ENGINE SECTION 1

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

ENGINE SECTION 1

MECHANICAL

ME(H4SO 2.0)

1. General Description

A: SPECIFICATION

	Model		2.0 L	2.5 L
Engine	Cylinder arrangement		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
	Valve system mechanism		Belt driven, single over-head camshaft, 4-valve/ cylinder	
	Bore × Stroke mm (in)		92 × 75 (3.62 × 2.95)	99.5 × 79.0 (3.917 × 3.110)
	Displacement cm^3 (cu in)		1,994 (121.67)	2,457 (150)
	Compression ratio		10.0	
	Compression pressure (at 350 rpm) kPa (kg/cm^2, psi)		1,020 — 1,275 (10.4 — 13.0, 148 — 185)	
	Number of piston rings		Pressure ring: 2, Oil ring: 1	
	Intake valve timing	Open	BTDC 2°	BTDC 2°
		Close	ABDC 54°	ABDC 56°
	Exhaust valve timing	Open	BBDC 39°	BBDC 50°
		Close	ATDC 5°	ATDC 8°
	Valve clearance mm (in)	Intake	0.20±0.04 (0.0079±0.0016)	
		Exhaust	0.25±0.04 (0.0098±0.0016)	
	Idle speed [at neutral position on MT, or “P” or “N” range on AT] rpm		650±100 (No load) 800±100 (A/C ON)	
	Ignition order		1 → 3 → 2 → 4	
	Ignition timing BTDC/rpm		13°±10°/650	

NOTE:
US: undersize OS: oversize

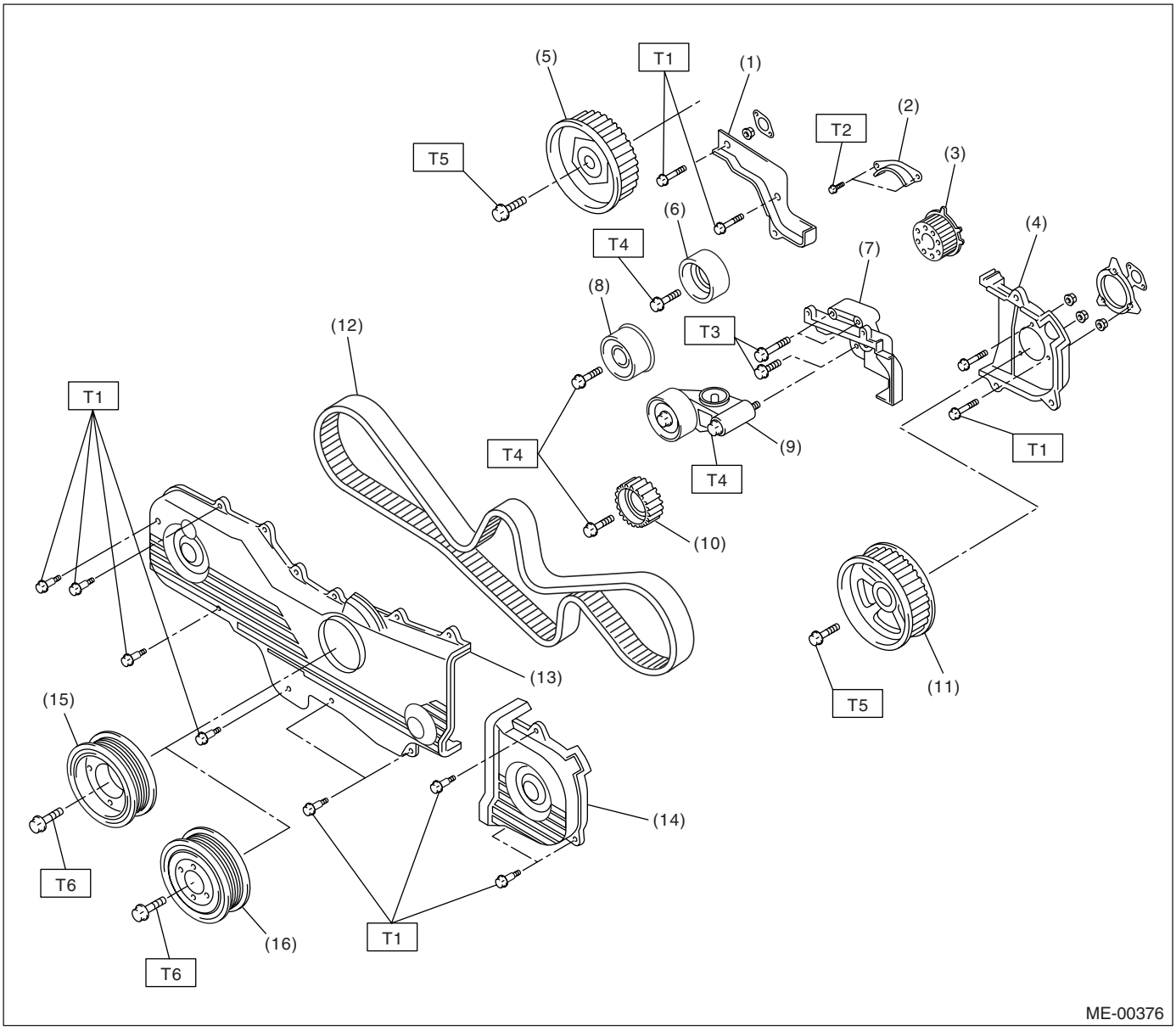
Belt tension adjuster	Protrusion of adjuster rod mm (in)				5.2 — 6.2 (0.205 — 0.244)
Belt tensioner	Spacer O.D. mm (in)				17.955 — 17.975 (0.7069 — 0.7077)
	Tensioner bushing I.D. mm (in)				18.00 — 18.08 (0.7087 — 0.7118)
	Clearance between spacer and bushing mm (in)			Standard	0.025 — 0.125 (0.0010 — 0.0049)
	Side clearance of spacer mm (in)			Standard	0.20 — 0.55 (0.0079 — 0.0217)
Valve rocker arm	Clearance between shaft and arm mm (in)			Standard	0.020 — 0.054 (0.0008 — 0.0021)
Camshaft	Bend limit mm (in)				0.020 (0.00079)
	Side clearance mm (in)			Standard	0.030 — 0.090 (0.0012 — 0.0035)
	Cam lobe height mm (in)	2.0 L	Intake	Standard	39.646 — 39.746 (1.5609 — 1.5648)
			Exhaust	Standard	39.351 — 39.451 (1.5493 — 1.5532)
		2.5 L	Intake	Standard	39.485 — 39.585 (1.5545 — 1.5585)
			Exhaust	Standard	39.904 — 40.004 (1.5710 — 1.5750)
	Camshaft journal O.D. mm (in)				31.928 — 31.945 (1.2570 — 1.2577)
	Camshaft journal hole I.D. mm (in)				32.000 — 32.018 (1.2598 — 1.2605)
	Oil clearance mm (in)			Standard	0.055 — 0.090 (0.0022 — 0.0035)
Cylinder Head	Surface warpage limit (mating with cylinder block) mm (in)				0.03 (0.001)
	Grinding limit mm (in)				0.1 (0.004)
	Standard height mm (in)				97.5 (3.84)

Valve seat	Refacing angle				90°
	Contacting width mm (in)		Intake	Standard	0.8 — 1.4 (0.03 — 0.055)
			Exhaust	Standard	1.2 — 1.8 (0.047 — 0.071)
Valve guide	Inside diameter mm (in)				6.000 — 6.012 (0.2362 — 0.2367)
	Protrusion above head mm (in)			Intake	20.0 — 21.0 (0.787 — 0.827)
				Exhaust	16.5 — 17.5 (0.650 — 0.689)
Valve	Head edge thickness mm (in)		Intake	Standard	0.8 — 1.2 (0.03 — 0.047)
			Exhaust	Standard	1.0 — 1.4 (0.039 — 0.055)
	Stem outer diameters mm (in)			Intake	5.950 — 5.965 (0.2343 — 0.2348)
				Exhaust	5.945 — 5.960 (0.2341 — 0.2346)
	Valve stem gap mm (in)		Standard	Intake	0.035 — 0.062 (0.0014 — 0.0024)
				Exhaust	0.040 — 0.067 (0.0016 — 0.0026)
	Overall length mm (in)			Intake	120.6 (4.75)
				Exhaust	121.7 (4.79)
Valve springs	Free length mm (in)				54.30 (2.1378)
	Squareness				2.5°, 2.4 mm (0.094 in)
	Tension/spring height N (kgf, lb)/mm (in)			Set	214 — 246 (22 — 25, 48 — 55)/ 45.0 (1.772)
				Lift	526 — 582 (54 — 59, 119 — 130)/ 34.7 (1.366)
Cylinder block	Surface warpage limit (mating with cylinder head) mm (in)				0.025 (0.00098)
	Grinding limit mm (in)				0.1 (0.004)
	Standard height mm (in)				201.0 (7.91)
	Cylinder inner diameter mm (in)	2.0 L	Standard	A	92.005 — 92.015 (3.6222 — 3.6226)
				B	91.995 — 92.005 (3.6218 — 3.6222)
		2.5 L	Standard	A	99.505 — 99.515 (3.9175 — 3.9179)
				B	99.495 — 99.505 (3.9171 — 3.9175)
	Taper mm (in)			Standard	0.015 (0.0006)
	Out-of-roundness mm (in)			Standard	0.010 (0.0004)
	Piston clearance mm (in)			Standard	−0.010 — 0.010 (−0.00039 — 0.00039)
	Boring limit mm (in)				0.5 (0.020)
Piston	Outer diameter mm (in)	2.0 L	Standard	A	92.005 — 92.015 (3.6222 — 3.6226)
				B	91.995 — 92.005 (3.6219 — 3.6222)
			0.25 (0.0098) OS		92.245 — 92.265 (3.6317 — 3.6325)
			0.50 (0.0197) OS		92.495 — 92.515 (3.6415 — 3.6423)
		2.5 L	Standard	A	99.505 — 99.515 (3.9175 — 3.9179)
				B	99.495 — 99.505 (3.9171 — 3.9175)
			0.25 (0.0098) OS		99.745 — 99.765 (3.9270 — 3.9278)
			0.50 (0.0197) OS		99.995 — 100.015 (3.9368 — 3.9376)
	Piston pin standard diameter mm (in)				23.000 — 23.006 (0.9055 — 0.9057)
Piston pin	Outer diameter mm (in)				22.994 — 23.000 (0.9053 — 0.9055)
	Standard clearance between piston and piston pin mm (in)				0.004 — 0.008 (0.0002 — 0.0003)
	Degree of fit				Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston Ring	Ring closed gap mm (in)		Top ring		Standard 0.20 — 0.35 (0.0079 — 0.0138)
			Second ring	2.0 L	Standard 0.40 — 0.50 (0.0157 — 0.0197)
				2.5 L	Standard 0.35 — 0.50 (0.0138 — 0.0197)
			Oil ring		Standard 0.20 — 0.50 (0.0079 — 0.0197)
	Ring groove gap mm (in)		Top ring		Standard 0.040 — 0.080 (0.0016 — 0.0031)
			Second ring		Standard 0.030 — 0.070 (0.0012 — 0.0028)

Connecting Rod	Bend twist per 100 mm (3.94 in) in length	mm (in)	Limit		0.10 (0.0039)
	Side clearance of large end	mm (in)	Standard		0.070 — 0.330 (0.0028 — 0.0130)
Bearing of large end	Oil clearance	mm (in)	Standard		0.016 — 0.044 (0.00063 — 0.0017)
	Bearing size (Thickness at center)	mm (in)	Standard		1.492 — 1.501 (0.0587 — 0.0591)
			0.03 (0.0012) US		1.510 — 1.513 (0.0594 — 0.0596)
			0.05 (0.0020) US		1.520 — 1.523 (0.0598 — 0.0600)
			0.25 (0.0098) US		1.620 — 1.623 (0.0638 — 0.0639)
Bush of small end	Clearance between piston pin and bushing	mm (in)	Standard		0 — 0.022 (0 — 0.0009)
Crankshaft	Bend limit			mm (in)	0.035 (0.0014)
	Crank pin	Out-of-roundness mm (in)	2.0 L		0.005 (0.0002)
			2.5 L		0.003 (0.0001)
		Cylindricality mm (in)	2.0 L		0.006 (0.0002)
			2.5 L		0.004 (0.0002)
		Grinding limit (dia.)		mm (in)	To 51.750 (2.0374)
	Crank journal	Out-of-roundness		mm (in)	0.005 (0.0002)
		Cylindricality		mm (in)	0.006 (0.0002)
		Grinding limit (dia.)		mm (in)	To 59.750 (2.3524)
	Crank pin outer diameter	mm (in)	Standard		51.984 — 52.000 (2.0466 — 2.0472)
			0.03 (0.0012) US		51.954 — 51.970 (2.0454 — 2.0461)
			0.05 (0.0020) US		51.934 — 51.950 (2.0446 — 2.0453)
			0.25 (0.0098) US		51.734 — 51.750 (2.0368 — 2.0374)
	Crank journal outer diameter	mm (in)	Standard		59.992 — 60.008 (2.3619 — 2.3625)
			0.03 (0.0012) US		59.962 — 59.978 (2.3607 — 2.3613)
			0.05 (0.0020) US		59.942 — 59.958 (2.3599 — 2.3605)
			0.25 (0.0098) US		59.742 — 59.758 (2.3520 — 2.3527)
	Side clearance	mm (in)	Standard		0.030 — 0.115 (0.0012 — 0.0045)
	Oil clearance	mm (in)	Standard		0.010 — 0.030 (0.0001 — 0.0012)
Main bearing	Main bearing mm (in)	#1, #3	Standard		1.998 — 2.011 (0.0787 — 0.0792)
			0.03 (0.0012) US		2.017 — 2.020 (0.0794 — 0.0795)
			0.05 (0.0020) US		2.027 — 2.030 (0.0798 — 0.0799)
			0.25 (0.0098) US		2.127 — 2.130 (0.0837 — 0.0839)
		#2, #4, #5	Standard		2.000 — 2.013 (0.0787 — 0.0793)
			0.03 (0.0012) US		2.019 — 2.022 (0.0795 — 0.0796)
			0.05 (0.0020) US		2.029 — 2.032 (0.0799 — 0.0800)
			0.25 (0.0098) US		2.129 — 2.132 (0.0838 — 0.0839)

