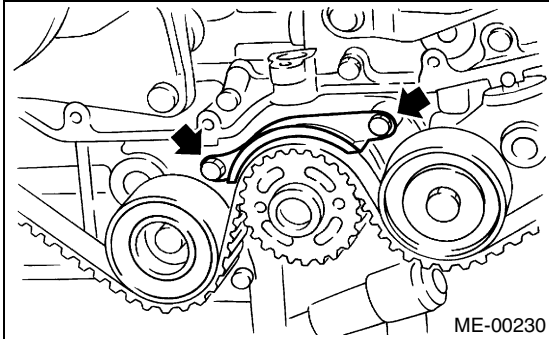


15. Timing Belt Assembly

A: REMOVAL

1. TIMING BELT

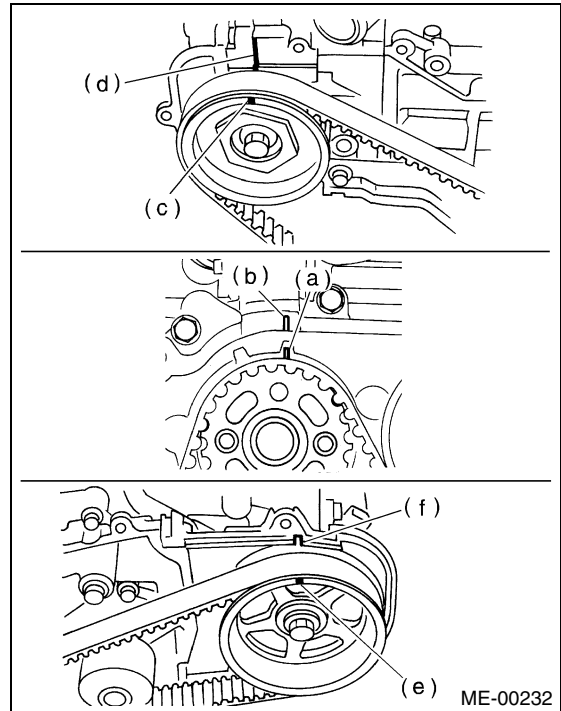
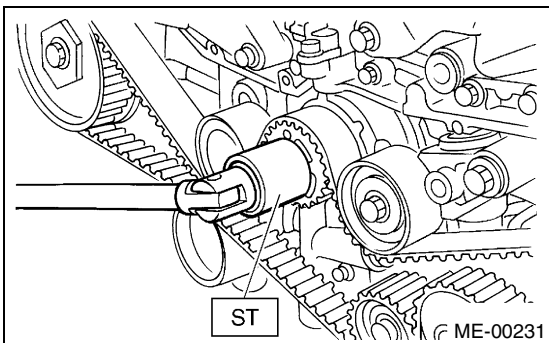
- 1) Remove the V-belt. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
- 4) Remove the timing belt guide. (MT vehicles)



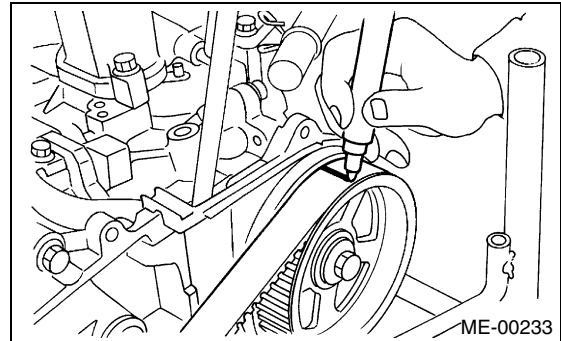
5) If the alignment mark (a) and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as shown in procedures below.

- (1) Turn the crankshaft using ST. Align the mark (a) of sprocket to cylinder block notch (b) and ensure the right side cam sprocket mark (c), cam cap and cylinder head matching surface (d) and/or left side cam sprocket mark (e) and belt cover notch (f) are properly adjusted.

ST 499987500 CRANKSHAFT SOCKET



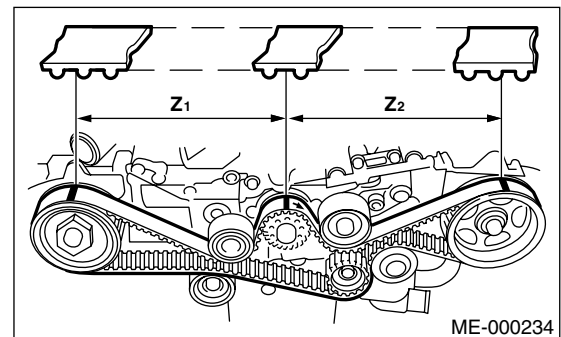
(2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to crank sprocket and cam sprockets.



Specified data:

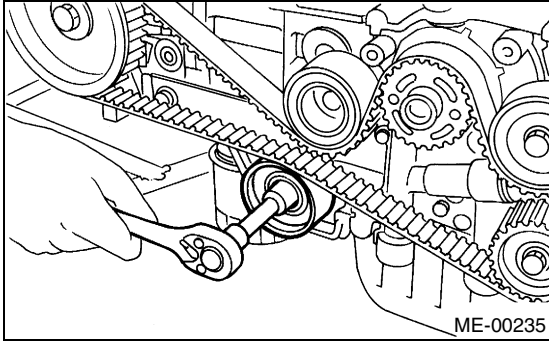
Z_1 : 46.8 tooth length

Z_2 : 43.7 tooth length

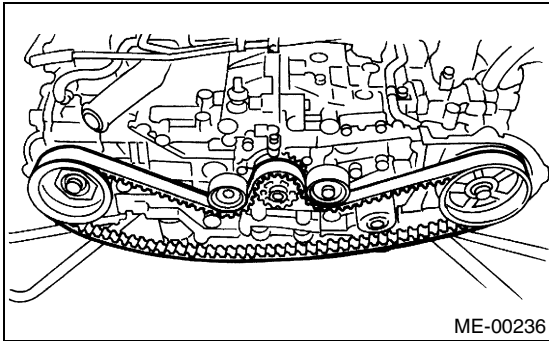


6) Remove the belt idler (No. 2).

7) Remove the belt idler No. 2.

