

ENGINE LUBRICATION SYSTEM

2-4

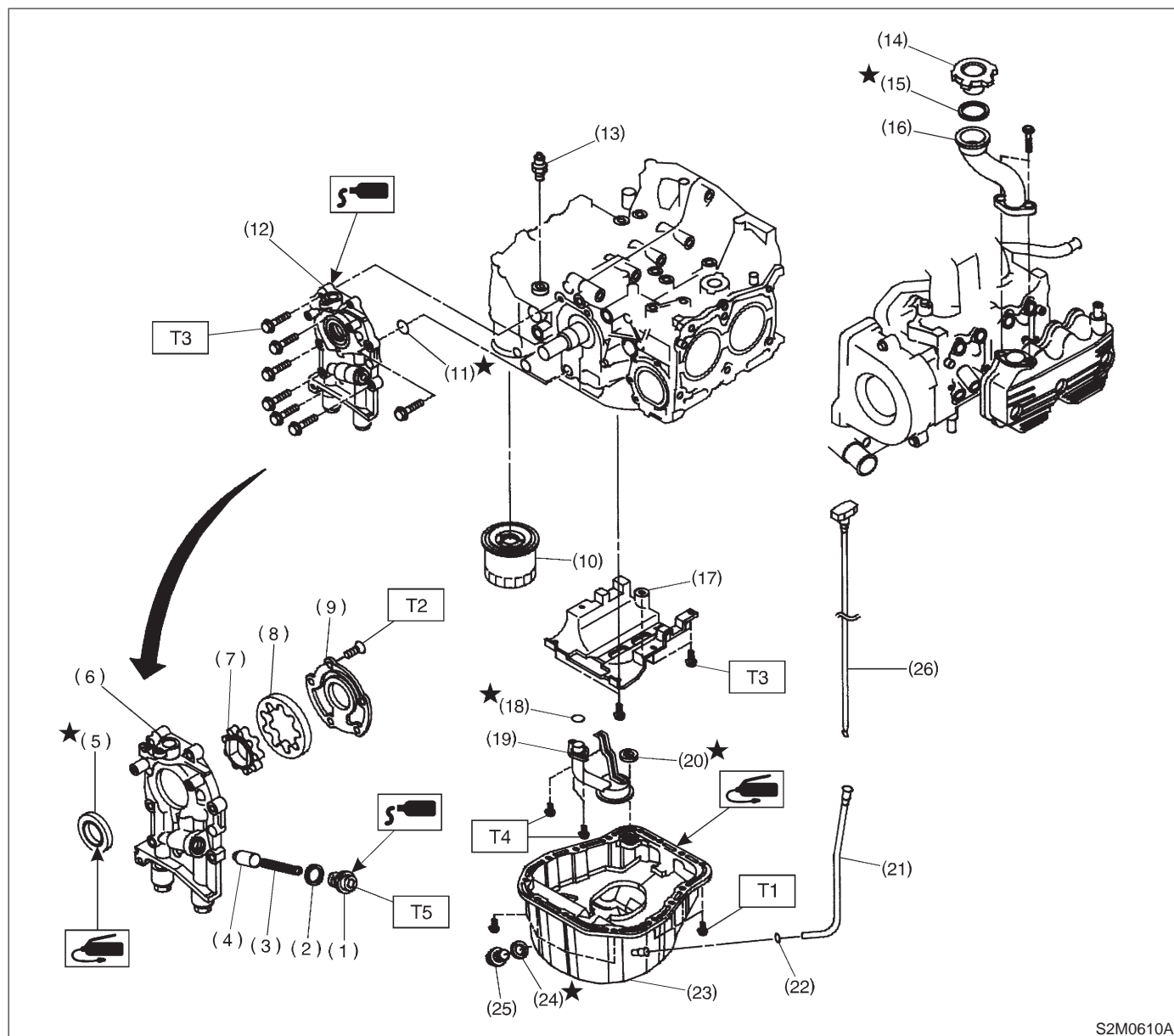
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1. Specifications

