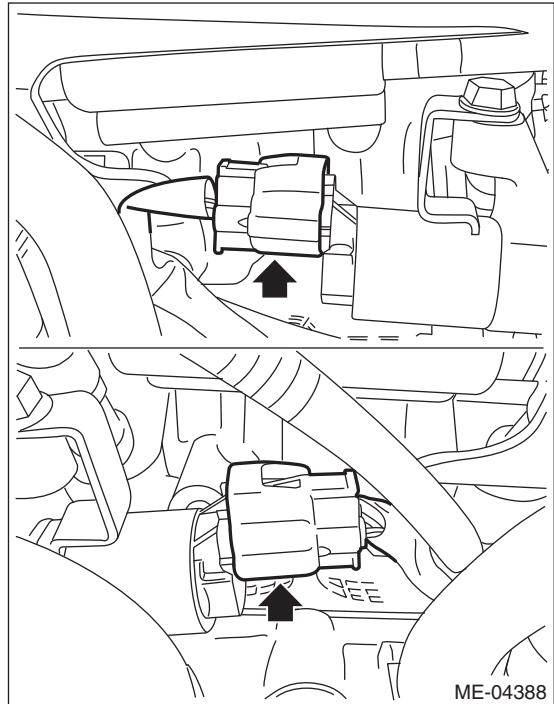
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



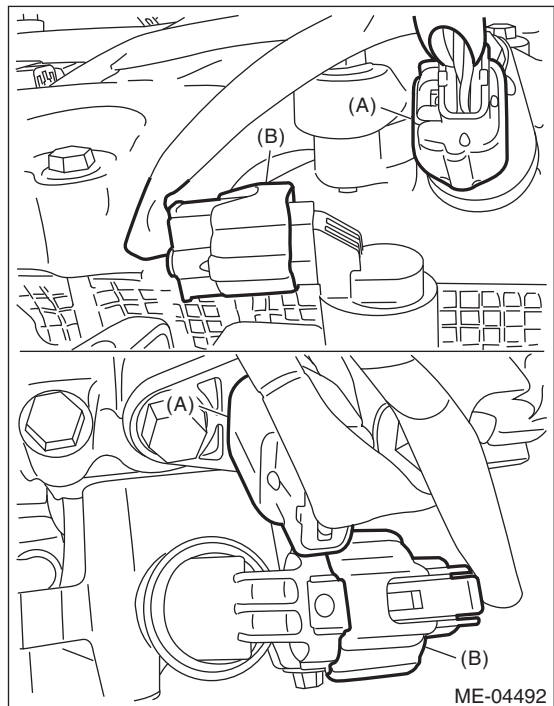
15) Connect the connector to the oil level switch.



16) Connect the connectors to the intake oil flow control solenoid valve.



17) Connect the connectors to exhaust camshaft position sensor (A) and exhaust oil flow control solenoid valve (B).



18) Install the timing belt cover. <Ref. to ME(H4DOTC)-49, INSTALLATION, Timing Belt Cover.>

19) Install the crank pulley. <Ref. to ME(H4DOTC)-44, INSTALLATION, Crank Pulley.>

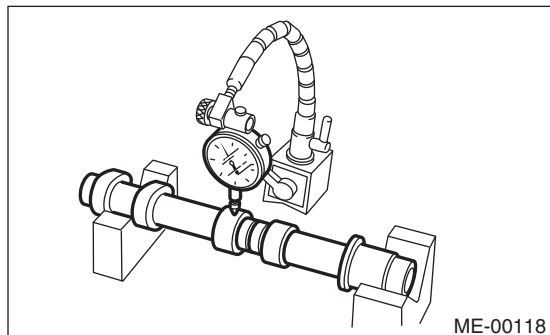
Camshaft

MECHANICAL

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Camshaft bend limit:
0.020 mm (0.00079 in)



2) Check the journal for damage and wear. Replace if faulty.

3) Check the cutout portion used for camshaft sensor for damage. Replace if faulty.

4) Check the cam face condition, and remove the minor faults by grinding with oil stone. Replace if there is uneven wear or others.

5) Measure the cam lobe height "H" and cam base circle diameter "A". If it exceeds the standard or offset wear occurs, replace it.