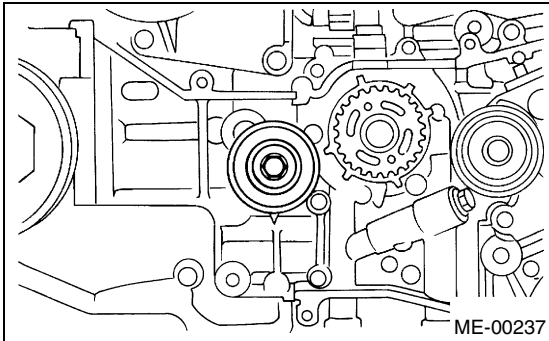


8) Remove the timing belt.

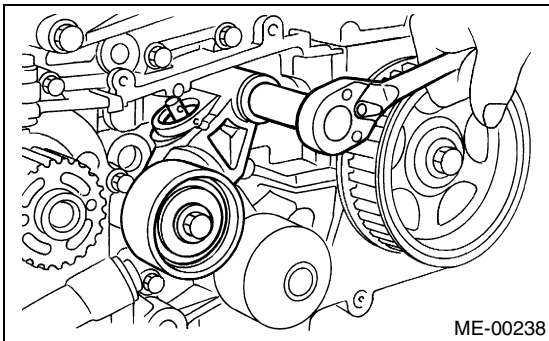


2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove the belt idler (No. 1).



2) Remove the automatic belt tension adjuster assembly.



B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

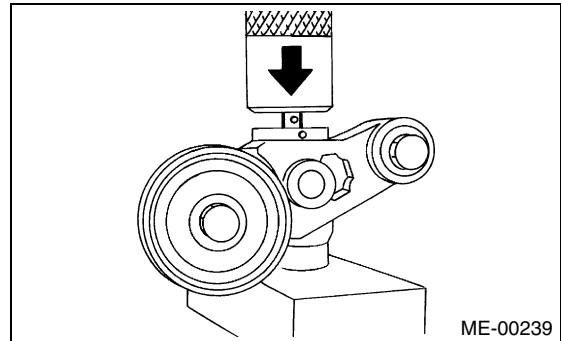
1) Preparation for installation of automatic belt tension adjuster assembly;

CAUTION:

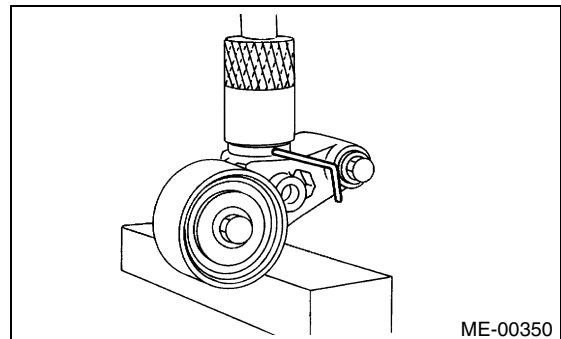
- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Press-in the push adjuster rod gradually taking more than 3 minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
- Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
- Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.

(2) Slowly move the adjuster rod down with a pressure of 294 N (30 kgf, 66 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.



(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



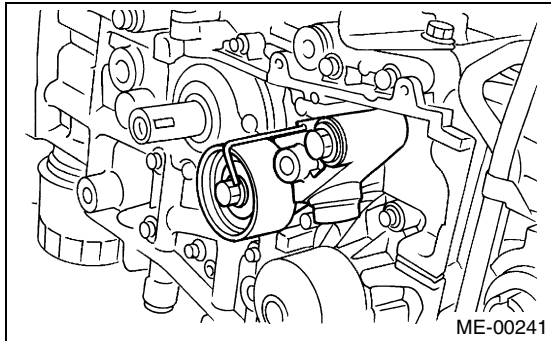
TIMING BELT ASSEMBLY

MECHANICAL

2) Install the automatic belt tension adjuster assembly.

Tightening torque:

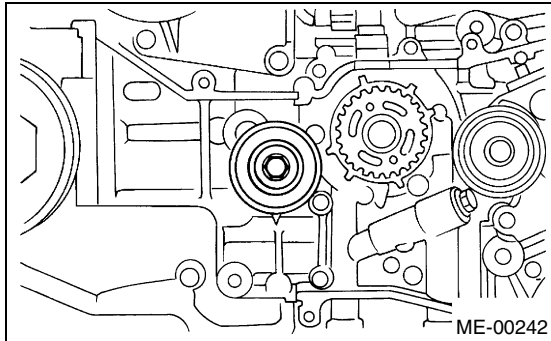
39 N·m (4.0 kgf·m, 28.9 ft·lb)



3) Install the belt idler (No. 1).

Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)



2. TIMING BELT

1) Preparation for the installation of automatic belt tension adjuster assembly. <Ref. to ME(SOHC)-47, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

2) Installation of timing belt

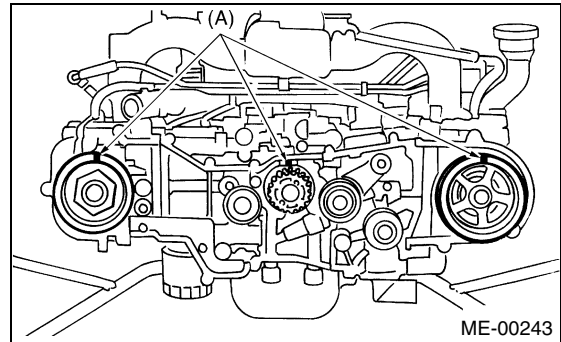
(1) Turn the camshaft sprocket No. 2 using ST1, and then turn the camshaft sprocket No. 1 using ST2 so that their alignment marks (A) come to top positions.

ST1 18231AA010 CAMSHAFT SPROCKET WRENCH

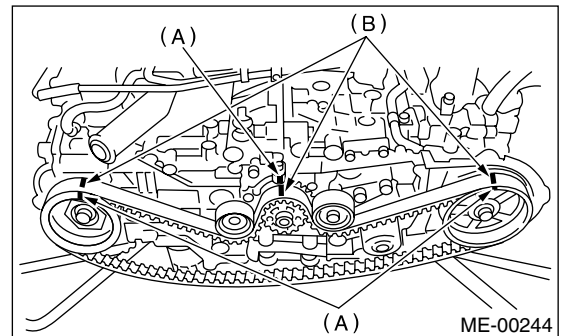
NOTE:

Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.

ST2 499207400 CAMSHAFT SPROCKET WRENCH



(2) While aligning alignment marks (B) on the timing belt with marks (A) on sprockets, position the timing belt properly.



3) Install the belt idler No. 2.