Lubrication method					Forced lubrication		
Oil pump	Pump type				Trochoid type		
	Number of teeth		Inner rotor		9		
			Outer rotor		10		
	Outer rotor diameter × thickness				78 × 9 mm (3.07 × 0.35 in)		
	Tip clearance between inner and outer rotor		STANDARD		0.04 — 0.14 mm (0.0016 — 0.0055 in)		
			LIMIT		0.18 mm (0.0071 in)		
	Side clearance between inner rotor and pump case		STANDARD		0.02 — 0.07 mm (0.0008 — 0.0028 in)		
			LIMIT		0.15 mm (0.0059 in)		
	Case clearance between outer rotor and pump case		STANDARD		0.10 — 0.175 mm (0.0039 — 0.0069 in)		
			LIMIT		0.20 mm (0.0079 in)		
	Capacity at 80°C (176°F)	600 rpm	Discharge	- pressure	98 kPa (1.0 kg/cm ² , 14 psi) or more		
				- quantity	2200 cc	4.2 ℓ (4.4 US qt, 3.7 Imp qt)/min.	
		2500 cc	4.6 ℓ (4.9 US qt, 4.0 Imp qt)/min.				
		5,000 rpm	Discharge	- pressure	294 kPa (3.0 kg/cm ² , 43 psi) or more		
				- quantity	2200 cc	42.0 ℓ (11.10 US gal, 9.24 Imp gal)/min.	
					2500 cc	47.0 ℓ (12.4 US gal, 10.3 Imp gal)/min.	
Relief valve operation pressure					2200 cc	490 kPa (5.0 kg/cm ² , 71 psi)	
			2500 cc	588 kPa (6.0 kg/cm ² , 85 psi)			
Oil filter	Type				Full-flow filter type		
	Filtration area				1,000 cm ² (155 sq in)		
	By-pass valve opening pressure				156 kPa (1.6 kg/cm ² , 23 psi)		
	Outer diameter × width				80 × 70 mm (3.15 × 2.76 in)		
	Oil filter to engine thread size				M 20 x 1.5		
Relief valve (on rocker shaft) operation pressure					69 kPa (0.7 kg/cm ² , 10 psi)		
Oil pressure switch	Type				Immersed contact point type		
	Working voltage — wattage				12 V — 3.4 W or less		
	Warning light activation pressure				14.7 kPa (0.15 kg/cm ² , 2.1 psi)		
	Proof pressure				More than 981 kPa (10 kg/cm ² , 142 psi)		
Oil capacity (at replacement)					2200 cc	4.0 ℓ (4.2 US qt, 3.5 Imp qt)	
					2500 cc	4.5 ℓ (4.8 US qt, 4.0 Imp qt)	

1. Lubrication System

A: 2200 cc MODEL



S2M0610A

- (1) Plug
- (2) Washer
- (3) Relief valve spring
- (4) Relief valve
- (5) Oil seal
- (6) Oil pump case
- (7) Inner rotor
- (8) Outer rotor
- (9) Oil pump cover
- (10) Oil filter
- (11) O-ring
- (12) Oil pump ASSY

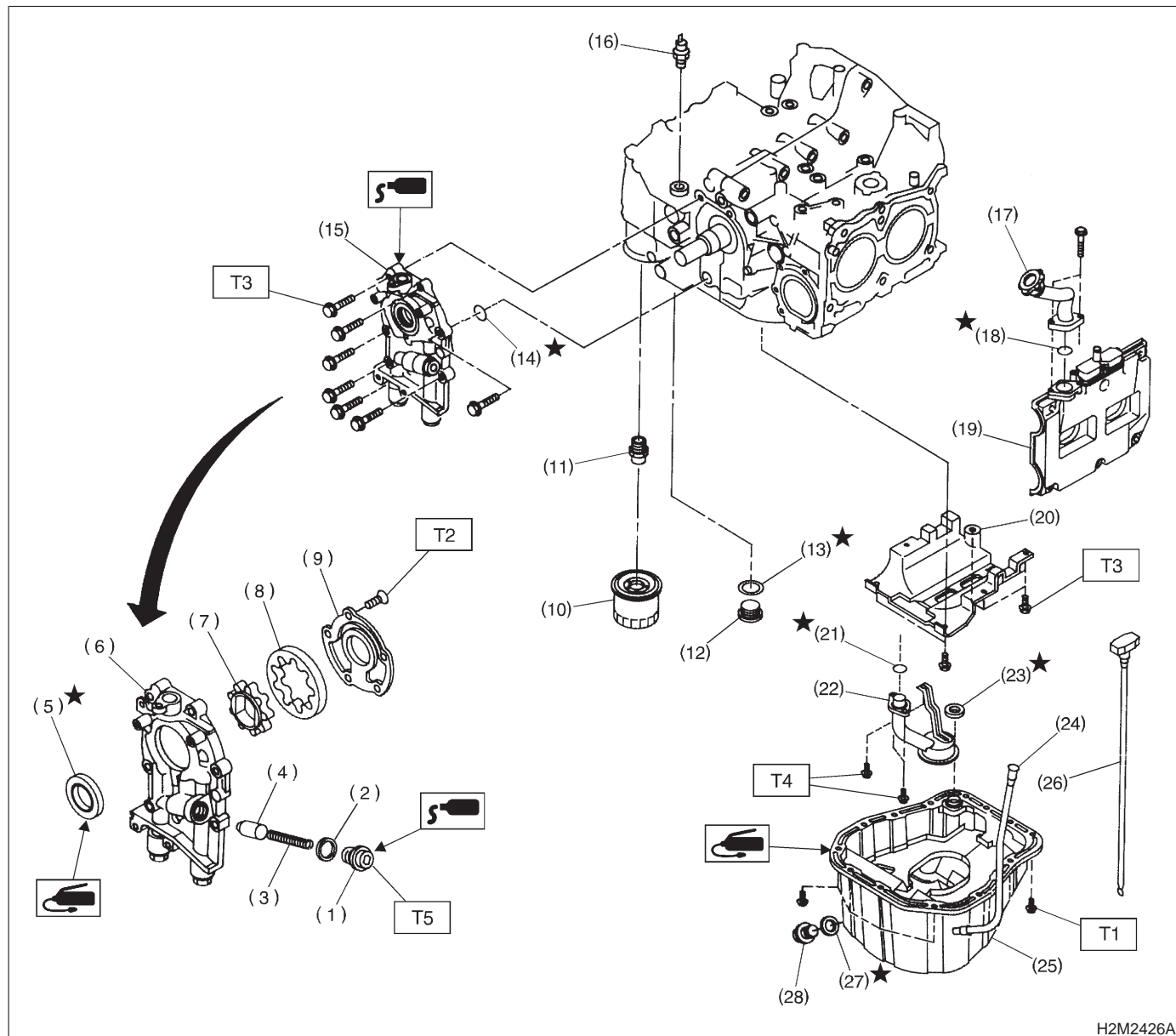
- (13) Oil pressure switch
- (14) Oil filler cap
- (15) O-ring
- (16) Oil filler duct
- (17) Baffle plate
- (18) O-ring
- (19) Oil strainer
- (20) Gasket
- (21) Oil level gauge
- (22) O-ring
- (23) Oil pan
- (24) Washer