Cam lobe height H:

Standard

Intake

46.55 — 46.65 mm (1.833 — 1.837 in)

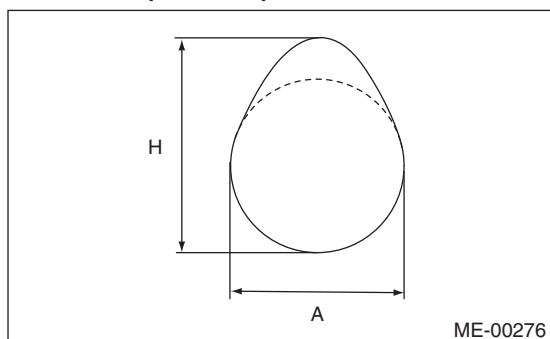
Exhaust

45.85 — 45.95 mm (1.805 — 1.809 in)

Cam base circle diameter A:

Standard

37.0 mm (1.457 in)



6) Measure the outside diameter of camshaft journal. If the journal diameter is not within specification, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard mm (in)	37.946 — 37.963 (1.4939 — 1.4946)	29.946 — 29.963 (1.1790 — 1.1796)

7) Measure the oil clearance of camshaft journal.

(1) Clean the camshaft cap and cylinder head camshaft journal.

(2) Place the camshaft on cylinder head. (Without installing the valve lifter)

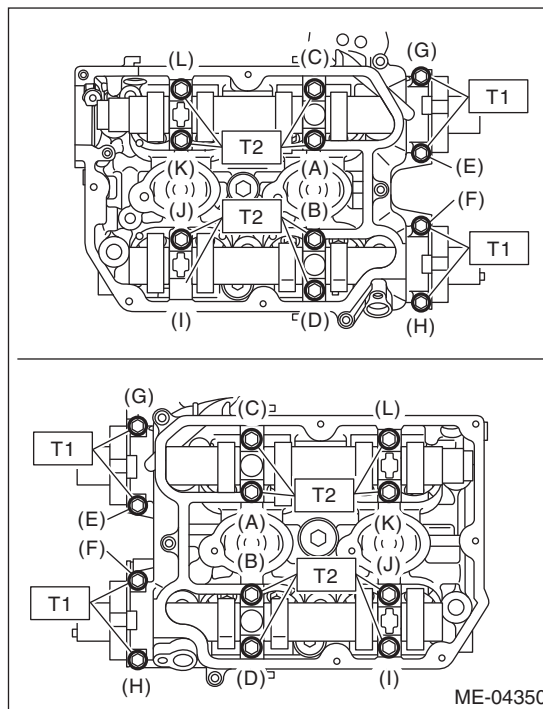
(3) Place a plastigauge across each camshaft journals.

(4) Gradually tighten the camshaft cap in at least two steps, in alphabetical order shown in the figure, and then tighten to the specified torque. Do not turn the camshaft.

Tightening torque:

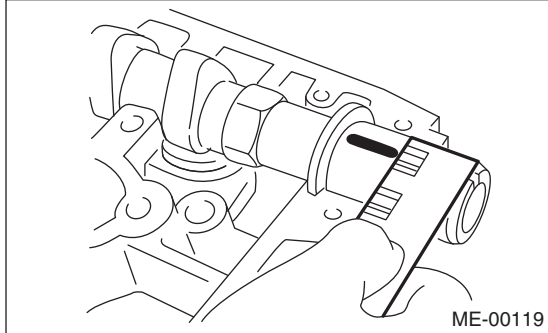
T1: 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)

T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



(5) Remove the camshaft cap.

(6) Measure the widest point of the plastigauge on each journal. If oil clearance exceeds the standard, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Camshaft oil clearance:**Standard****0.037 — 0.072 mm (0.0015 — 0.0028 in)**

(7) Completely remove the plastigauge.

8) Measure the thrust clearance of camshaft with the dial gauge set at end of camshaft. If the thrust clearance is not within the standard or there is off-set wear, replace the camshaft caps and cylinder head as a set. If necessary replace the camshaft.

Camshaft thrust clearance:**Standard****0.068 — 0.116 mm (0.0027 — 0.0047 in)**