B: COMPONENT

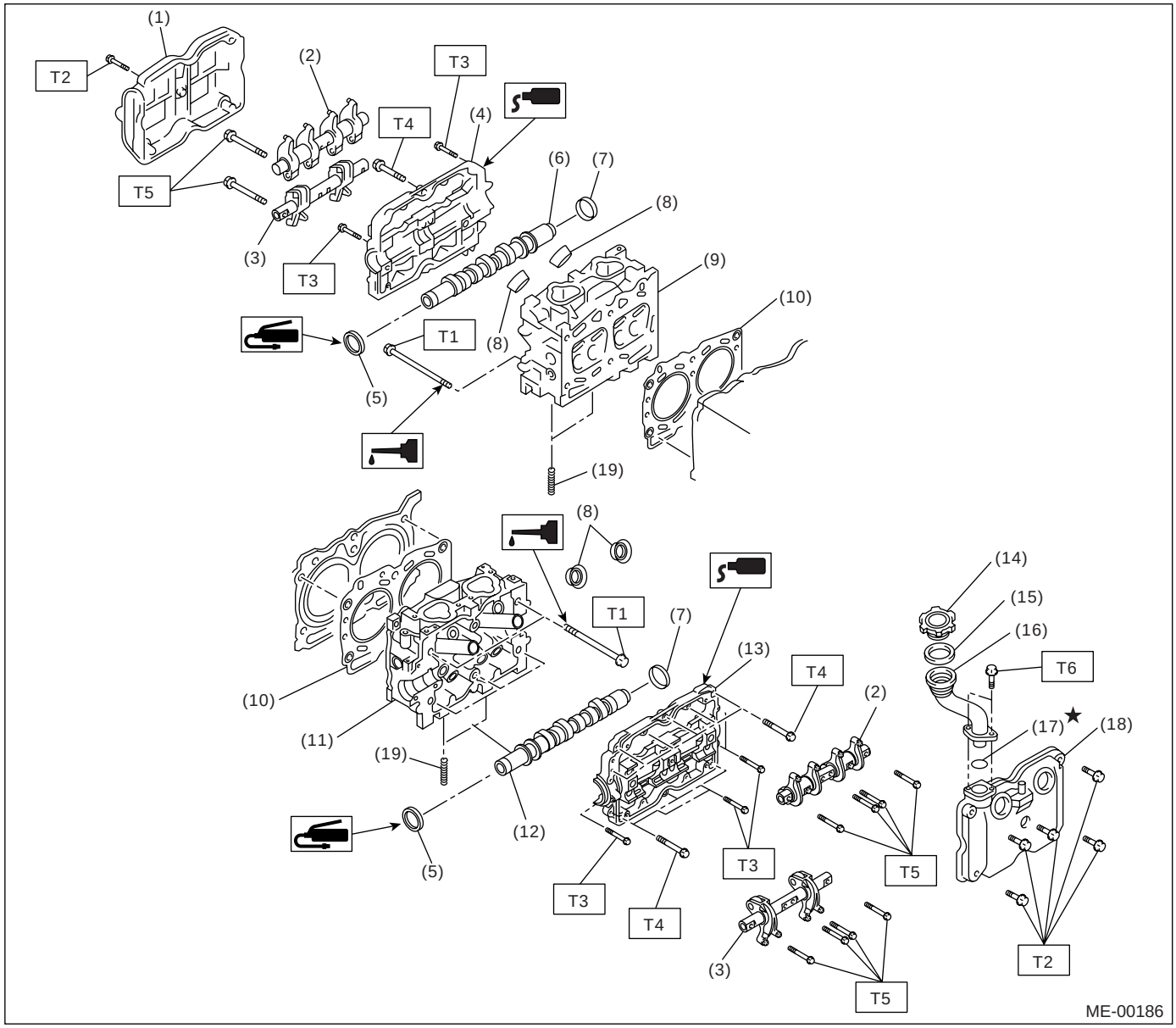
1. TIMING BELT



(1) Timing belt cover No. 2 (RH)
(2) Timing belt guide (MT model)
(3) Crankshaft sprocket
(4) Timing belt cover No. 2 (LH)
(5) Camshaft sprocket No. 1
(6) Belt idler (No. 1)
(7) Tensioner bracket
(8) Belt idler (No. 2)
(9) Automatic belt tension adjuster ASSY
(10) Belt idler No. 2
(11) Camshaft sprocket No. 2
(12) Timing belt
(13) Front timing belt cover
(14) Timing belt cover (LH)
(15) Crank pulley (2.0 L model)
(16) Crank pulley (2.5 L model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 10 (1.0, 7.2)
T3: 25 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: 78 (8.0, 57.9)
T6: <Ref. to ME(H4SO 2.0)-40, INSTALLATION, Crank Pulley.>

2. CYLINDER HEAD AND CAMSHAFT

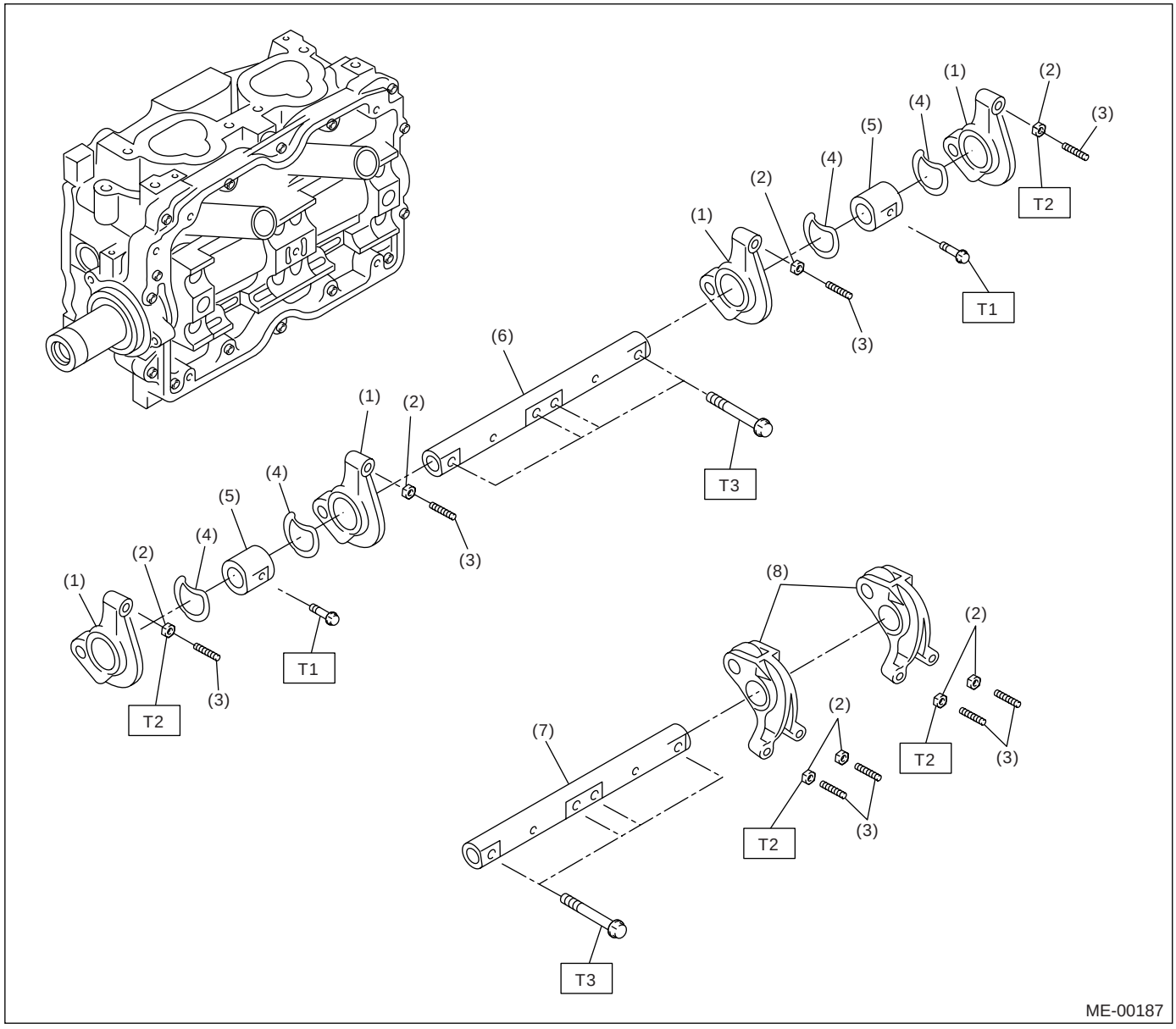


(1) Rocker cover (RH)
(2) Intake valve rocker ASSY
(3) Exhaust valve rocker ASSY
(4) Camshaft cap (RH)
(5) Oil seal
(6) Camshaft (RH)
(7) Plug
(8) Spark plug pipe gasket
(9) Cylinder head (RH)
(10) Cylinder head gasket
(11) Cylinder head (LH)
(12) Camshaft (LH)
(13) Camshaft cap (LH)
(14) Oil filler cap
(15) Gasket
(16) Oil filler duct
(17) O-ring
(18) Rocker cover (LH)
(19) Stud bolt

Tightening torque: N·m (kgf-m, ft-lb)

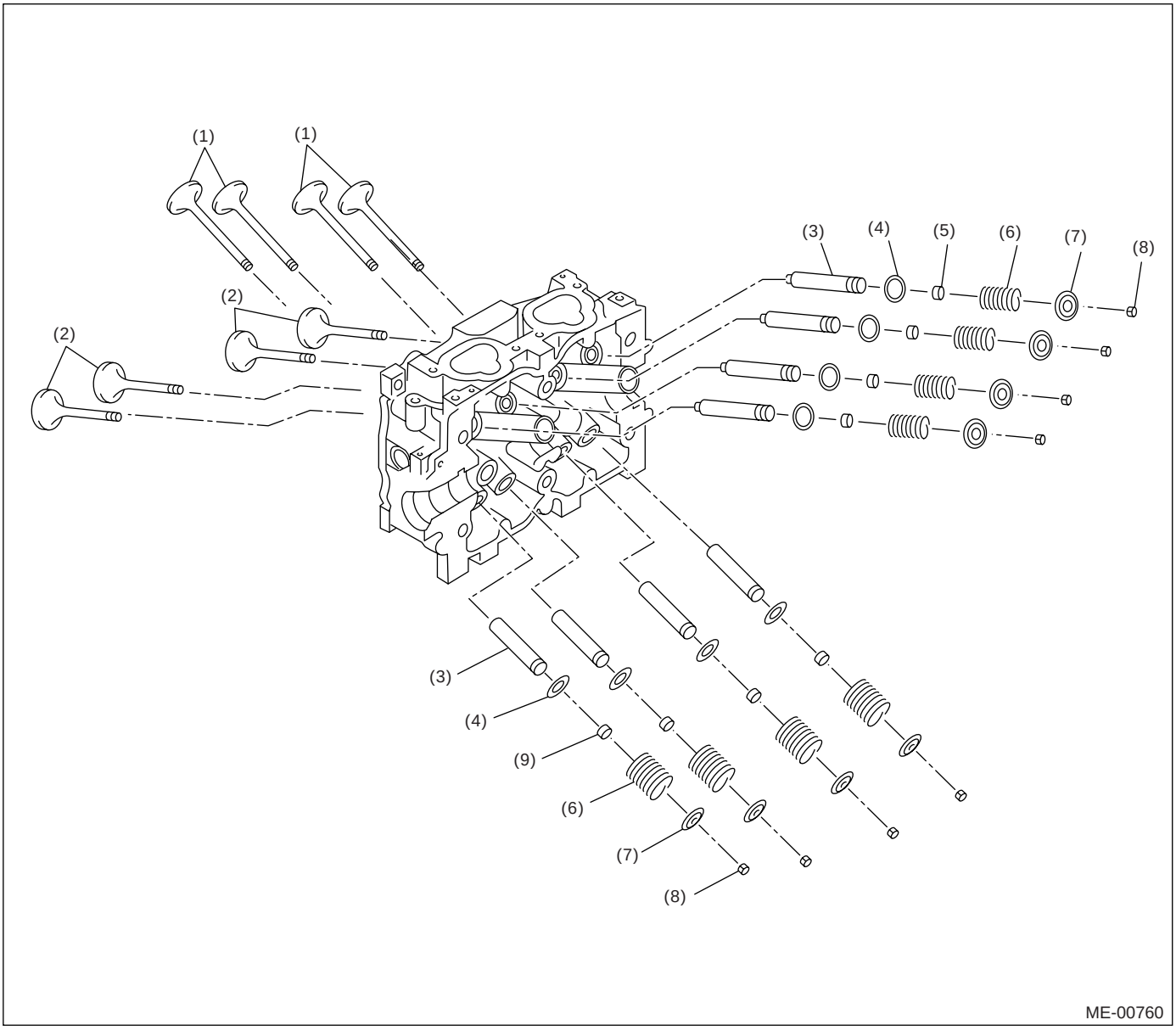
T1: ***<Ref. to ME(H4SO 2.0)-57, INSTALLATION, Cylinder Head.>***
T2: ***5 (0.5, 3.6)***
T3: ***10 (1.0, 7.2)***
T4: ***18 (1.8, 13.0)***
T5: ***25 (2.5, 18.1)***
T6: ***6.4 (0.65, 4.7)***