- (25) Drain plug
- (26) Oil level gauge

Tightening torque: N·m (kg-m, ft-lb)

- T1: 5 (0.5, 3.6)
- T2: 5 — 6 (0.5 — 0.6, 3.6 — 4.3)
- T3: 6.4 (0.65, 4.7)
- T4: 10 (1.0, 7.0)
- T5: 40.7 — 47.6 (4.15 — 4.85, 30.0 — 35.1)

B: 2500 cc MODEL



H2M2426A

- | | |
|---------------------------|----------------------------|
| (1) Plug | (13) Gasket |
| (2) Washer | (14) O-ring |
| (3) Relief valve spring | (15) Oil pump ASSY |
| (4) Relief valve | (16) Oil pressure switch |
| (5) Oil seal | (17) Oil filler duct |
| (6) Oil pump case | (18) O-ring |
| (7) Inner rotor | (19) Cylinder head cover |
| (8) Outer rotor | (20) Baffle plate |
| (9) Oil pump cover | (21) O-ring |
| (10) Oil filter | (22) Oil strainer |
| (11) Oil filter connector | (23) Gasket |
| (12) Connector | (24) Oil level gauge guide |

- | |
|----------------------|
| (25) Oil pan |
| (26) Oil level gauge |
| (27) Metal gasket |
| (28) Drain plug |

Tightening torque: N-m (kg-m, ft-lb)

T1: 5 (0.5, 3.6)

T2: 5^{+1}_{-0} (0.5^{+0.1}/₋₀, 3.6^{+0.7}/₋₀)

T3: 6.4 (0.65, 4.7)

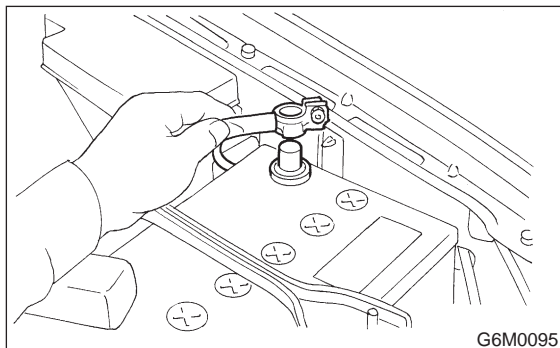
T4: 10 (1.0, 7.0)

T5: 44.1 ± 3.4 (4.5 ± 0.35 , 32.5 ± 2.5)

1. Oil Pump

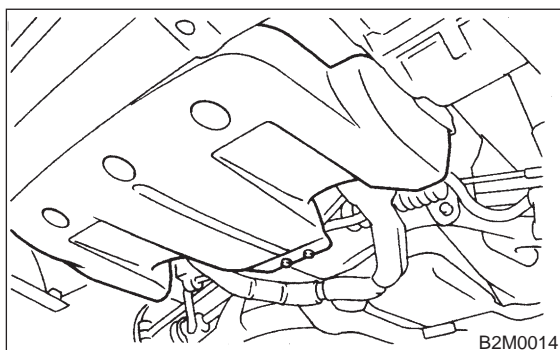
A: REMOVAL

1) Disconnect battery ground cable.