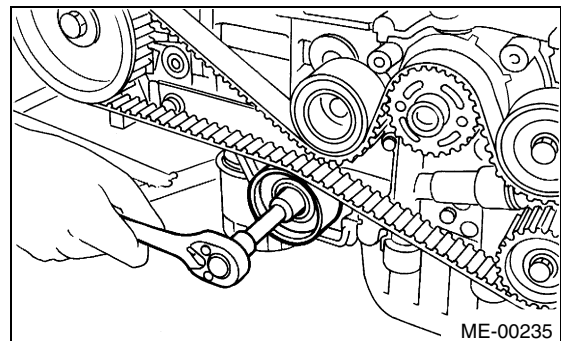
Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)

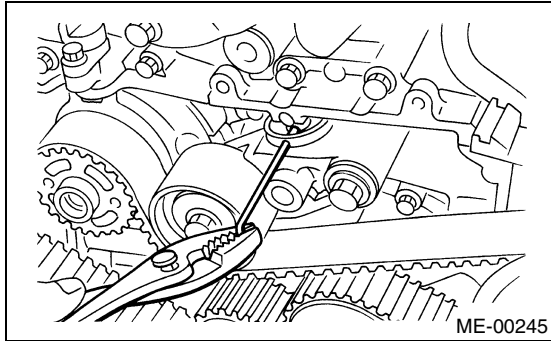
4) Install the belt idler (No. 2).

Tightening torque:

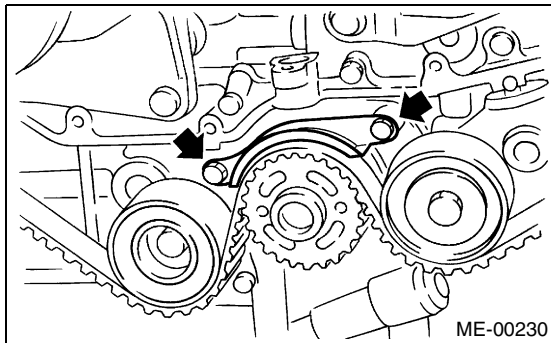
39 N·m (4.0 kgf·m, 28.9 ft·lb)



5) After ensuring that the marks on timing belt and camshaft sprockets are aligned, remove the stopper pin from belt tension adjuster.

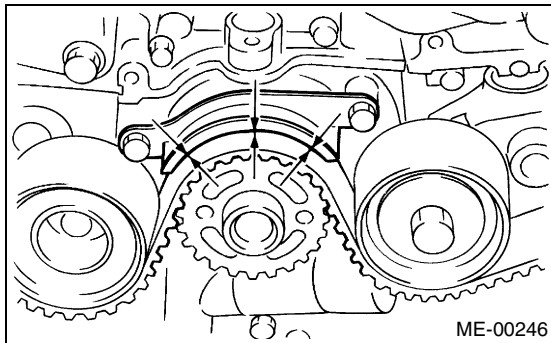


6) Install the timing belt guide. (MT vehicles)
(1) Temporarily tighten the remaining bolts.



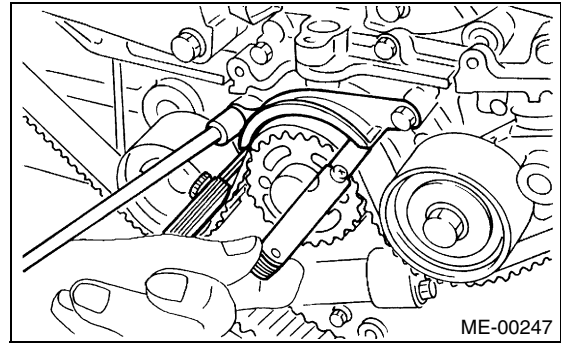
(2) Check and adjust the clearance between timing belt and timing belt guide by using thickness gauge.

Clearance:
 $1.0 \pm 0.5 \text{ mm (0.039} \pm 0.020 \text{ in)}$



(3) Tighten the remaining bolts.

Tightening torque:
 $10 \text{ N}\cdot\text{m (1.0 kgf}\cdot\text{m, 7.2 ft}\cdot\text{lb)}$



7) Install the belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>

8) Install the crankshaft pulley. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>

9) Install the V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>

C: INSPECTION

1. TIMING BELT

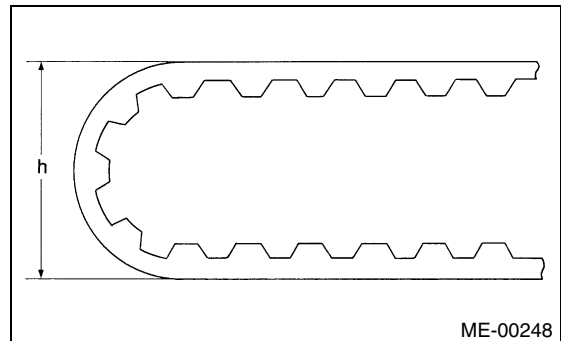
1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace the belt.

2) Check the condition of back side of belt; if any crack is found, replace the belt.

CAUTION:

- Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
- Do not bend the belt sharply.

Bending radius: h
 $60 \text{ mm (2.36 in) or more}$



TIMING BELT ASSEMBLY

MECHANICAL

2. AUTOMATIC BELT TENSION ADJUST-ER

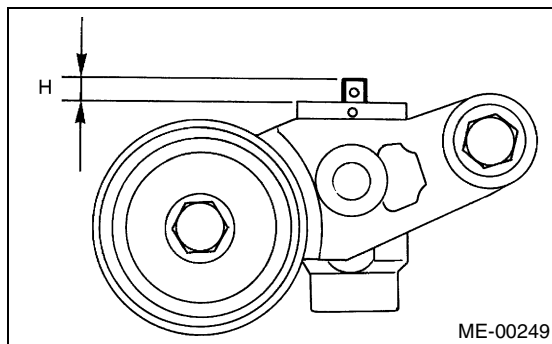
- 1) Visually check oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace faulty parts.
- 2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 66 lb) is applied to it. This is to check adjuster rod stiffness.
- 3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kgf, 66 lb), check it using the following procedures:
 - (1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.
 - (2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kgf, 66 lb) to it. Check adjuster rod stiffness.
 - (3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

CAUTION:

- Always use a vertical type pressing tool to move the adjuster rod down.
 - Do not use a lateral type vise.
 - Push the adjuster rod vertically.
 - Press-in the adjuster rod gradually taking more than 3 minutes.
 - Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
 - Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
- 4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: H

$5.7 \pm 0.5 \text{ mm (0.224} \pm 0.020 \text{ in)}$



3. BELT TENSION PULLEY

- 1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the automatic belt tension adjuster assembly if faulty.
- 2) Check the tension pulley for smooth rotation. Replace if noise or excessive play is noted.
- 3) Check the tension pulley for grease leakage.