3. VALVE ROCKER ASSEMBLY



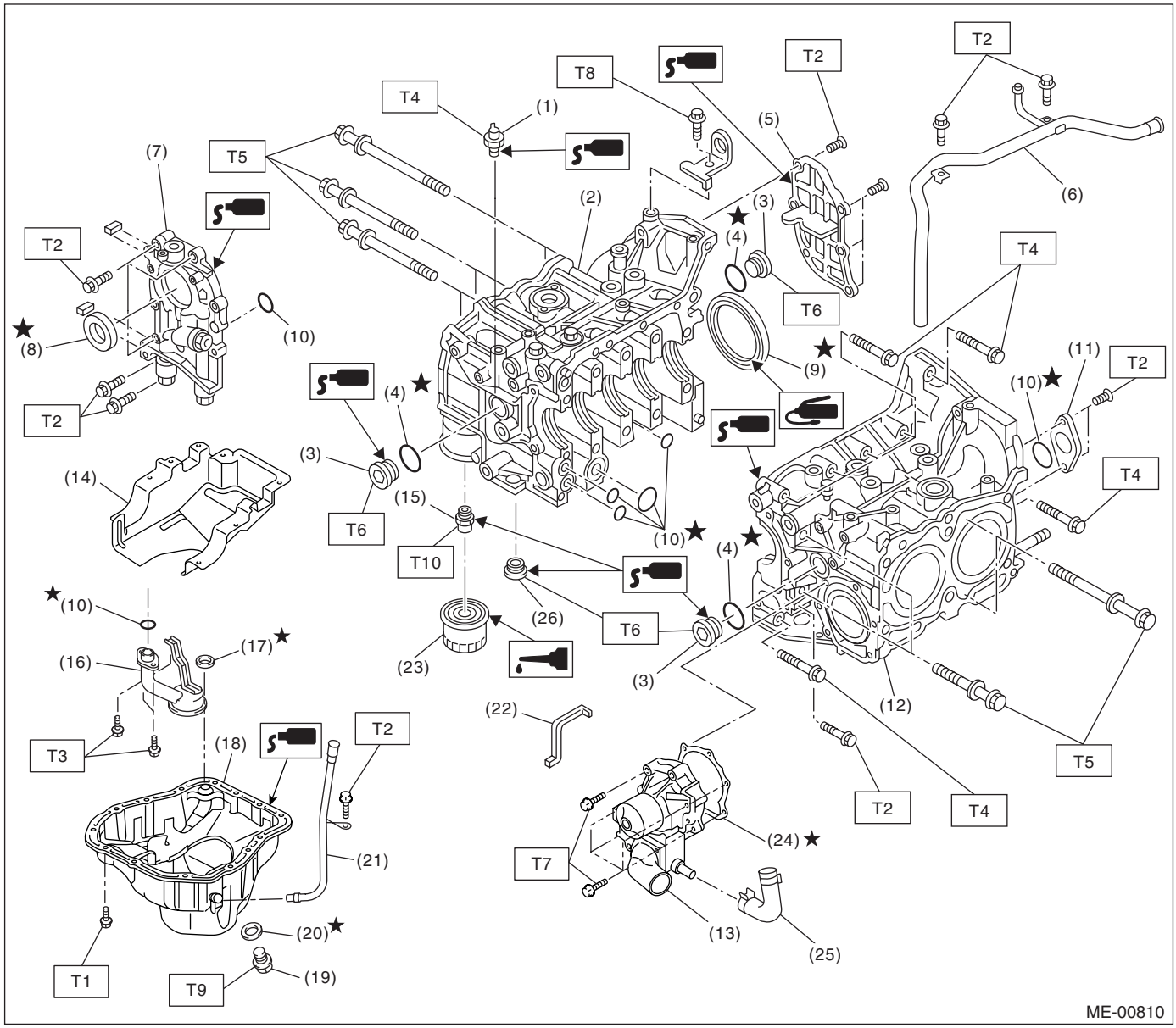
(1)	Intake valve rocker arm	(5)	Rocker shaft support	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Valve rocker nut	(6)	Intake rocker shaft	***T1: 5 (0.5, 3.6)***
(3)	Valve rocker adjust screw	(7)	Exhaust rocker shaft	***T2: 10 (1.0, 7.2)***
(4)	Spring	(8)	Exhaust valve rocker arm	***T3: 25 (2.5, 18.1)***

4. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Valve guide
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Exhaust valve oil seal

5. CYLINDER BLOCK

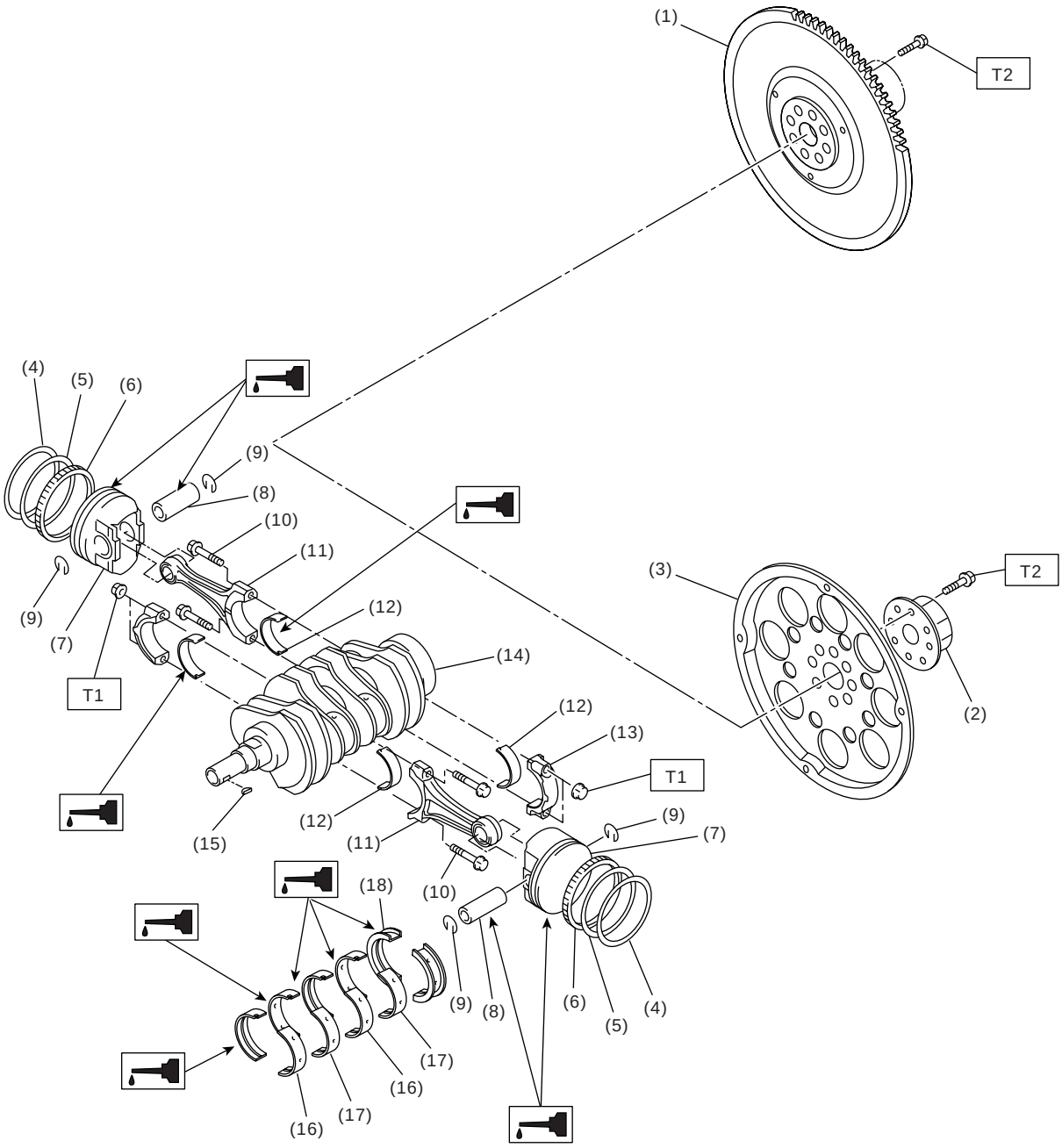


(1)	Oil pressure switch	(14)	Baffle plate
(2)	Cylinder block (RH)	(15)	Oil filter connector
(3)	Service hole plug	(16)	Oil strainer
(4)	Gasket	(17)	Gasket
(5)	Oil separator cover	(18)	Oil pan
(6)	Water by-pass pipe	(19)	Drain plug
(7)	Oil pump	(20)	Metal gasket
(8)	Front oil seal	(21)	Oil level gauge guide
(9)	Rear oil seal	(22)	Water pump sealing
(10)	O-ring	(23)	Oil filter
(11)	Service hole cover	(24)	Gasket
(12)	Cylinder block (LH)	(25)	Water pump hose
(13)	Water pump	(26)	Seal

Tightening torque: N·m (kgf-m, ft-lb)

T1:	***5 (0.5, 3.6)***
T2:	***6.4 (0.65, 4.7)***
T3:	***10 (1.0, 7.2)***
T4:	***25 (2.5, 18.1)***
T5:	***<Ref. to ME(H4SO 2.0)-67, INSTALLATION, Cylinder Block.>***
T6:	***70 (7.1, 50.6)***
T7:	***First 12 (1.2, 8.7) Second 12 (1.2, 8.7)***
T8:	***16 (1.6, 11.6)***
T9:	***44 (4.5, 33)***
T10:	***45 (4.6, 33.3)***

6. CRANKSHAFT AND PISTON

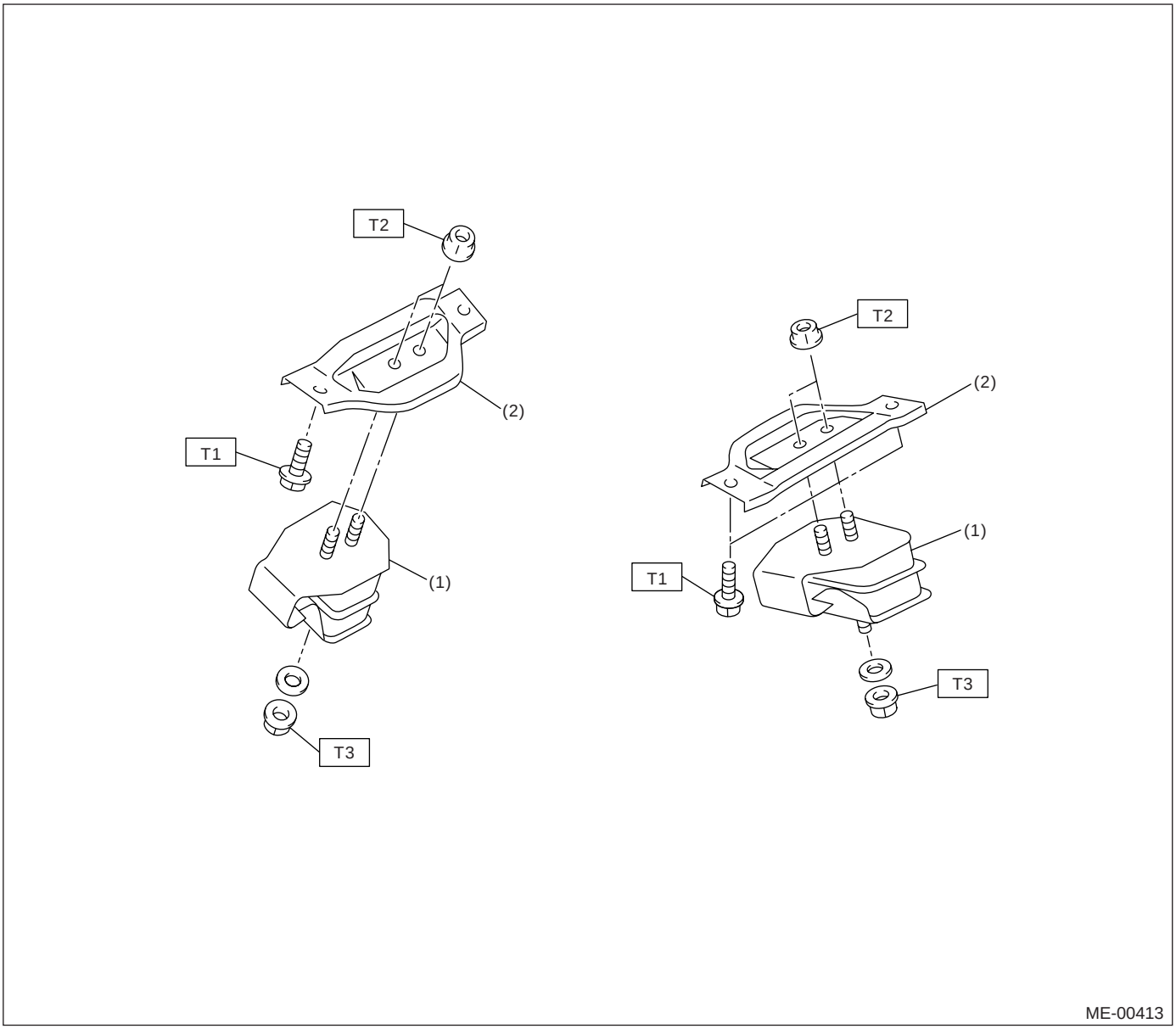


ME-00190

(1)	Flywheel (MT model)	(8)	Piston pin	(15)	Woodruff key
(2)	Reinforcement (AT model)	(9)	Snap ring	(16)	Crankshaft bearing #1, #3
(3)	Drive plate (AT model)	(10)	Connecting rod bolt	(17)	Crankshaft bearing #2, #4
(4)	Top ring	(11)	Connecting rod	(18)	Crankshaft bearing #5
(5)	Second ring	(12)	Connecting rod bearing	***Tightening torque: N·m (kgf-m, ft-lb)***	
(6)	Oil ring	(13)	Connecting rod cap	***T1: 45 (4.6, 33.3)***	
(7)	Piston	(14)	Crankshaft	***T2: 72 (7.3, 52.8)***	