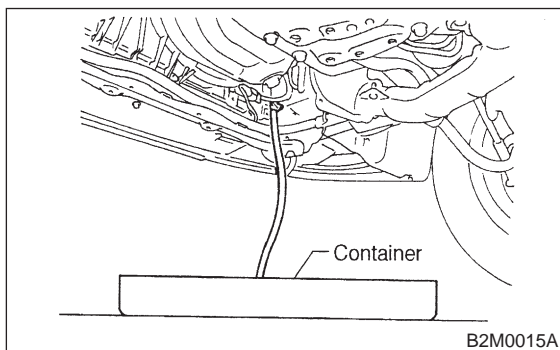


2) Lift-up the vehicle.

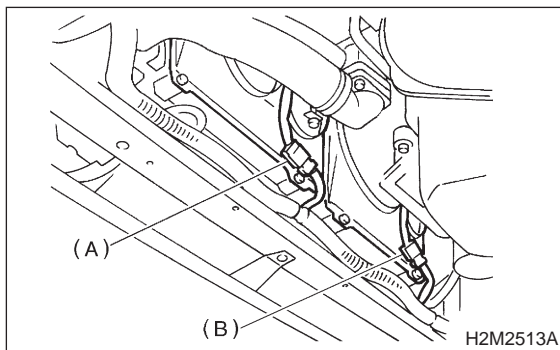
3) Remove under cover.



4) Drain coolant. <Ref. to 2-5 [W1A0].>

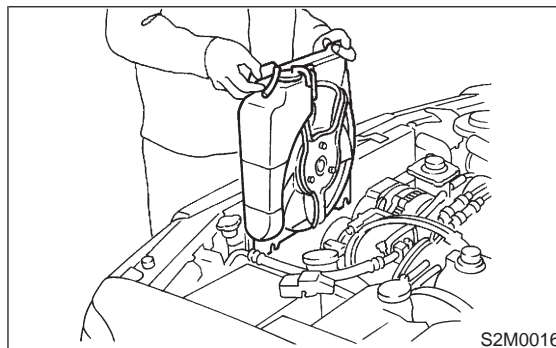


5) Disconnect connectors from radiator main fan (A) and sub fan (B) motors.

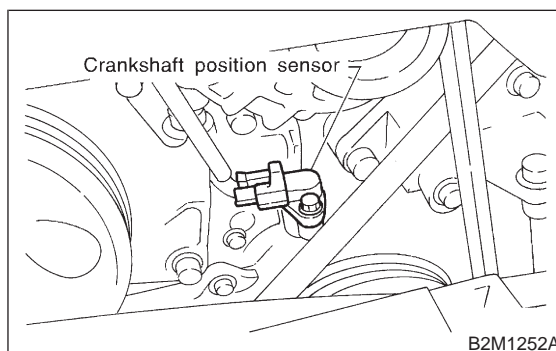


6) Lower the vehicle.

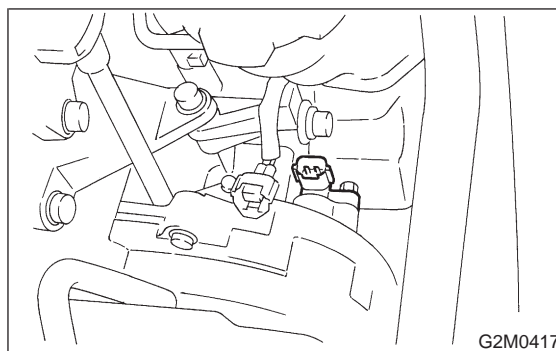
7) Remove radiator main fan and sub fan assemblies. <Ref. to 2-5 [W6A0].> and <Ref. to 2-5 [W7A0].>



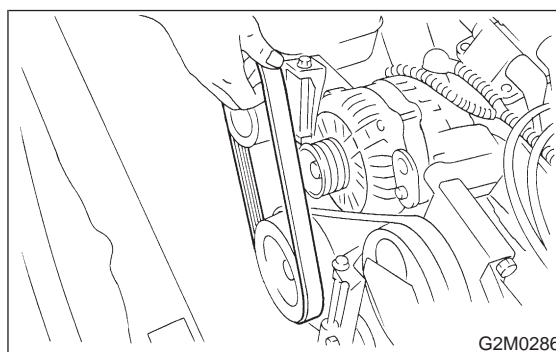
8) Remove crankshaft position sensor.