4. BELT IDLER

- 1) Check the belt idler for smooth rotation. Replace if noise or excessive play is noted.
- 2) Check the belt outer contacting surfaces of idler pulley for abnormal wear and scratches.
- 3) Check the belt idler for grease leakage.

16. Camshaft Sprocket

A: REMOVAL

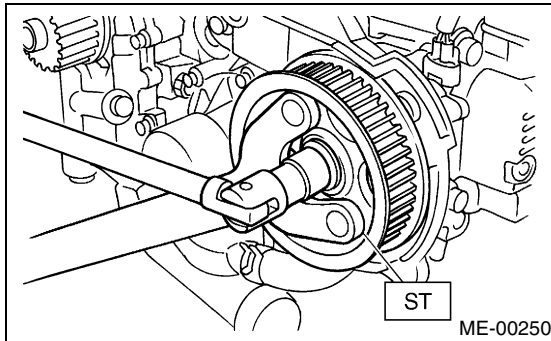
1. REMOVAL

- 1) Remove the V-belt. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft position sensor. <Ref. to FU(SOHC)-28, REMOVAL, Camshaft Position Sensor.>
- 6) Remove the camshaft sprocket No. 2. To lock the camshaft, use ST.

ST 18231AA010 CAMSHAFT SPROCKET WRENCH

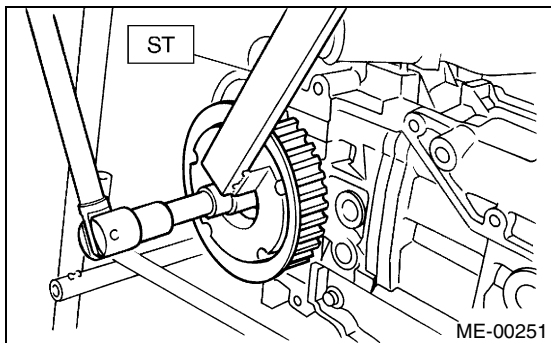
NOTE:

Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.



- 7) Remove the camshaft sprocket No. 1. To lock the camshaft, use ST.

ST 499207400 CAMSHAFT SPROCKET WRENCH



B: INSTALLATION

- 1) Install the camshaft sprocket No. 1. To lock the camshaft, use ST.

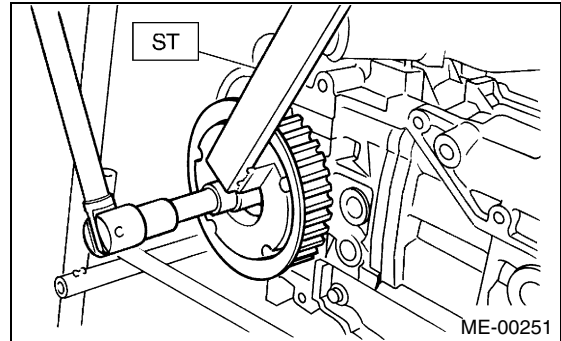
ST 499207400 CAMSHAFT SPROCKET WRENCH

Tightening torque:

78 N·m (8.0 kgf·m, 57.9 ft·lb)

NOTE:

Do not confuse the right and left side camshaft sprockets during installation. The camshaft sprocket No. 2 is identified by a projection used to monitor camshaft position sensor.



- 2) Install the camshaft sprocket No. 2. To lock camshaft, use ST.

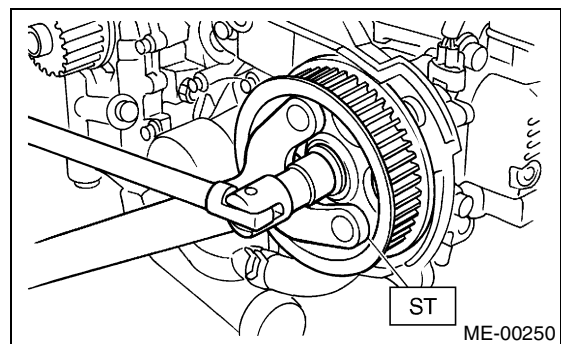
ST 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:

Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.

Tightening torque:

78 N·m (8.0 kgf·m, 57.9 ft·lb)



- 3) Install the camshaft position sensor. <Ref. to FU(SOHC)-28, INSTALLATION, Camshaft Position Sensor.>

- 4) Install the timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>

- 5) Install the belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>

- 6) Install the crankshaft pulley. <Ref. to ME(SOHC)-43, INSTALLATION, Crankshaft Pulley.>

CAMSHAFT SPROCKET

MECHANICAL

7) Install the V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>

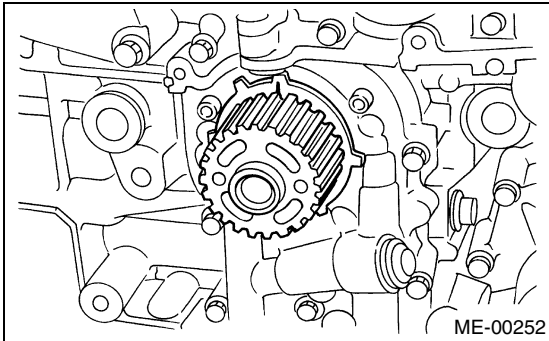
C: INSPECTION

- 1) Check the sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check the camshaft sprocket notch for sensor for damage and contamination of foreign matter.

17. Crankshaft Sprocket

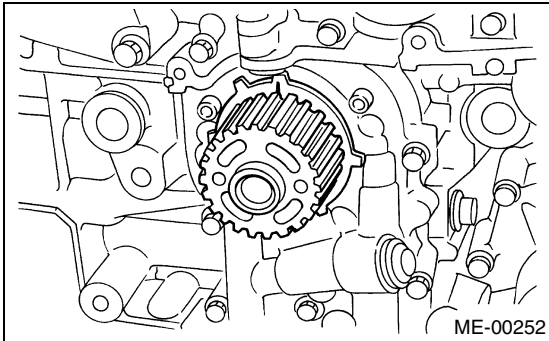
A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME(SOHC)-51, REMOVAL, Camshaft Sprocket.>
- 6) Remove the crankshaft sprocket.