7. ENGINE MOUNTING

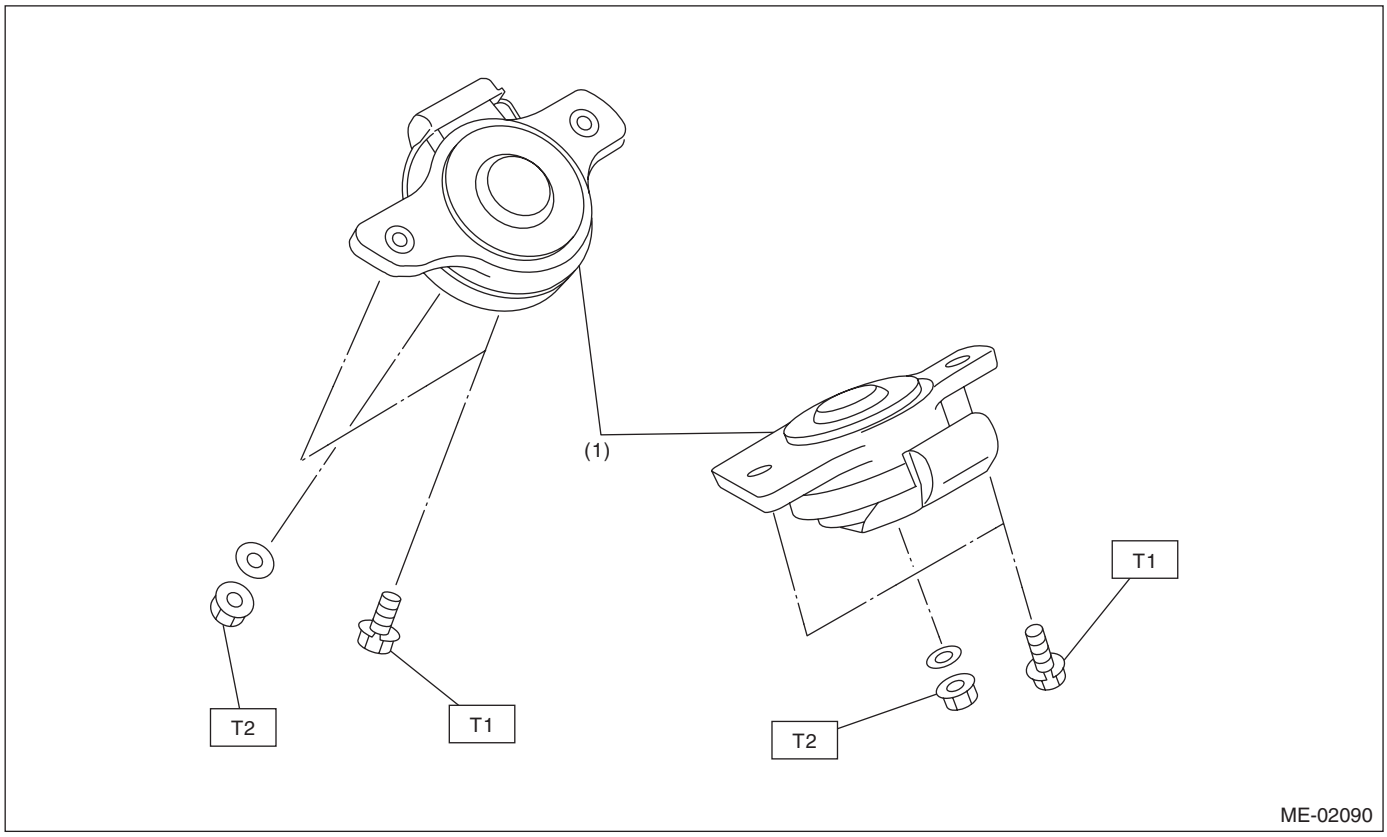
- 2.0 L model



(1) Front cushion rubber
(2) Front engine mounting bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 42 (4.3, 31.0)
T3: 85 (8.7, 63)

- 2.5 L model



(1) Front cushion rubber

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 85 (8.7, 62.7)

C: CAUTION

• Wear work clothing, including a cap, protective goggles and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn yourself, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
• All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
• Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
• Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
• All removed parts, if to be reused, should be reinstalled in the original positions and directions.
• Bolts, nuts and washers should be replaced with new ones as required.
• Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
• Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
• Be sure not to damage coated surfaces of body panels with tools, or not to stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
• Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
• Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOL

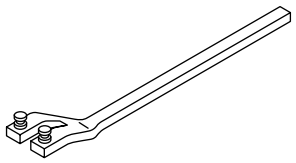
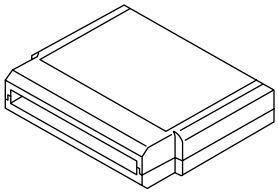
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18231AA010	18231AA010	CAM SPROCKET WRENCH	• Used for removing and installing cam sprocket. (LH side) • CAM SPROCKET WRENCH (499207100) can also be used.
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical system.

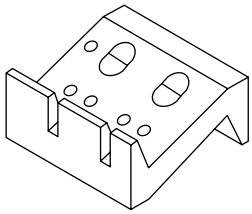
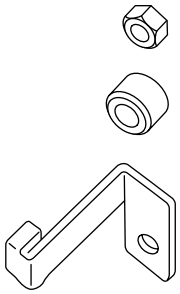
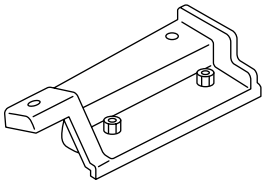
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)
 ST-498267800	498267800	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve spring.
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817100).

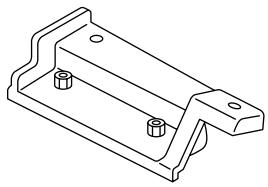
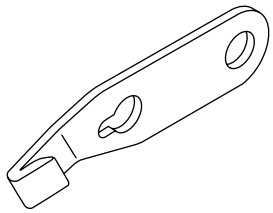
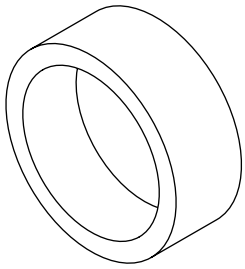
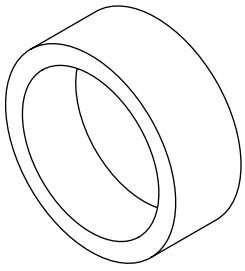
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817100).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening/tightening crank pulley bolt.
 ST-398744300	398744300	PISTON GUIDE	Used for installing piston in cylinder. (2.0 L model)
 ST-498747300	498747300	PISTON GUIDE	Used for installing piston in cylinder. (2.5 L model)

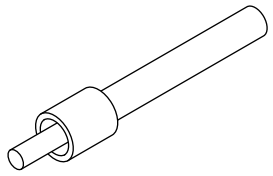
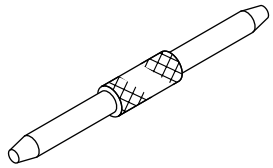
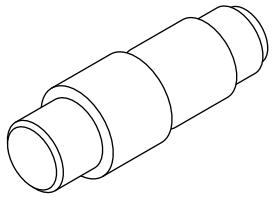
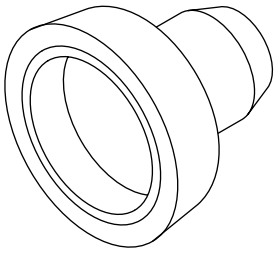
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST-499017100	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST-499037100	499037100	CONNECTING ROD BUSHING REMOVER AND INSTALLER	Used for removing and installing connecting rod bushing.
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).

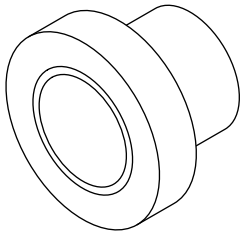
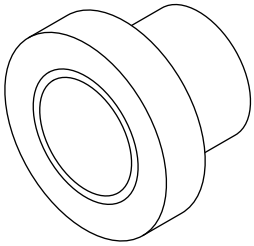
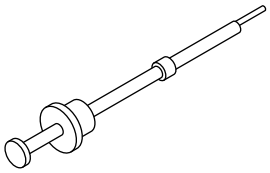
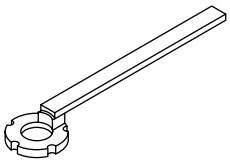
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499587500	499587500	OIL SEAL INSTALLER	• Used for installing camshaft oil seal. • Used with OIL SEAL GUIDE (499597000).
 ST-499587700	499587700	CAMSHAFT OIL SEAL INSTALLER	Used for installing cylinder head plug.
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 ST-499207400	499207400	CAM SPROCKET WRENCH	Used for removing and installing cam sprocket. (RH side)

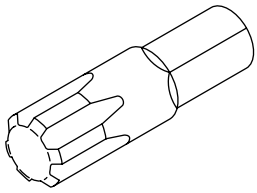
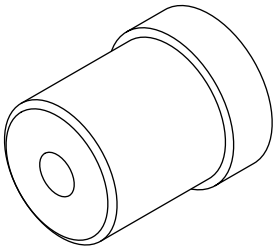
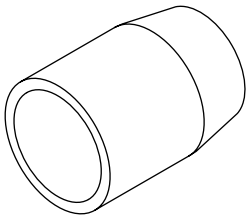
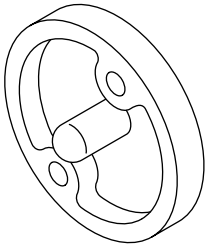
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499497000	499497000	TORX® PLUS	Used for removing and installing camshaft cap.
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 ST-499597000	499597000	OIL SEAL GUIDE	• Used for installing camshaft oil seal. • Used with CAMSHAFT OIL SEAL INSTALLER (499587500).
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).

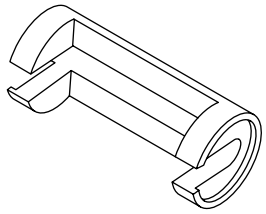
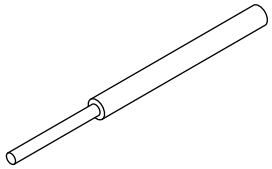
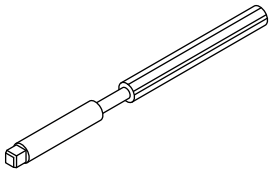
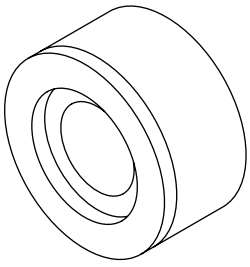
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499767700	499767700	VALVE GUIDE ADJUSTER	Used for installing valve guides. (Intake side)

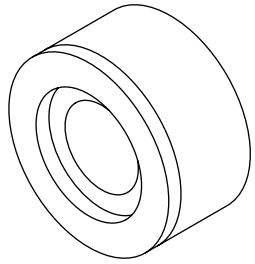
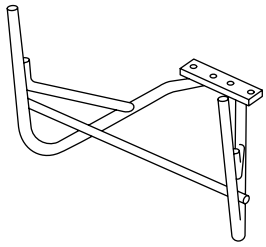
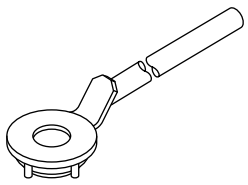
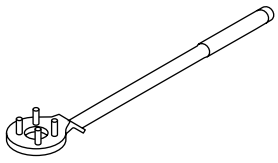
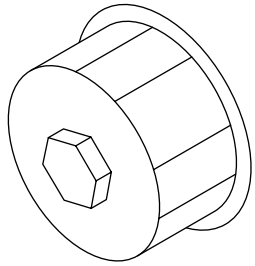
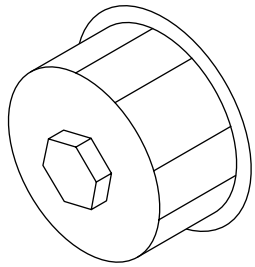
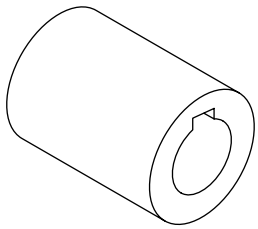
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499767800	499767800	VALVE GUIDE ADJUSTER	Used for installing valve guides. (Exhaust side)
 ST-499817100	499817100	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 ST-499977400	499977400	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening/tightening crank pulley bolt. (2.0 L model)
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening/tightening crank pulley bolt. (2.5 L model)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.

2. GENERAL TOOL

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.
Tachometer (Secondary pick-up type)	Used for measuring idle speed.
Timing light	Used for measuring ignition timing.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing belt
- Valve rocker assembly
- Camshaft
- Cylinder head

2. Compression

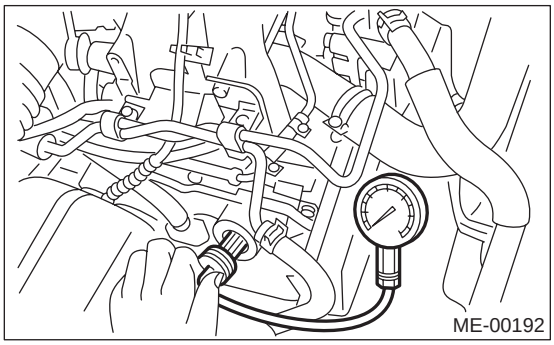
A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) After warming-up the engine, turn the ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Release the fuel pressure.
<Ref. to FU(H4SO 2.0)-38, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
4) Remove all the spark plugs. <Ref. to IG(H4SO 2.0)-5, REMOVAL, Spark Plug.>
5) Fully open the throttle valve.
6) Check the starter motor for satisfactory performance and operation.
7) Hold the compression gauge tight against the spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

8) Crank the engine by means of the starter motor, and read the maximum value on the gauge when the pointer is steady.



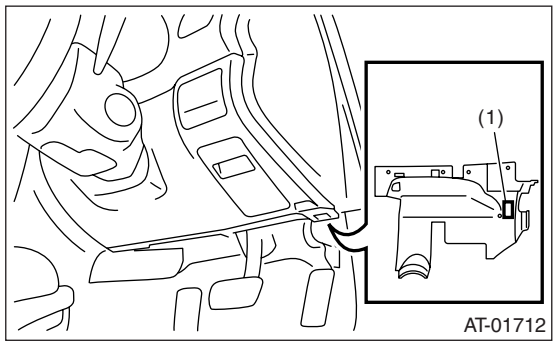
9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard:
1,020 — 1,275 kPa (10.4 — 13.0 kgf/cm^2, 148 — 185 psi)
Difference between cylinders:
49 kPa (0.5 kgf/cm^2, 7 psi) or less

3. Idle Speed

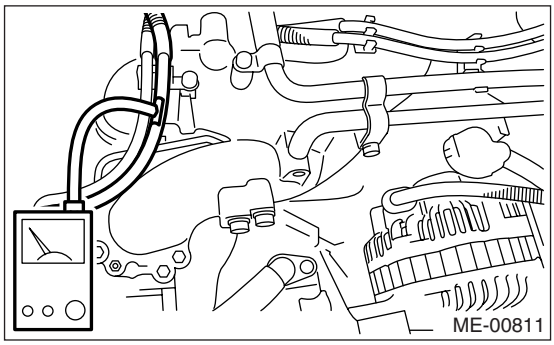
A: INSPECTION

1) Before checking the idle speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Idle the engine.
3) Stop the engine, and turn the ignition switch to OFF.
4) When using Subaru Select Monitor, refer to the following. <Ref. to ME(H4SO 2.0)-13, SPECIAL TOOL, PREPARATION TOOL, General Description.>
   (1) Insert the cartridge to the Subaru Select Monitor.
   (2) Connect the Subaru Select Monitor to data link connector.