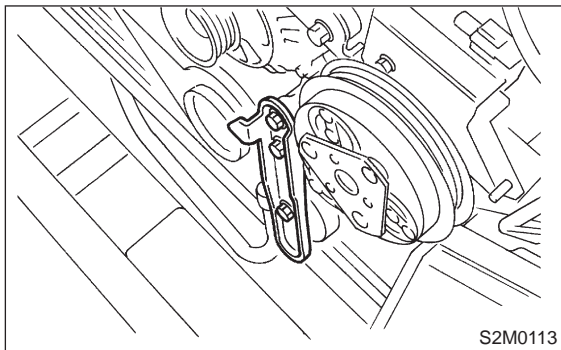
9) Remove camshaft position sensor.



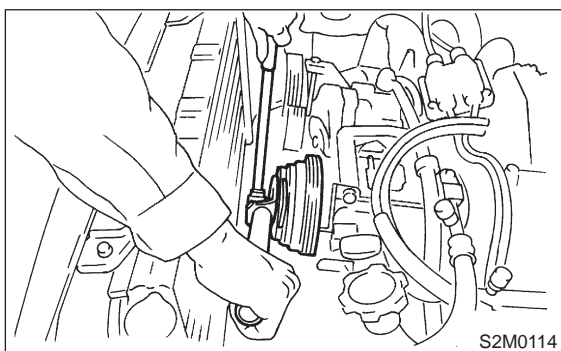
10) Remove V-belts. <Ref. to 1-5 [G200].>



11) Remove rear side V-belt tensioner.

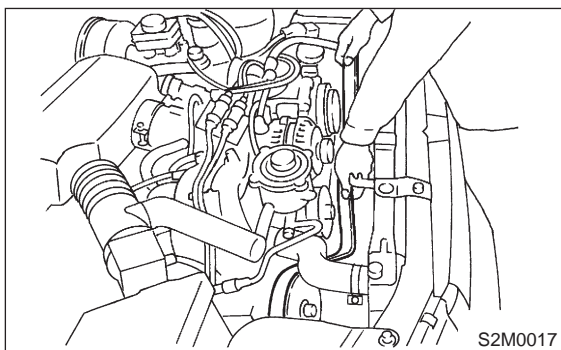


12) Remove crankshaft pulley by using ST.
ST 49997700 CRANKSHAFT PULLEY
WRENCH

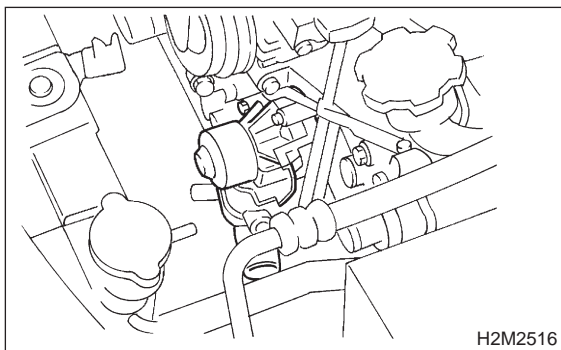


13) Remove timing belt.

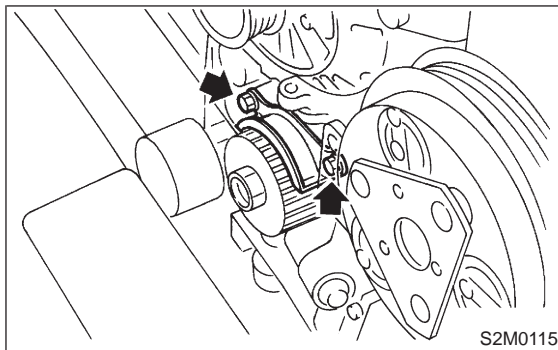
- SOHC:
<Ref. to 2-3a [W2A0].>
- DOHC:
<Ref. to 2-3b [W2A0].>



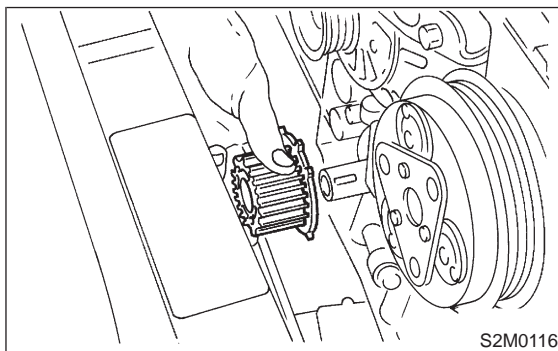
14) Remove water pump. <Ref. to 2-5 [W2A0].>