B: INSTALLATION

- 1) Install the crankshaft sprocket.



- 2) Install the camshaft sprocket. <Ref. to ME(SOHC)-51, INSTALLATION, Camshaft Sprocket.>
- 3) Install the timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>
- 4) Install the belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>
- 5) Install the crankshaft pulley. <Ref. to ME(SOHC)-43, INSTALLATION, Crankshaft Pulley.>
- 6) Install the V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>

C: INSPECTION

- 1) Check the sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.

- 3) Check the crankshaft sprocket notch for sensor for damage and contamination of foreign matter.

VALVE ROCKER ASSEMBLY

MECHANICAL

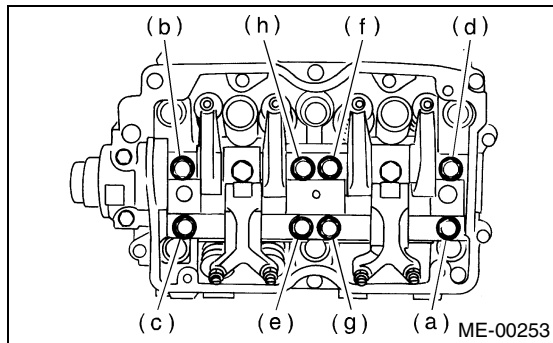
18. Valve Rocker Assembly

A: REMOVAL

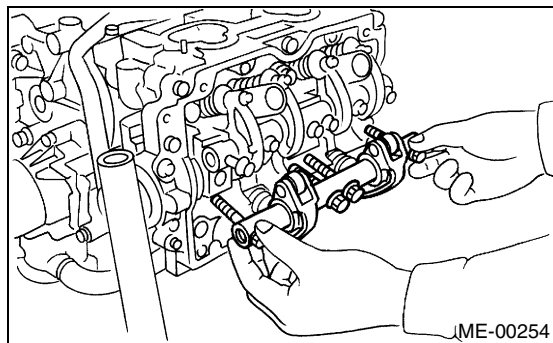
- 1) Remove the V-belt. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME(SOHC)-51, REMOVAL, Camshaft Sprocket.>
- 6) Disconnect the PCV hose and remove rocker cover.
- 7) Removal of valve rocker assembly
 - (1) Remove the bolts (a) through (h) in alphabetical sequence.

NOTE:

Leave two or three threads of bolts (g and h) engaged to retain the valve rocker assembly.



- (2) Remove the valve rocker assembly.



B: INSTALLATION

- 1) Installation of valve rocker assembly
 - (1) Temporarily tighten the bolts (a) through (d) equally as shown in the figure.

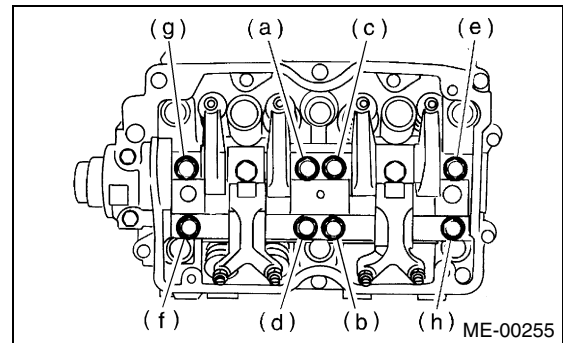
NOTE:

Do not allow the valve rocker assembly to gouge knock pins.

- (2) Tighten the bolts (e) through (h) to specified torque.
- (3) Tighten the bolts (a) through (d) to specified torque.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



- 2) Adjust the valve clearances. <Ref. to ME(SOHC)-30, ADJUSTMENT, Valve Clearance.>
- 3) Install the rocker cover and connect PCV hose.
- 4) Install the camshaft sprocket. <Ref. to ME(SOHC)-51, INSTALLATION, Camshaft Sprocket.>
- 5) Install the timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>
- 6) Install the belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>
- 7) Install the crankshaft pulley. <Ref. to ME(SOHC)-43, INSTALLATION, Crankshaft Pulley.>
- 8) Install the V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>

C: DISASSEMBLY

- 1) Remove the bolts which secure rocker shaft.
- 2) Extract the rocker shaft. Remove the valve rocker arms, springs and shaft supports from rocker shaft.

NOTE:

Arrange all removed parts in order so that they can be installed in their original positions.

- 3) Remove the nut and adjuster screw from valve rocker.

D: ASSEMBLY

- 1) Install the adjuster screw and nut to valve rocker.
- 2) Arrange the valve rocker arms, springs and shaft supports in assembly order and insert valve rocker shaft.

Tightening torque (Shaft supports installing bolts):

5 N·m (0.5 kgf-m, 3.6 ft-lb)

NOTE:

Valve rocker arms, rocker shaft and shaft supports have identification marks. Ensure the parts with same markings are properly assembled.

- 3) Install the valve rocker shaft securing bolts.

E: INSPECTION

1. VALVE ROCKER ARM AND ROCKER SHAFT

- 1) Measure the inside diameter of valve rocker arm and outside diameter of valve rocker shaft, and determine the difference between the two (= oil clearance).

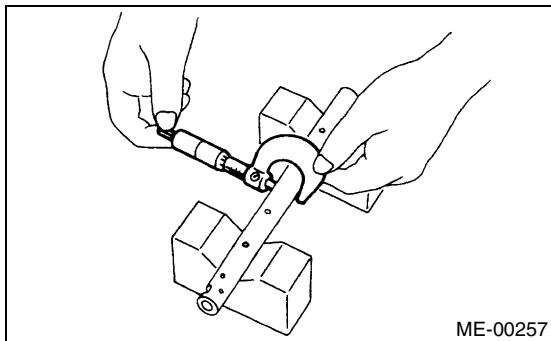
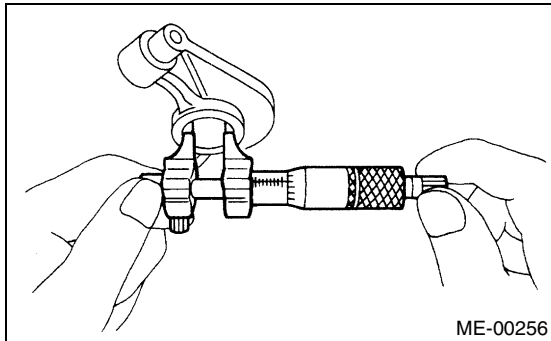
Clearance between arm and shaft:

Standard

0.020 — 0.054 mm (0.0008 — 0.0021 in)

Limit

0.10 mm (0.0039 in)



- 2) If oil clearance exceeds the limit, replace the valve rocker arm or shaft, whichever shows greater amount of wear.