(1) Data link connector

   (3) Turn the ignition switch to ON, and Subaru select monitor switch to ON.
   (4) Select {Each System Check} in the Main Menu.
   (5) Select {Engine} in the Selection Menu.
   (6) Select {Current Data Display & Save} in the Engine Control System Diagnosis.
   (7) Select {Data Display} in the Data Display Menu.
   (8) Start the engine, and read engine idle speed.
5) When using the tachometer (Secondary pick-up type):
   (1) Attach the pick-up clip to No. 1 cylinder spark plug cord.
   (2) Start the engine, and read engine idle speed.



NOTE:
This ignition system provides simultaneous ignition for #1 and #2 plugs. It must be noted that some tachometers may register twice that of actual engine speed.

6) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, A/C, etc. OFF)

Idle speed [No load and gears in "N" or "P" range]:
650±100 rpm

7) Check the idle speed when loaded. (Turn the A/C switch to "ON" and operate the compressor for at least one minute before measurement.)

Idle speed [A/C "ON" and gears in "N" or "P" range]:
800±100 rpm

NOTE:
Idle speed cannot be adjusted manually, because the idle speed is automatically adjusted. If the idle speed is out of specifications, refer to General Diagnosis Table under "Engine Control System". <Ref. to EN(H4SO 2.0)(diag)-2, Basic Diagnostic Procedure.>

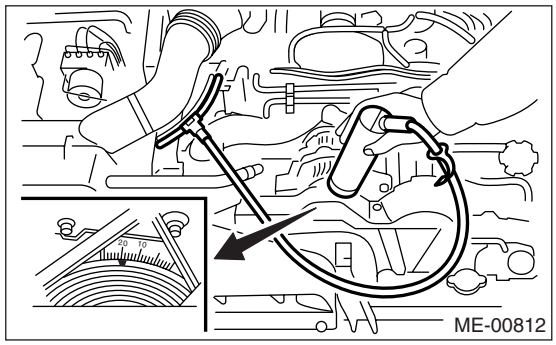
4. Ignition Timing

A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself at measurement.

1) Idle the engine.
2) To check the ignition timing, connect a timing light to #1 cylinder spark plug cord, and illuminate the timing mark with the timing light.
3) Start the engine and check the ignition timing at the following idle speed.

Ignition timing [BTDC/rpm]:
13°±10°/650

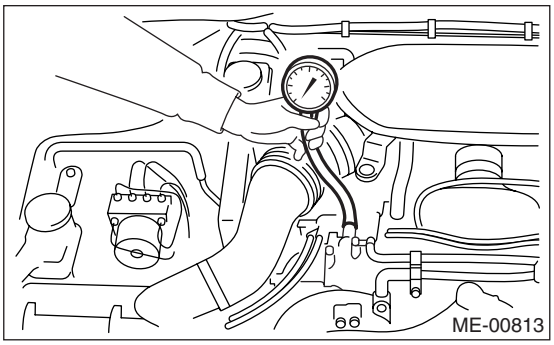


If the timing is not correct, check the ignition control system. <Ref. to EN(H4SO 2.0)(diag)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

1) Idle the engine.
2) Disconnect the brake vacuum hose from the intake manifold, and then install the vacuum gauge.
3) Keep the engine at the idle speed and read the vacuum gauge indication.
By observing the gauge needle movement, the internal condition of the engine can be diagnosed as described below.



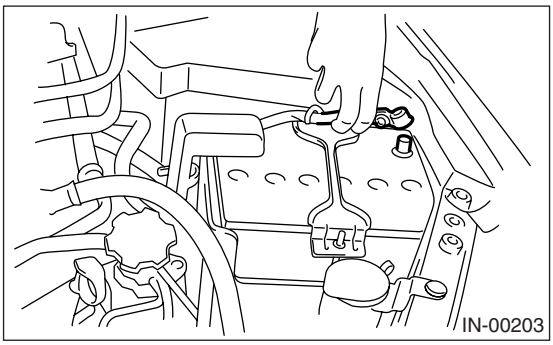
Vacuum pressure (at idling, A/C "OFF"):
Less than −60.0 kPa (−450 mmHg, −17.72 in-Hg)

Diagnosis of engine condition by measurement of intake manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Air leakage around intake manifold gasket, disconnection or damage of vacuum hose
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Exhaust pressure is too high, or exhaust system is clogged.
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
4. Needle drops suddenly and intermittently from normal position.	Valve anchoring
5. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
6. Needle vibrates above and below normal position in narrow range.	Defective ignition system

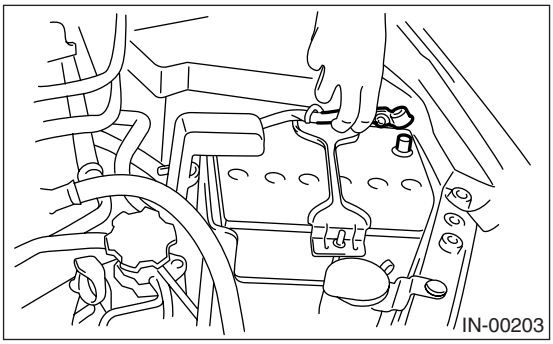
6. Engine Oil Pressure

A: INSPECTION

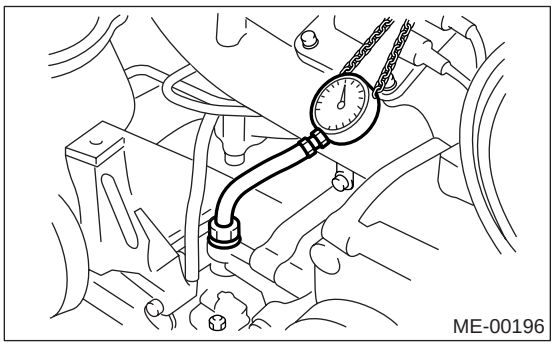
1) Disconnect the ground cable from battery.



2) Remove the generator from bracket. <Ref. to SC(H4SO 2.0)-14, REMOVAL, Generator.>
3) Disconnect the connector from oil pressure switch.
4) Remove the pressure switch from cylinder block. <Ref. to LU(H4SO 2.0)-17, REMOVAL, Oil Pressure Switch.>
5) Connect the oil pressure gauge hose to cylinder block.
6) Connect the battery ground cable to battery.



7) Start the engine, and measure oil pressure.



Oil pressure:
Standard
88 kPa (0.9 kg/cm^2, 13 psi) or more at 800 rpm
294 kPa (3.0 kg/cm^2, 43 psi) or more at 5,000 rpm

CAUTION:
• If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(H4SO 2.0)-19, INSPECTION, General Diagnostic Table.>
• If the oil pressure warning light is turned to ON but oil pressure is within specification, replace the oil pressure switch. <Ref. to LU(H4SO 2.0)-19, INSPECTION, General Diagnostic Table.>

NOTE:
The specified value is based on an engine oil temperature of 80°C (176°F).

8) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H4SO 2.0)-17, INSTALLATION, Oil Pressure Switch.>

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

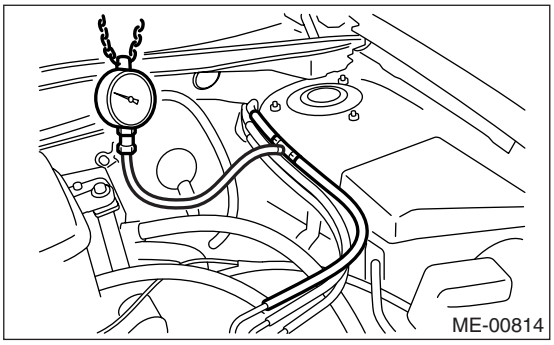
7. Fuel Pressure

A: INSPECTION

WARNING:
Before removing the fuel pressure gauge, release fuel pressure.

NOTE:
When the fuel pressure is out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure.
<Ref. to FU(H4SO 2.0)-38, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid, and remove the fuel filler cap.
3) Disconnect the fuel delivery hose from fuel damper, and connect a fuel pressure gauge.



4) Install the fuse of fuel pump to main fuse box.
5) Start the engine.
6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.

Fuel pressure:
Standard: 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)

7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:
Standard: 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)

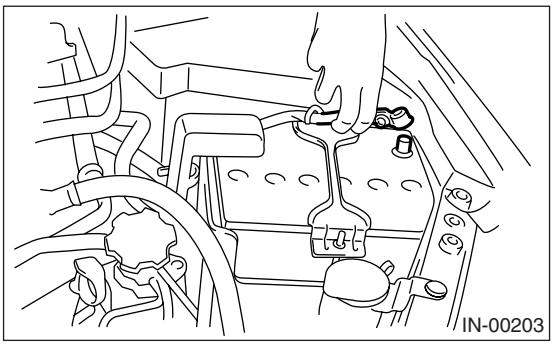
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kg/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

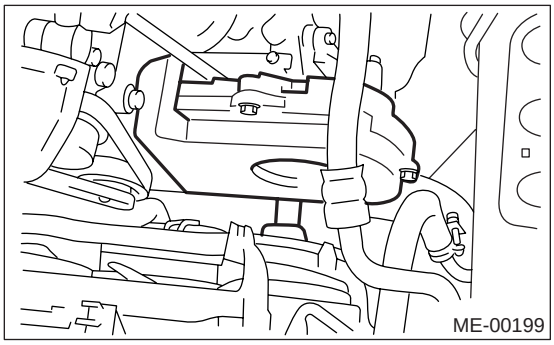
A: INSPECTION

NOTE:
Inspection and adjustment of valve clearance should be performed while engine is cold.

1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Lower the vehicle.
5) Disconnect the ground cable from battery.

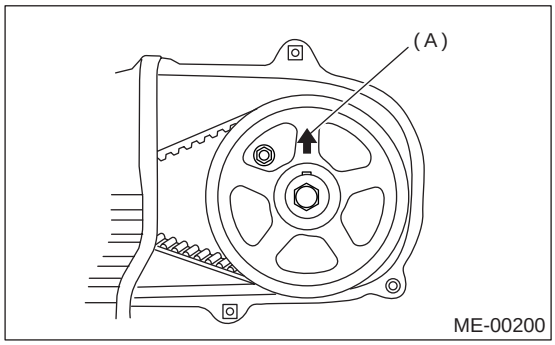


6) Remove the timing belt cover (LH).



7) When inspecting #1 and #3 cylinders:
   (1) Disconnect the spark plug cords from spark plugs RH side. <Ref. to IG(H4SO 2.0)-5, RH SIDE, REMOVAL, Spark Plug.>
   (2) Disconnect the PCV hose from rocker cover (RH).
   (3) Remove the bolts, then remove the rocker cover (RH).
8) When inspecting #2 and #4 cylinders:
   (1) Disconnect the spark plug cords from spark plugs (LH Side). <Ref. to IG(H4SO 2.0)-5, LH SIDE, REMOVAL, Spark Plug.>
   (2) Disconnect the PCV hose from rocker cover (LH).
   (3) Remove the bolts, then remove the rocker cover (LH).
9) Set #1 cylinder piston to top dead center of compression stroke by rotating the crank pulley clockwise using the socket wrench.

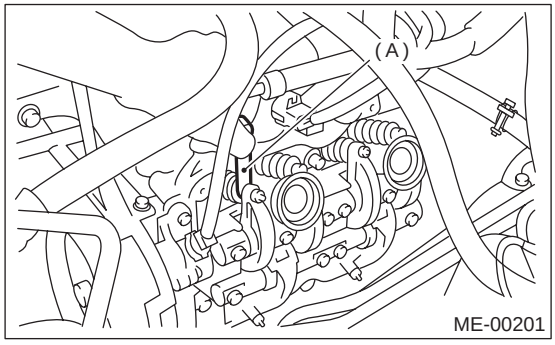
NOTE:
When the arrow mark (A) on cam sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.



10) Measure #1 cylinder valve clearance using thickness gauge.

CAUTION:
• Insert the thickness gauge (A) in as horizontally as possible with respect to the valve stem end face.
• Measure the exhaust valve clearances while lifting-up the vehicle.

Valve clearance (Standard):
Intake:
0.20±0.04 mm (0.0079±0.0016 in)
Exhaust:
0.25±0.04 mm (0.0098±0.0016 in)



11) If necessary, adjust the valve clearance. <Ref. to ME(H4SO 2.0)-29, ADJUSTMENT, Valve Clearance.>
12) Measure the valve clearance in #3, #2 and #4 cylinder in the same measurement procedure as #1 cylinder.

NOTE:
• Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before measuring valve clearances.
• By rotating the crank pulley clockwise every 180° from the state that #1 cylinder piston is on the top dead center of compression stroke, #3, #2 and #4 cylinder pistons come to the top dead center of compression stroke in this order.

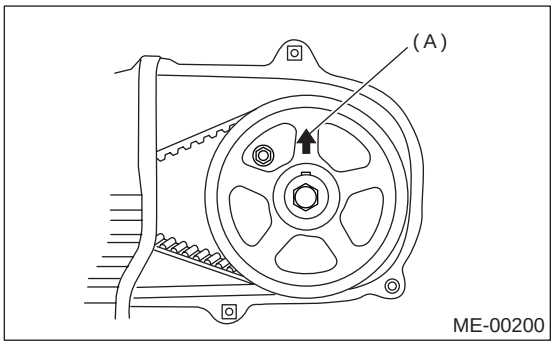
13) After inspection, install the related parts in the reverse order of removal.

B: ADJUSTMENT

CAUTION:
Adjustment of valve clearance should be performed while engine is cold.

1) Set #1 cylinder piston to top dead center of compression stroke by rotating the crank pulley clockwise using the socket wrench.

NOTE:
When the arrow mark (A) on cam sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.