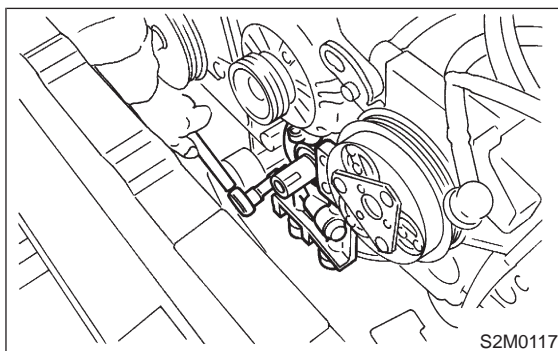
15) Remove timing belt guide. (MT vehicles only)



16) Remove crankshaft sprocket.



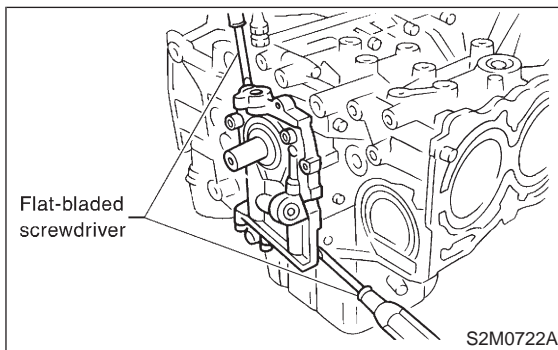
17) Remove bolts which install oil pump onto cylinder block.



18) Remove oil pump by using flat bladed screwdriver.

CAUTION:

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



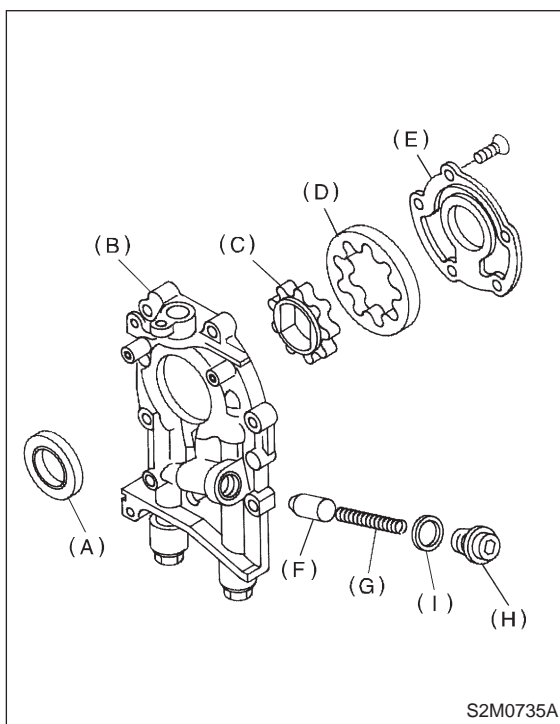
B: DISASSEMBLY

Remove screws which secure oil pump cover and disassemble oil pump.

Inscribe alignment marks on inner and outer rotors so that they can be replaced in their original positions during reassembly.

CAUTION:

Before removing relief valve, loosen plug when removing oil pump from cylinder block.



- (A) Oil seal
- (B) Pump case
- (C) Inner rotor
- (D) Outer rotor
- (E) Pump cover
- (F) Relief valve
- (G) Relief spring
- (H) Plug
- (I) Washer

C: INSPECTION**1. TIP CLEARANCE**

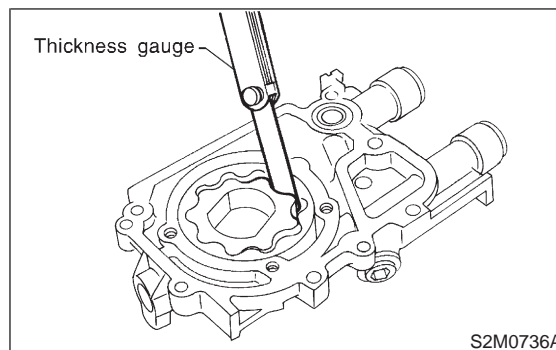
Measure the tip clearance of rotors. If the clearance exceeds the limit, replace rotors as a matched set.