Rocker arm inside diameter:

22.020 — 22.041 mm (0.8669 — 0.8678 in)

Rocker shaft diameter:

21.987 — 22.000 mm (0.8656 — 0.8661 in)

- 3) If cam or valve contact surface of valve rocker arm is worn or dented excessively, replace the valve rocker arm.

- 4) Check that the valve rocker arm roller rotates smoothly. If not, replace the valve rocker arm.

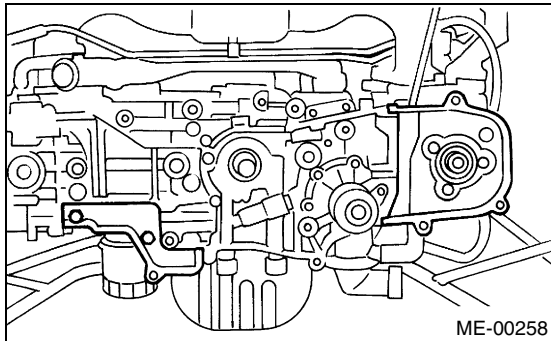
19. Camshaft

A: REMOVAL

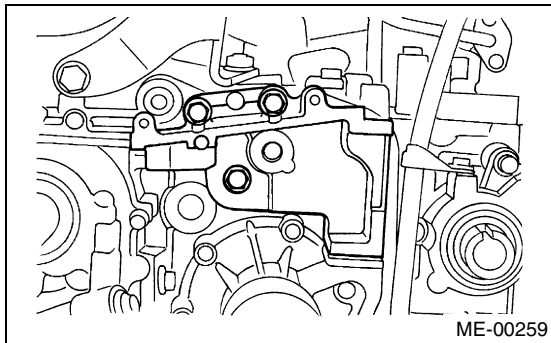
- 1) Remove the V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME(SOHC)-51, REMOVAL, Camshaft Sprocket.>
- 6) Remove the crankshaft sprocket. <Ref. to ME(SOHC)-53, REMOVAL, Crankshaft Sprocket.>
- 7) Remove the belt cover No. 2 (LH).
- 8) Remove the belt cover No. 2 (RH).

NOTE:

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

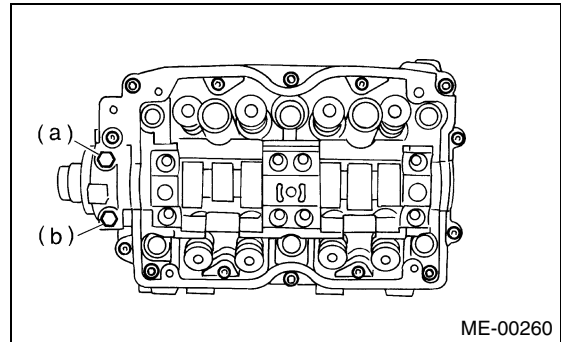


- 9) Remove the tensioner bracket.

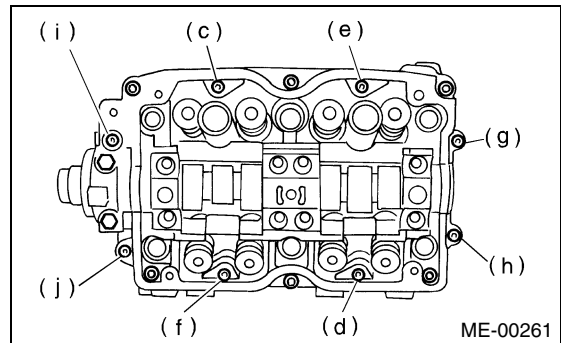


- 10) Remove the camshaft position sensor support. (LH side only)
- 11) Remove the oil level gauge guide. (LH side only)
- 12) Remove the valve rocker assembly. <Ref. to ME(SOHC)-54, REMOVAL, Valve Rocker Assembly.>
- 13) Remove the camshaft cap.

- (1) Remove the bolts (a) through (b) in alphabetical sequence.

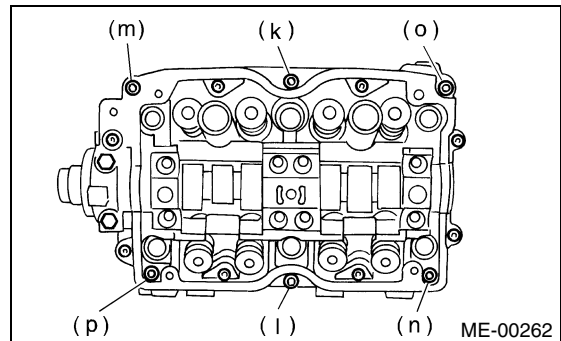


- (2) Equally loosen the bolts (c) through (j) all the way in alphabetical sequence.

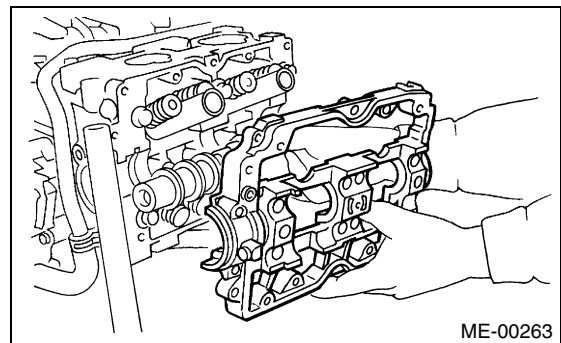


- (3) Remove the bolts (k) through (p) in alphabetical sequence using ST.

ST 499497000 TORX PLUS



- (4) Remove the camshaft cap.



- 14) Remove the camshaft.
- 15) Remove the oil seal.

16) Remove the plug from rear side of camshaft.