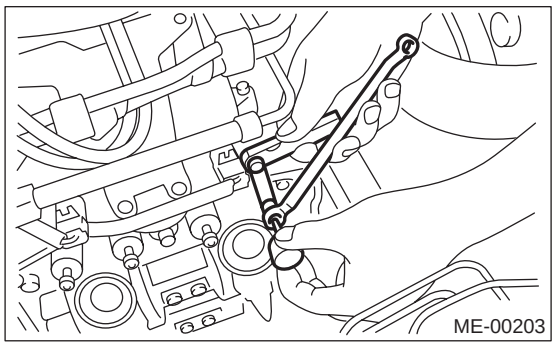


2) Adjust the #1 cylinder valve clearance.
(1) Loosen the valve rocker nut and screw.
(2) Place a suitable thickness gauge.
(3) While noting the valve clearance, tighten the valve rocker adjusting screw.
(4) When the specified valve clearance is obtained, tighten the valve rocker nut.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

CAUTION:
• Insert the thickness gauge in as horizontally as possible with respect to the valve stem end face.
• Adjust the exhaust valve clearances while lifting-up the vehicle.

Valve clearance
Intake:
0.20±0.04 mm (0.0079±0.0016 in)
Exhaust:
0.25±0.04 mm (0.0098±0.0016 in)



3) Adjust the valve clearance in #3, #2 and #4 cylinder in the same adjustment procedure as #1 cylinder.

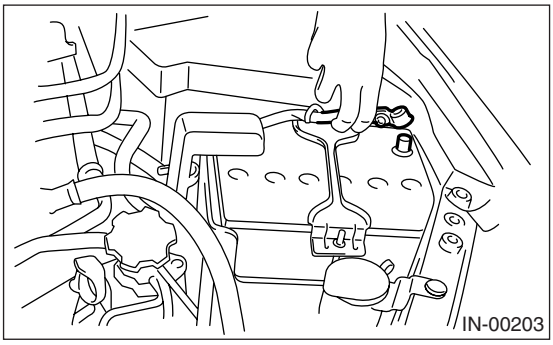
NOTE:
• Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before adjusting valve clearances.
• By rotating the crank pulley clockwise every 180° from the state that #1 cylinder piston is on the top dead center of compression stroke, #3, #2 and #4 cylinder pistons come to the top dead center of compression stroke in this order.

4) Ensure the valve clearances of each cylinder are within specifications. If necessary, readjust the valve clearances.

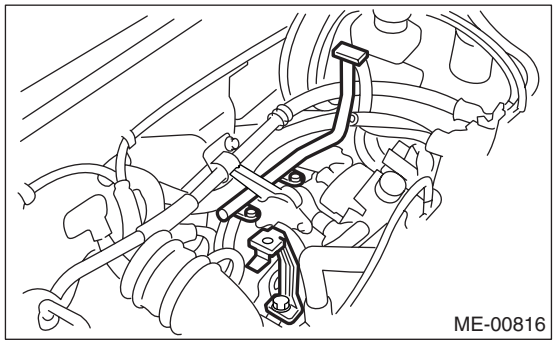
9. Engine Assembly

A: REMOVAL

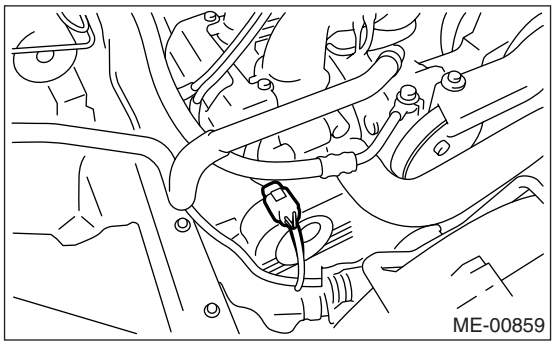
1) Set the vehicle on a lift.
2) Open the front hood fully and support with the front food stay.
3) Collect the refrigerant from A/C system. <Ref. to AC-20, PROCEDURE, Refrigerant Recovery Procedure.>
4) Release the fuel pressure.
<Ref. to FU(H4SO 2.0)-38, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.> or <Ref. to FU(H4SO 2.5)-40, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
5) Remove the fuel filler cap.
6) Disconnect the ground cable from battery.


IN-00203

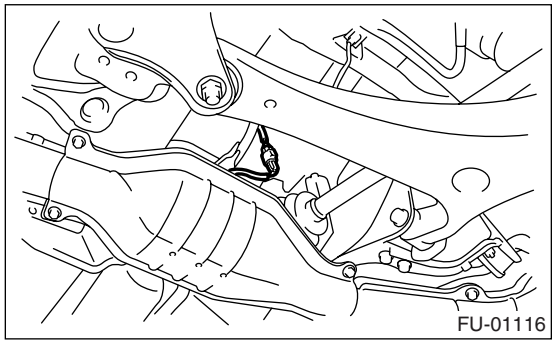
7) Remove the air intake duct, air cleaner case and air intake chamber.
<Ref. to IN(H4SO 2.0)-9, REMOVAL, Air Intake Duct.> <Ref. to IN(H4SO 2.0)-6, REMOVAL, Air Cleaner Case.> <Ref. to IN(H4SO 2.0)-8, REMOVAL, Air Intake Chamber.>
8) Remove the under cover.
9) Remove the radiator from vehicle. <Ref. to CO(H4SO 2.0)-20, REMOVAL, Radiator.>
10) Disconnect the A/C pressure hoses from A/C compressor.
11) Remove the air intake chamber stay.


ME-00816

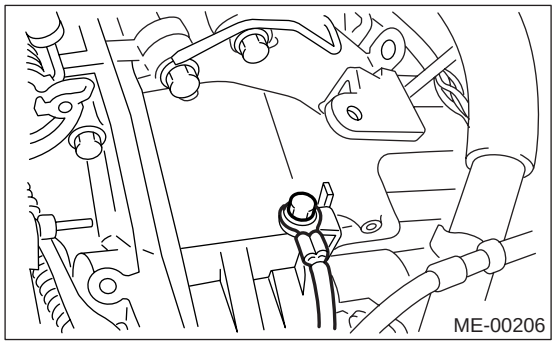
12) Disconnect the following connectors and cables.
(1) Front oxygen (A/F) sensor connector


ME-00859

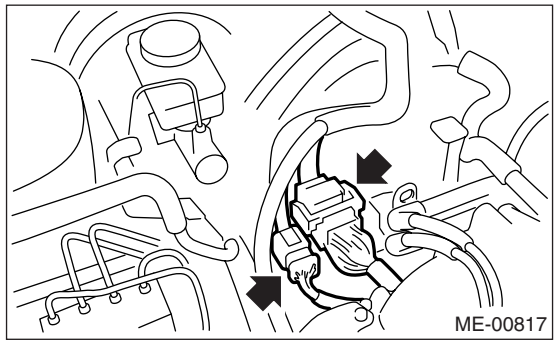
(2) Rear oxygen sensor connector


FU-01116

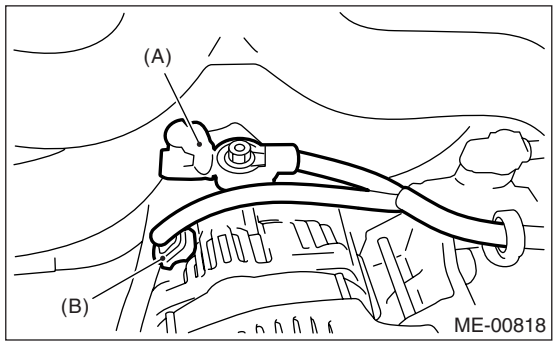
(3) Engine ground cable


ME-00206

(4) Engine harness connectors

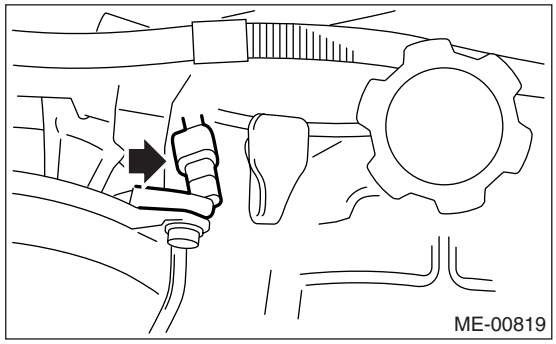

ME-00817

(5) Generator connector and terminal

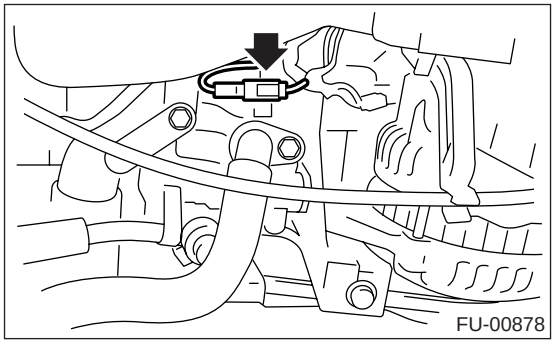


(A) Terminal
(B) Generator connector

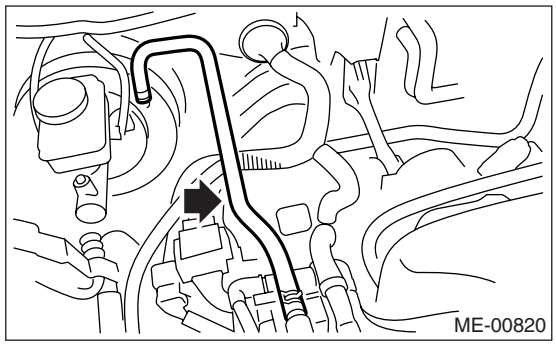
(6) A/C compressor connectors



(7) Power steering switch connector

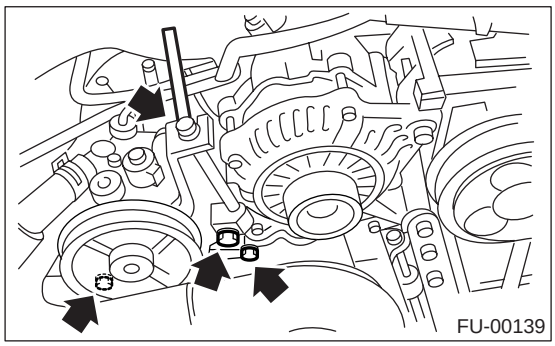


13) Disconnect the following hoses.
(1) Brake booster vacuum hose

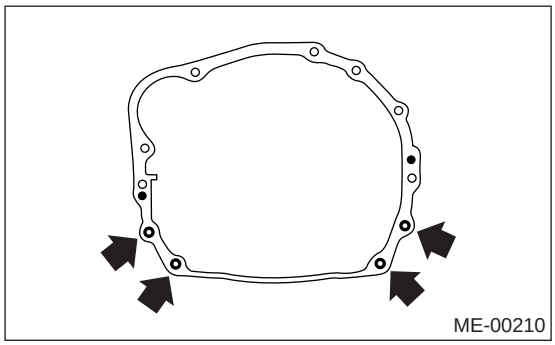


(2) Heater inlet and outlet hoses

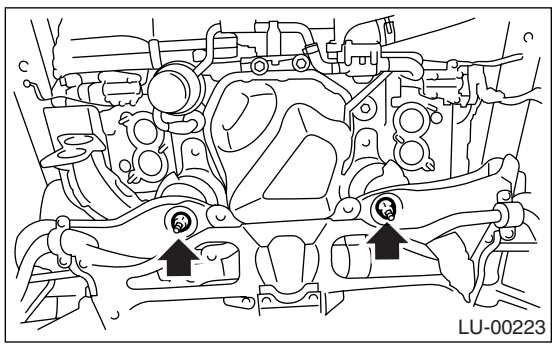
14) Remove the power steering pump from bracket.
(1) Loosen the lock bolt and slider bolt, and remove the front side belt. <Ref. to ME(H4SO 2.0)-38, FRONT SIDE BELT, REMOVAL, V-belt.>
(2) Remove the power steering pump bracket.



(3) Place the power steering pump on the right side wheel apron.
15) Remove the front and center exhaust pipe.
<Ref. to EX(H4SO 2.0)-7, REMOVAL, Front Exhaust Pipe.>
16) Remove the nuts which hold lower side of transmission to engine.

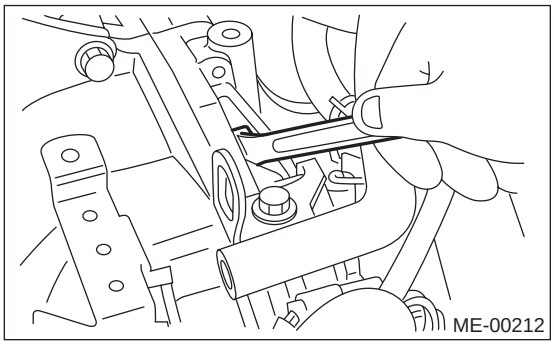


17) Remove the nuts which install front cushion rubber onto front crossmember.

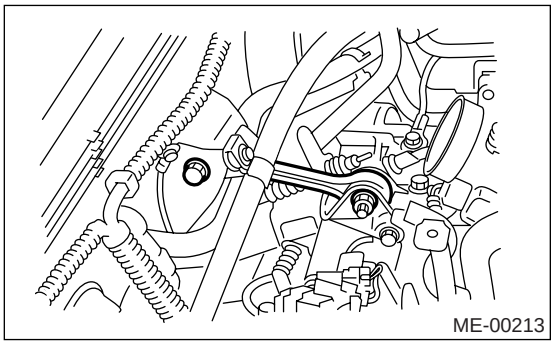


18) Separate the torque converter clutch from drive plate. (AT model)
(1) Lower the vehicle.
(2) Remove the service hole plug.
(3) Remove the bolts which hold torque converter clutch to drive plate.

(4) Remove other bolts while rotating the engine using a socket wrench.

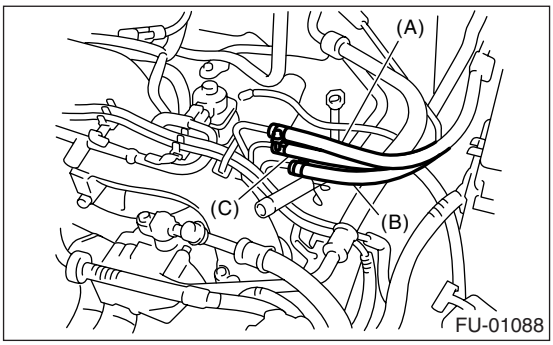


19) Remove the pitching stopper.