Tip clearance:**Standard**

0.04 — 0.14 mm (0.0016 — 0.0055 in)

Limit

0.18 mm (0.0071 in)

**2. CASE CLEARANCE**

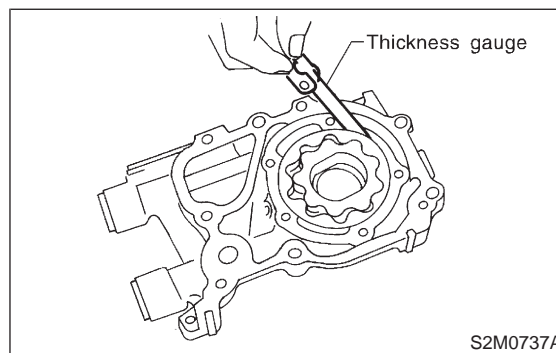
Measure the clearance between the outer rotor and the cylinder block rotor housing. If the clearance exceeds the limit, replace the rotor.

Case clearance:**Standard**

0.10 — 0.175 mm (0.0039 — 0.0069 in)

Limit

0.20 mm (0.0079 in)



1. Oil Pump

3. SIDE CLEARANCE

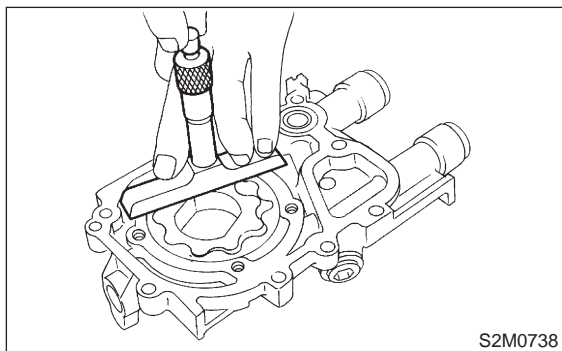
Measure clearance between oil pump inner rotor and pump cover. If the clearance exceeds the limit, replace rotor or pump body.

Side clearance:**Standard**

0.02 — 0.07 mm (0.0008 — 0.0028 in)

Limit

0.15 mm (0.0059 in)



4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

Relief valve spring:

Free length; 71.8 mm (2.827 in)

Installed length; 54.7 mm (2.154 in)

Load when installed; 77.08 N (7.86 kg, 17.33 lb)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

6. OIL SEAL

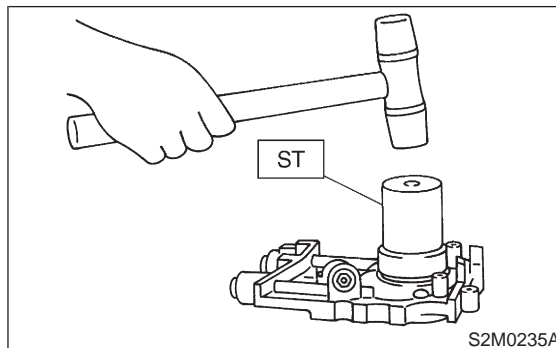
Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

D: ASSEMBLY

- 1) Install front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

CAUTION:

Use a new oil seal.

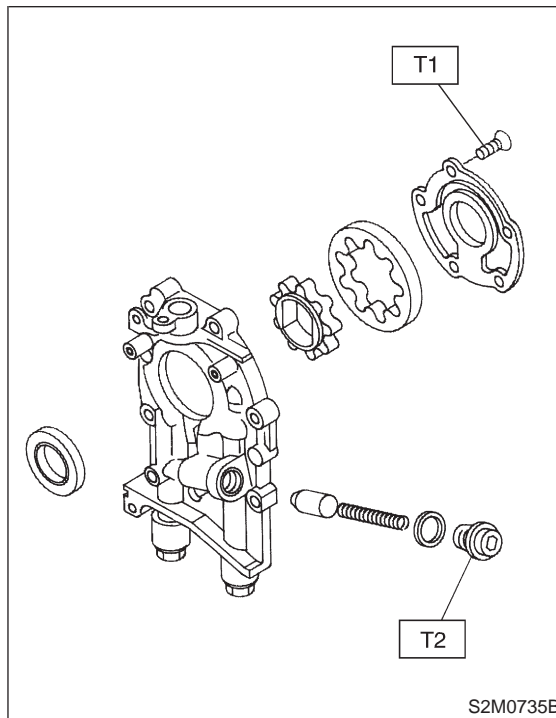


- 2) Install inner and outer rotors in their original positions.
- 3) Install oil relief valve and relief spring.
- 4) Install oil pump cover.