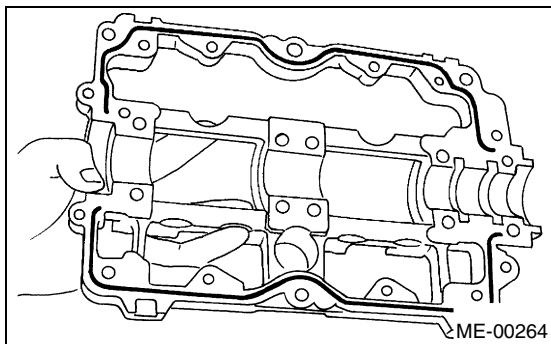
CAUTION:

- Do not remove the oil seal unless necessary.
- Do not scratch the journal surface when removing oil seal.

B: INSTALLATION

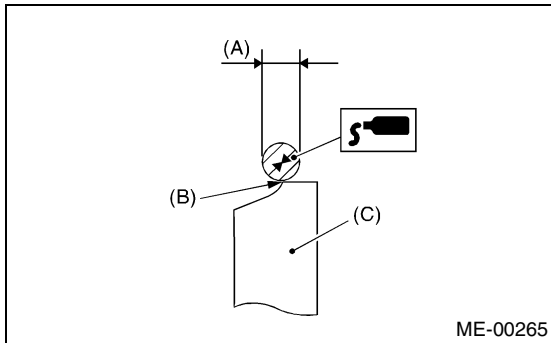
- 1) Apply a coat of engine oil to the camshaft journals, and then install the camshaft.
- 2) Install the camshaft cap.
 - (1) Apply liquid gasket on the around of camshaft cap.

Liquid gasket:
THREE BOND 1280B
P/N K0877YA018

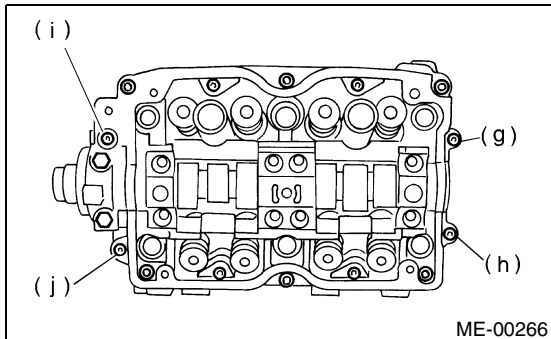


NOTE:

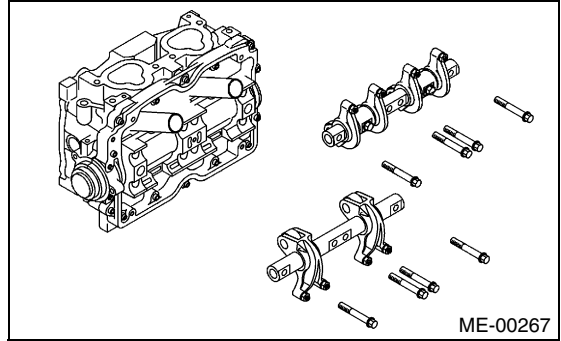
Apply a coat of 3 mm (0.12 in) dia (A). liquid gasket along edge (B) of the camshaft cap (C) mating surface.



(2) Temporarily tighten the bolts (g) through (j) in alphabetical sequence.



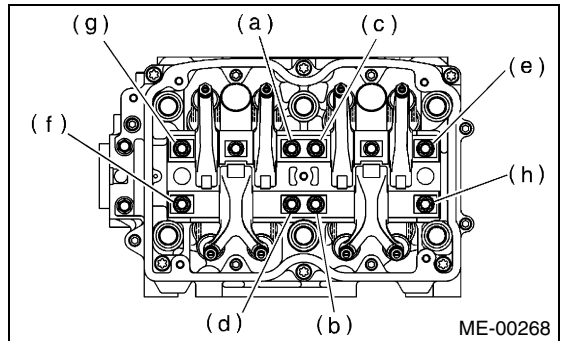
(3) Install the valve rocker assembly.



(4) Tighten the bolts (a) through (h) in alphabetical sequence.

Tightening torque:

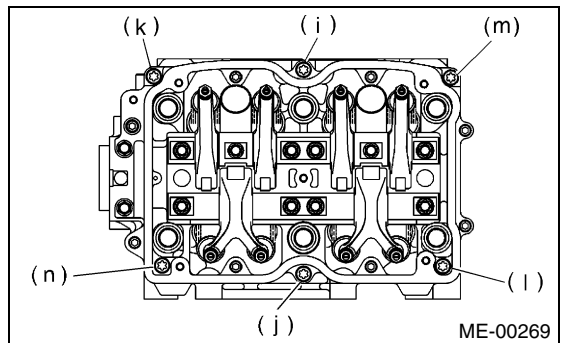
25 N·m (2.5 kgf·m, 18.1 ft·lb)



(5) Tighten the TORX bolts (i) through (n) in alphabetical sequence using ST. ST 499497000 TORX PLUS

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)



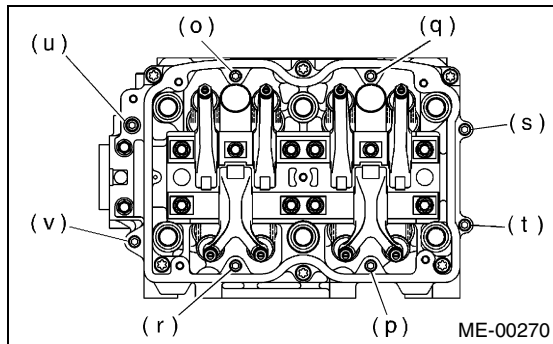
CAMSHAFT

MECHANICAL

(6) Tighten the bolts (o) through (v) in alphabetical sequence.

Tightening torque:

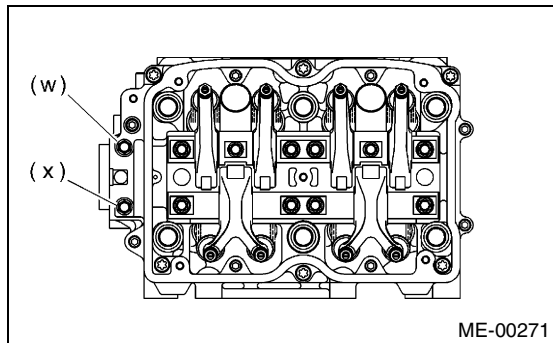
10 N·m (1.0 kgf·m, 7.2 ft·lb)



(7) Tighten the bolts (w) through (x) in alphabetical sequence.