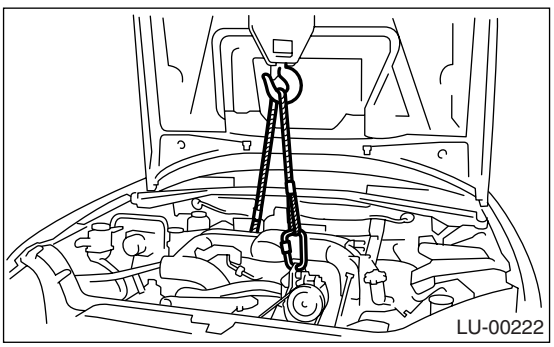


20) Disconnect the fuel delivery hose (A), return hose (B) and evaporation hose (C).

CAUTION:
• Catch fuel from the hose into container.
• Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.

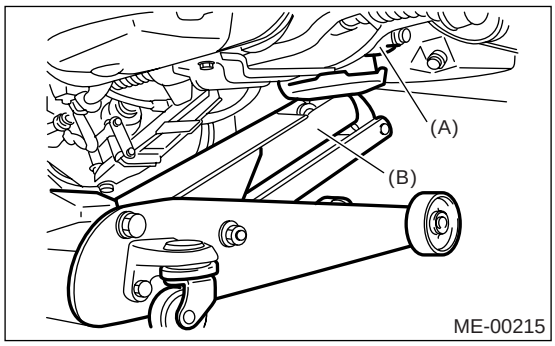


21) Support the engine with a lifting device and wire ropes.



22) Support the transmission with a garage jack.

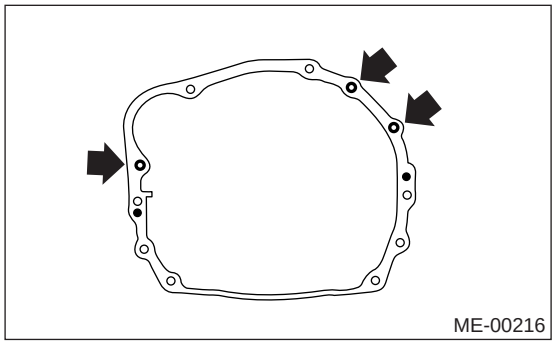
CAUTION:
• Doing this is very important because the transmission lowers for its own weight. This work is also of great importance for facilitating reinstallation.



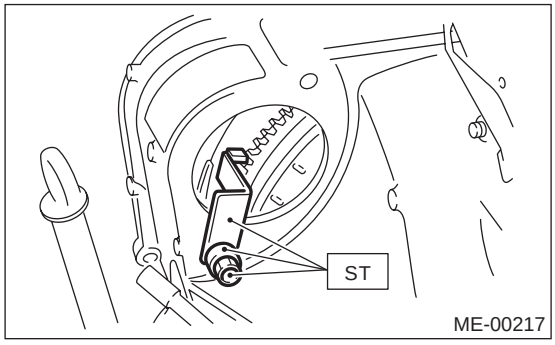
(A) Transmission
(B) Garage jack

• Before removing the engine away from transmission, check to be sure no work has been overlooked.

23) Separation of engine and transmission.
(1) Remove the starter. <Ref. to SC(H4SO 2.0)-6, REMOVAL, Starter.>
(2) Remove the bolts which hold upper side of transmission to engine.



24) Set the ST to converter case. (AT model)
ST 498277200 STOPPER SET



25) Remove the engine from vehicle.
(1) Slightly raise the engine.
(2) Raise the transmission with garage jack.

(3) Move the engine horizontally until main shaft is withdrawn from clutch cover.
(4) Slowly move the engine away from engine compartment.

NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

26) Remove the front cushion rubbers.

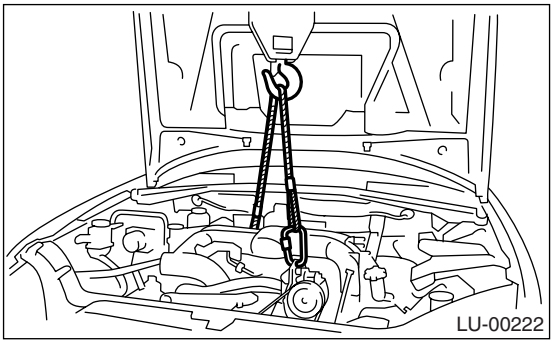
B: INSTALLATION

1) Install the front cushion rubbers.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

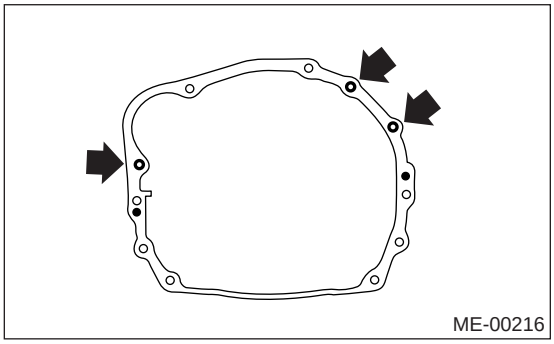
2) Position the engine in engine compartment and align it with transmission.

NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.



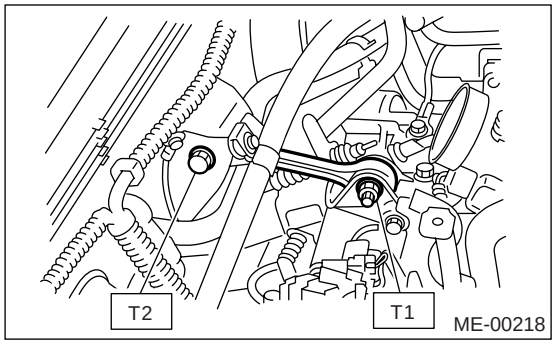
3) Apply a small amount of grease to splines of main shaft. (MT model)
4) Tighten the bolts which hold upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



5) Remove the lifting device and wire ropes.
6) Remove the garage jack.
7) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



8) Remove the ST from converter case. (AT model)

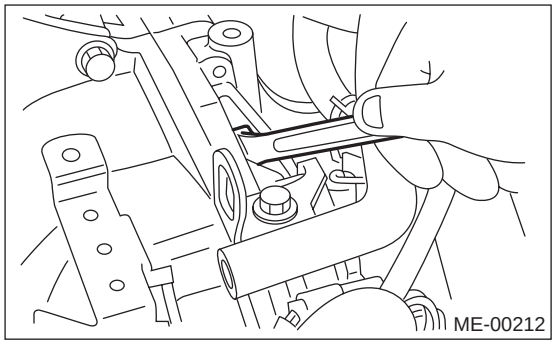
NOTE:
Be careful not to drop the ST into the converter case when removing the ST.

ST 498277200 STOPPER SET

9) Install the starter. <Ref. to SC(H4SO 2.0)-6, INSTALLATION, Starter.>
10) Install the torque converter clutch to drive plate. (AT model)
(1) Tighten the bolts which hold torque converter clutch to drive plate.
(2) Tighten other bolts while rotating the engine using a socket wrench.

CAUTION:
Be careful not to drop bolts into the torque converter clutch housing.

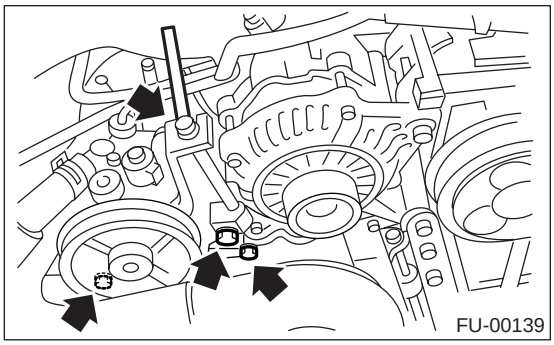
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



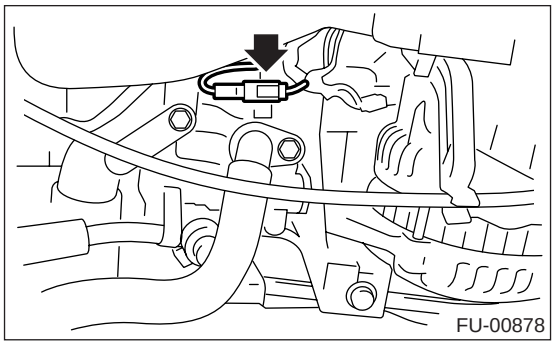
(3) Clog the service hole plug and prevent foreign matters from being mixed.

11) Install the power steering pump on bracket.
(1) Install the power steering pump on bracket, and tighten the bolts.

Tightening torque:
22 N·m (2.2 kgf-m, 16 ft-lb)



(2) Connect the power steering switch connector.

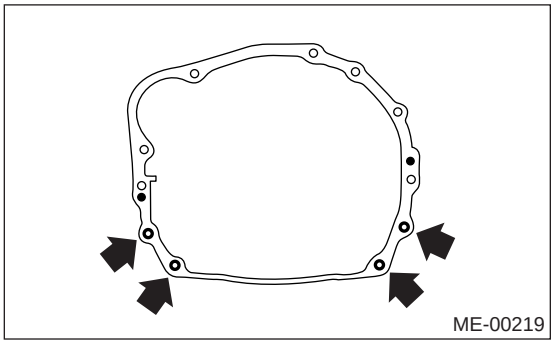


(3) Install the front side belt and adjust it. <Ref. to ME(H4SO 2.0)-38, FRONT SIDE BELT, INSTALLATION, V-belt.>

12) Lift-up the vehicle.

13) Tighten the nuts which hold lower side of transmission to engine.

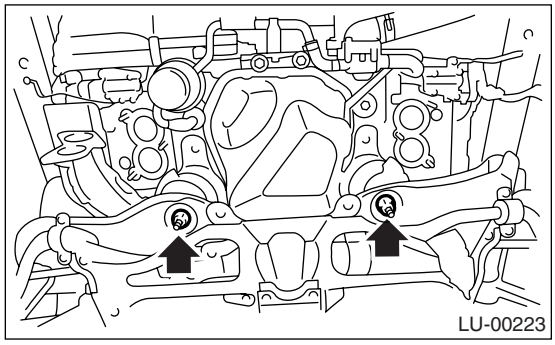
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



14) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:
85 N·m (8.7 kgf-m, 63 ft-lb)

NOTE:
Make sure the front cushion rubber mounting bolts are securely installed.



15) Install the front and center exhaust pipe. <Ref. to EX(H4SO 2.0)-8, INSTALLATION, Front Exhaust Pipe.>

16) Lower the vehicle.

17) Connect the following hoses:
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose

18) Connect the following connectors:
(1) Front oxygen (A/F) sensor connector
(2) Rear oxygen sensor connector
(3) Engine ground cable

Tightening torque:
14 N·m (1.4 kgf-m, 10.1 ft-lb)

(4) Engine harness connectors
(5) Generator connector and terminal
(6) A/C compressor connector

19) Install the air intake chamber stay.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

20) Install the A/C pressure hoses. <Ref. to AC-38, INSTALLATION, Hose and Tube.>

21) Install the radiator to vehicle. <Ref. to CO(H4SO 2.0)-21, INSTALLATION, Radiator.>

22) Install the air intake duct, air cleaner case and air intake chamber. <Ref. to IN(H4SO 2.0)-9, INSTALLATION, Air Intake Duct.> <Ref. to IN(H4SO 2.0)-7, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H4SO 2.0)-8, INSTALLATION, Air Intake Chamber.>

23) Install the under cover.

24) Install the battery in the vehicle, and connect cables.

25) Fill engine coolant. <Ref. to CO(H4SO 2.0)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

26) Check the ATF level and replenish it if necessary.

<Ref. to 4AT-31, INSPECTION, Automatic Transmission Fluid.>
27) Charge the A/C system with refrigerant. <Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>
28) Remove the front hood stay, and close the front hood.
29) Take off the vehicle from a lift.

C: INSPECTION

1) Check pipes and hoses are installed firmly.
2) Check that the engine coolant and ATF are at specified levels.

10.Engine Mounting

A: REMOVAL

1) Remove the engine assembly. <Ref. to ME(H4SO 2.0)-30, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Engine mounting;
35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

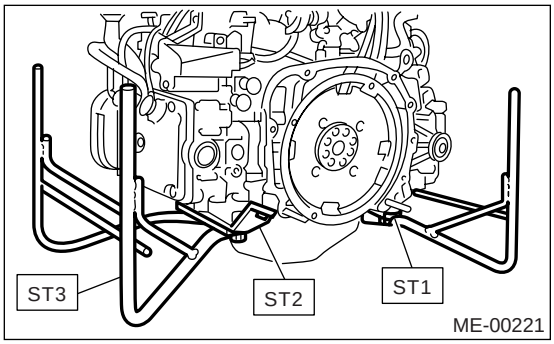
Make sure that no crack or other damages do not exist.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from the body, secure it in the ST shown below.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817100	ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. The procedure for overhauling of the engine will be completed when you go through all steps in the process.
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

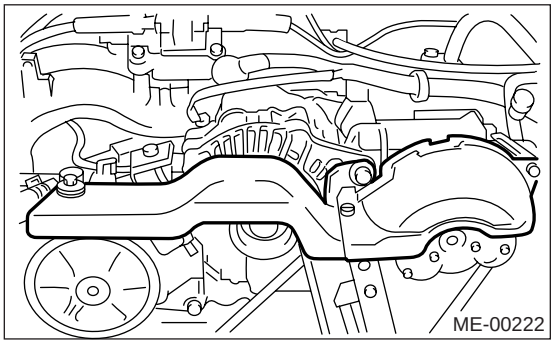
12.V-belt

A: REMOVAL

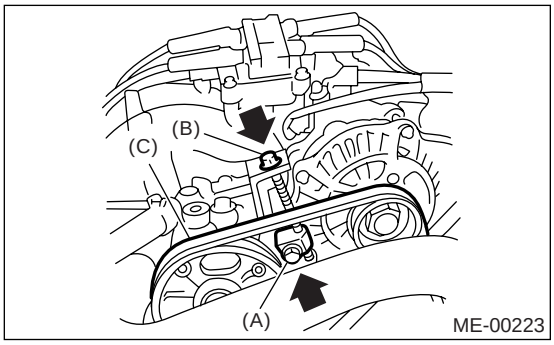
NOTE:
Perform the following procedures with the engine installed to the body.