Tightening torque:

10 N·m (1.0 kgf·m, 7.2 ft·lb)

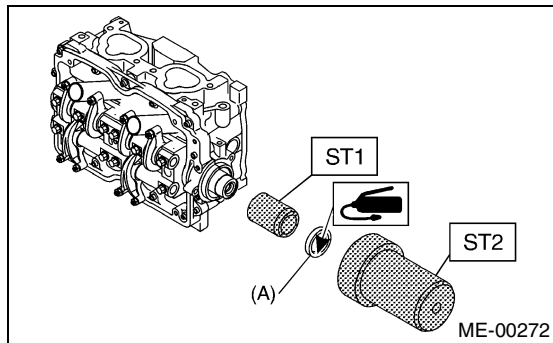


3) Apply a coat of grease to oil seal lips, and then install the oil seal (A) on camshaft using ST1 and ST2.

NOTE:

Use a new oil seal.

| | | |
|-----|-----------|--------------------|
| ST1 | 499597000 | OIL SEAL GUIDE |
| ST2 | 499587500 | OIL SEAL INSTALLER |



4) Install the plug using ST.

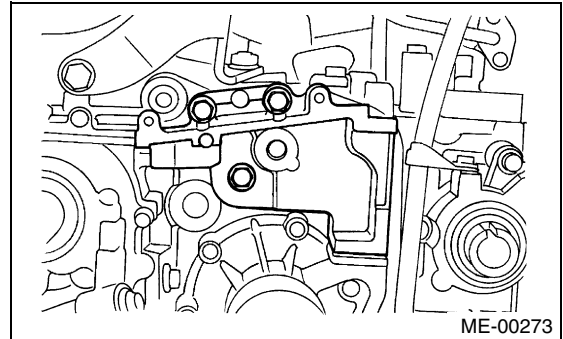
| | | |
|----|-----------|-----------------------------|
| ST | 499587700 | CAMSHAFT OIL SEAL INSTALLER |
|----|-----------|-----------------------------|

5) Adjust the valve clearance. <Ref. to ME(SOHC)-30, ADJUSTMENT, Valve Clearance.>

- 6) Install the rocker cover and connect PCV hose.
- 7) Install the oil level gauge guide. (LH side only)
- 8) Install the camshaft position sensor support. (LH side only)
- 9) Install the tensioner bracket.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



10) Install the belt cover No. 2 (RH).

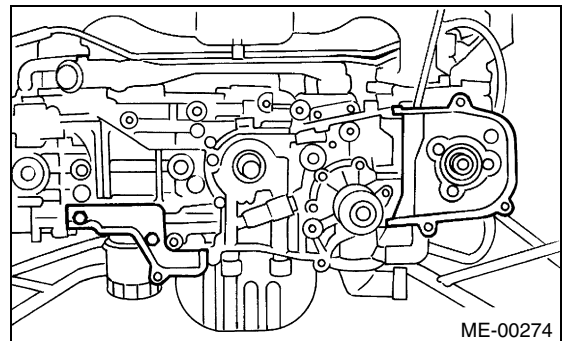
Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)

11) Install the belt cover No. 2 (LH).

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)



12) Install the crankshaft sprocket.

<Ref. to ME(SOHC)-53, INSTALLATION, Crankshaft Sprocket.>

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

14) Install the timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>

15) Install the belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>

16) Install the crankshaft pulley. <Ref. to ME(SOHC)-43, INSTALLATION, Crankshaft Pulley.>

17) Install the V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>

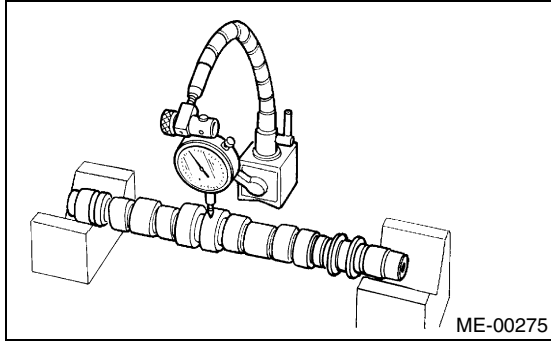
C: INSPECTION

1. CAMSHAFT

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

Limit:

0.025 mm (0.0010 in)



- 2) Check the journal for damage and wear. Replace if faulty.
- 3) Measure the outside diameter of camshaft journal and inside diameter of cylinder head journal, and determine the difference between two (= oil clearance). If the oil clearance exceeds specifications, replace the camshaft or cylinder head as necessary.

| Unit: mm (in) | | |
|-----------------------|----------|-----------------------------------|
| Clearance at journal | Standard | 0.055 — 0.090 (0.0022 — 0.0035) |
| | Limit | 0.10 (0.0039) |
| Camshaft journal O.D. | | 31.928 — 31.945 (1.2570 — 1.2577) |
| Journal hole I.D. | | 32.000 — 32.018 (1.2598 — 1.2605) |

4) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

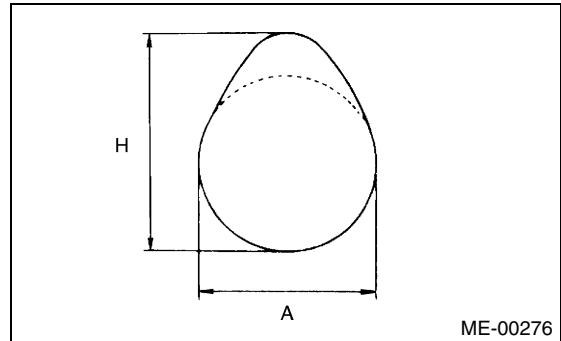
Cam height: H

| Model | Item | Unit: mm (in) | |
|---------|---------|---------------|--|
| 2000 cc | Intake | STD | 38.732 — 38.832 (1.5249 — 1.528885) |
| | | Limit | 38.632 (1.5209) |
| | Exhaust | STD | 39.257 — 39.357 (1.5455 — 1.5495) |
| | | Limit | 39.157 (1.5416) |
| 2500 cc | Intake | STD | 39.485 — 39.585 (1.5545 — 1.5585) |
| | | Limit | 39.385 (1.5506) |
| | Exhaust | STD | 39.257 — 39.357 (1.5455 — 1.5495) |
| | | Limit | 39.157 (1.5416) |

Cam base circle diameter A:

IN: 34.00 mm (1.3386 in)

EX: 34.00 mm (1.3386 in)



2. CAMSHAFT SUPPORT

Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace the camshaft support.

Standard:

0.030 — 0.090 mm (0.0012 — 0.0035 in)

Limit:

0.10 mm (0.0039 in)