1. FRONT SIDE BELT

1) Remove the V-belt covers.

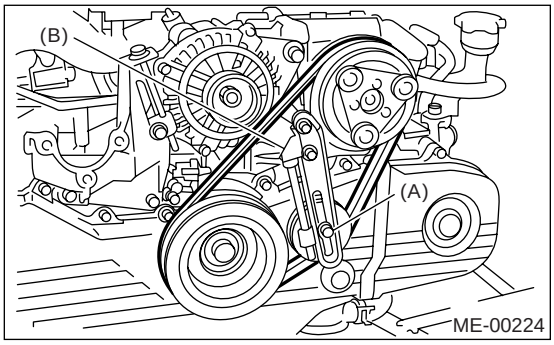


2) Loosen the lock bolt (A).
3) Loosen the slider bolt (B).
4) Remove the front side belt (C).

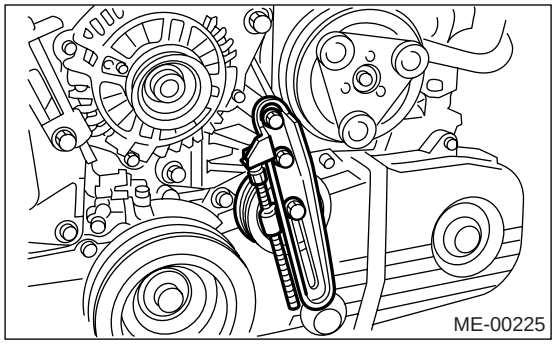


2. REAR SIDE BELT

1) Loosen the lock nut (A).
2) Loosen the slider bolt (B).



3) Remove the rear side belt.
4) Remove the belt tensioner.



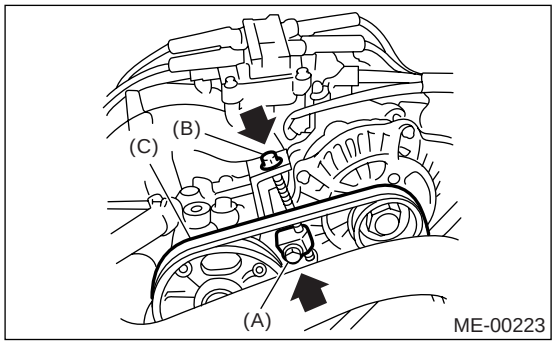
B: INSTALLATION

NOTE:
Wipe off any oil or water on the belt and pulley.

1. FRONT SIDE BELT

1) Install a V belt (C), and tighten the slider bolt so as to obtain the specified belt tension. <Ref. to ME(H4SO 2.0)-39, INSPECTION, V-belt.>
2) Tighten the lock bolt (A).
3) Tighten the slider bolt (B).

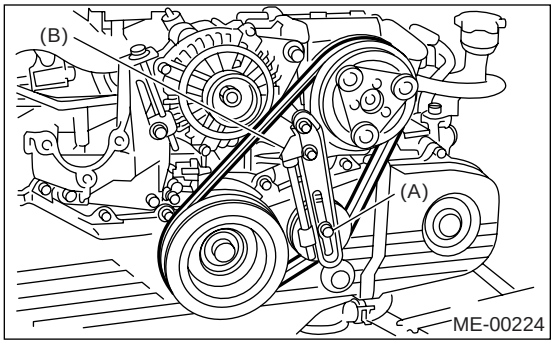
Tightening torque:
Lock bolt (A):
25 N·m (2.5 kgf-m, 18.1 ft-lb)



2. REAR SIDE BELT

1) Install the belt tensioner.
2) Install a V belt, and tighten the slider bolt (B) so as to obtain the specified belt tension.
<Ref. to ME(H4SO 2.0)-39, INSPECTION, V-belt.>
3) Tighten the lock nut (A).

Tightening torque:
Lock nut (A);
23 N·m (2.3 kgf-m, 17.0 ft-lb)



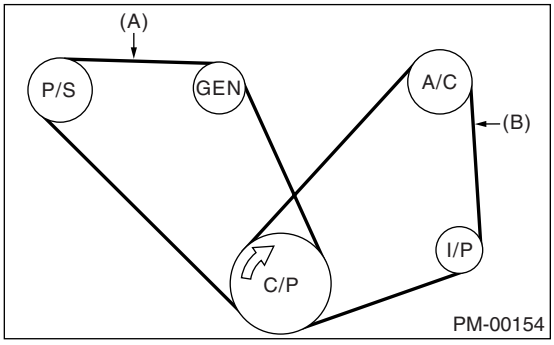
C: INSPECTION

1) Replace the belts, if cracks, fraying or wear is found.
2) Remove the V-belt cover and reservoir tank. (with belt tension gauge)
3) Check the V-belt tension and adjust it if necessary by changing the generator installing position or idler pulley installing position.

Belt tension (with belt tension gauge)

(A)
When installing new parts:
618 — 755 N (63 — 77 kgf, 139 — 170 lb)
At inspection:
490 — 640 N (50.0 — 65.3 kgf, 110.2 — 143.9 lb)

(B)
When installing new parts:
740 — 880 N (75.5 — 89.7 kgf, 166 — 198 lb)
At inspection:
350 — 450 N (35.7 — 45.9 kgf, 78.7 — 101.2 lb)

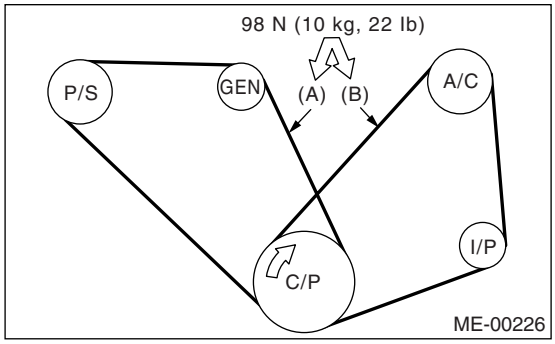


(A) Front side belt
(B) Rear side belt
C/P Crank pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

Belt tension (without belt tension gauge)

(A)
When installing new parts:
7 — 9 mm (0.276 — 0.354 in)
At inspection:
9 — 11 mm (0.354 — 0.433 in)

(B)
When installing new parts:
7.5 — 8.5 mm (0.295 — 0.335 in)
At inspection:
9.0 — 10.0 mm (0.354 — 0.394 in)



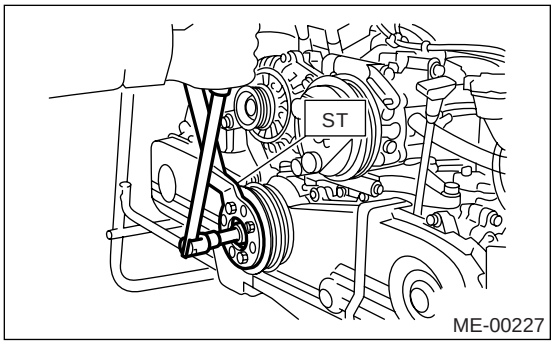
(A) Front side belt
(B) Rear side belt
C/P Crank pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

13.Crank Pulley

A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4SO 2.0)-38, REMOVAL, V-belt.>
2) Remove the crank pulley bolt. To lock the crankshaft, use ST.

ST 499977400 CRANK PULLEY WRENCH (2.0 L model)
ST 499977100 CRANK PULLEY WRENCH (2.5 L model)



3) Remove the crank pulley.

B: INSTALLATION

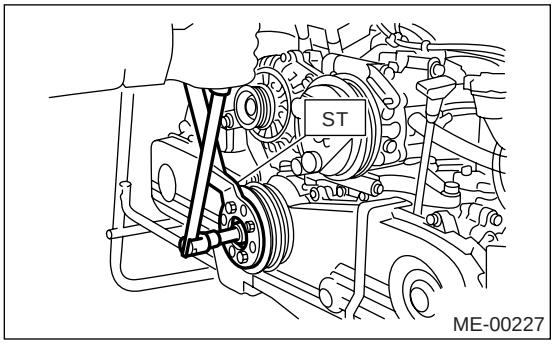
1. 2.0 L MODEL

1) Install the crank pulley.
2) Install the pulley bolt.
To lock the crankshaft, use ST.

ST 499977400 CRANK PULLEY WRENCH

(1) Clean the crankshaft thread using compressed air.
(2) Apply engine oil to the crank pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crank pulley bolts.

Tightening torque:
130 N·m (13.3 kgf-m, 95.9 ft-lb)



3) Confirm that the tightening angle of the crank pulley bolt is 45° or more. Perform the following procedures when less than 45°.

CAUTION:
If the tightening angle of crank pulley bolt is less than 45°, the bolt should be damaged. In this case, the bolt must be replaced.

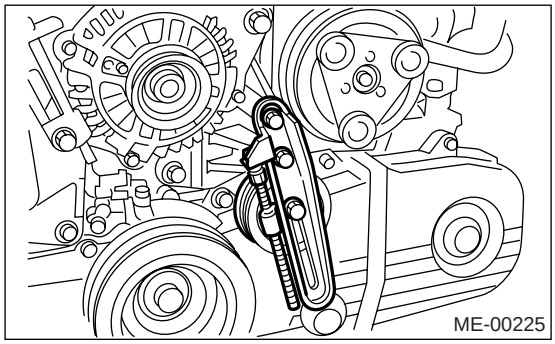
(1) Replace and clean the crank pulley bolts.

Crank pulley bolt:
Part No. 12369AA011

(2) Clean the crankshaft thread using compressed air.
(3) Apply engine oil to the crank pulley bolt seat and thread.
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(5) Tighten the crank pulley bolts keeping them in an angle 45° — 60°.

NOTE:
Conduct the tightening procedures by confirming the turning angle of the crank pulley bolt referring to the gauge indicated on the timing belt cover.

4) Install the belt tensioner.



5) Install the V-belts. <Ref. to ME(H4SO 2.0)-38, INSTALLATION, V-belt.>

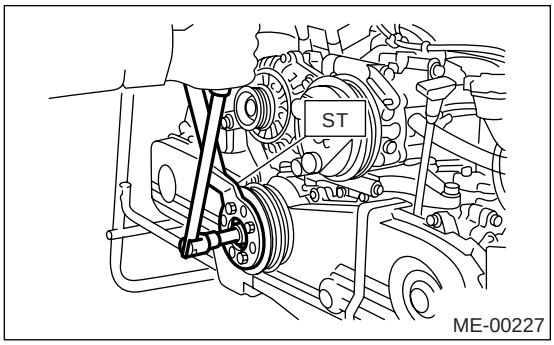
2. 2.5 L MODEL

1) Install the crank pulley.
2) Install the pulley bolt.
To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH

(1) Clean the crankshaft thread using compressed air.
(2) Apply engine oil to the crank pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crank pulley bolts.

Tightening torque:
180 N·m (18.4 kgf-m, 132.8 ft-lb)



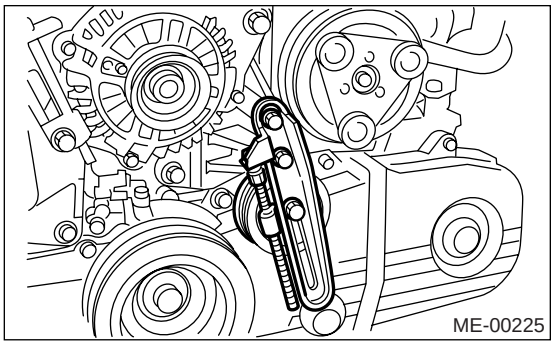
3) Confirm that the tightening angle of crank pulley bolt is 65 degrees or more. If the tightening angle of crank pulley bolt is less than 65 degrees, conduct the following procedures.
(1) Replace the crank pulley bolts and clean them.

crank pulley bolt:
12369AA011

(2) Clean the crankshaft thread using compressed air.
(3) Apply engine oil to the crank pulley bolt seal and thread.
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(5) Tighten the crank pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

NOTE:
Conduct the tightening procedures by confirming the turning angle of crank pulley bolt referring to the gauge indicated on timing belt cover.

4) Install the A/C belt tensioner.



5) Install the V-belt. **<Ref. to ME(H4SO 2.0)-38,** INSTALLATION**, V-belt.>**

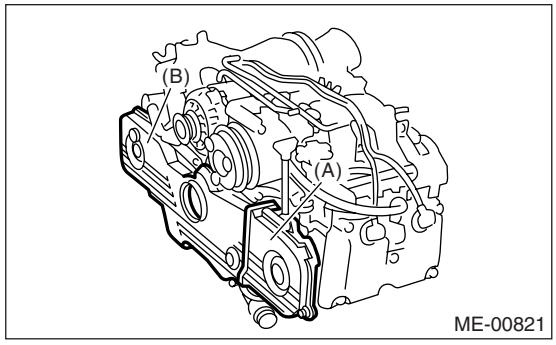
C: INSPECTION

1) Make sure the V-belt is not worn or otherwise damaged.
2) Check the tension of the belt. <Ref. to ME(H4SO 2.0)-39, INSPECTION, V-belt.>

14.Timing Belt Cover

A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4SO 2.0)-38, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H4SO 2.0)-40, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover (LH).
4) Remove the front timing belt cover.



(A) Timing belt cover (LH)
(B) Front timing belt cover

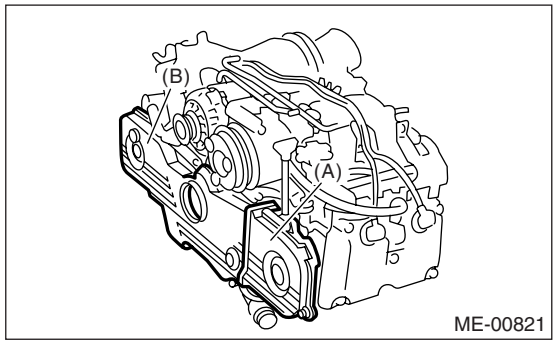
B: INSTALLATION

1) Install the front timing belt cover.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

2) Install the timing belt cover (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



(A) Timing belt cover (LH)
(B) Front timing belt cover

3) Install the crank pulley. <Ref. to ME(H4SO 2.0)-40, INSTALLATION, Crank Pulley.>
4) Install the V-belts. <Ref. to ME(H4SO 2.0)-38, INSTALLATION, V-belt.>

C: INSPECTION

Check the cover for damage.