Tightening torque:

T1: 5 — 6 N·m (0.5 — 0.6 kg·m, 3.6 — 4.3 ft·lb)

T2: 40.7 — 47.6 N·m (4.15 — 4.85 kg·m, 30.0 — 35.1 ft·lb)



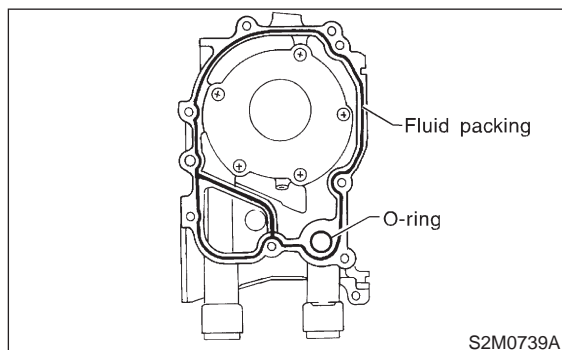
E: INSTALLATION

Installation is in the reverse order of removal.
Observe the following:

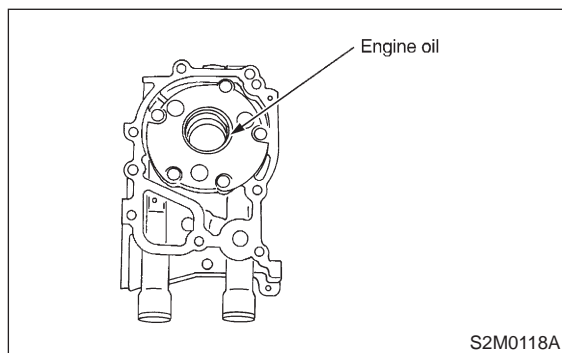
- 1) Apply fluid packing to matching surfaces of oil pump.

Fluid packing:

THREE BOND 1215 or equivalent



- 2) Replace O-ring with a new one.
- 3) Apply a coat of engine oil to the inside of the oil seal.



- 4) Be careful not to scratch oil seal when installing oil pump on cylinder block.
- 5) Position the oil pump, aligning the notched area with the crankshaft, and push the oil pump straight.

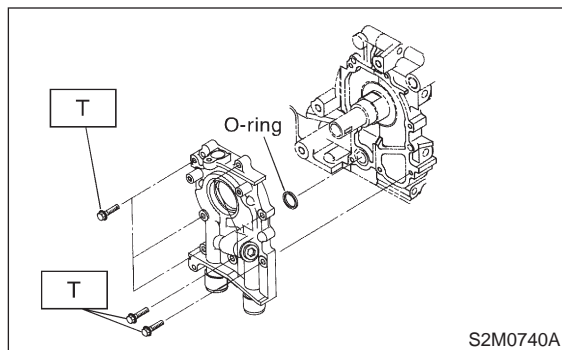
CAUTION:

Make sure the oil seal lip is not folded.

- 6) Install oil pump.

Tightening torque:

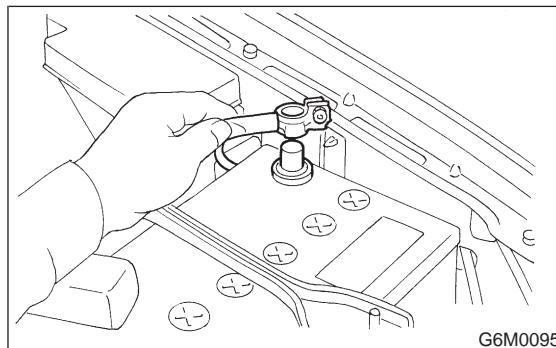
6.4 N·m (0.65 kg-m, 4.7 ft-lb)



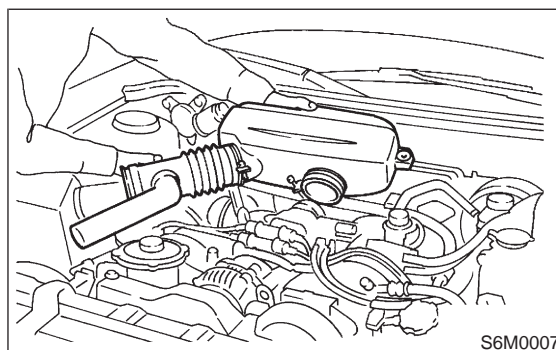
2. Oil Pan and Oil Strainer

A: REMOVAL

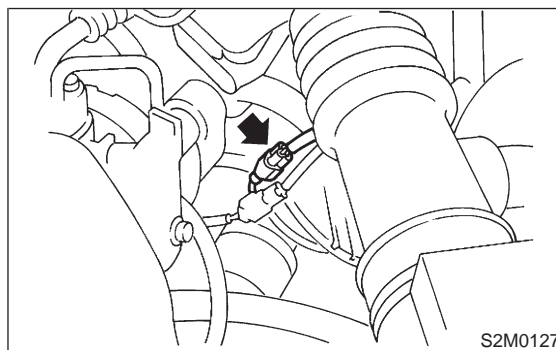
- 1) Disconnect battery ground cable.



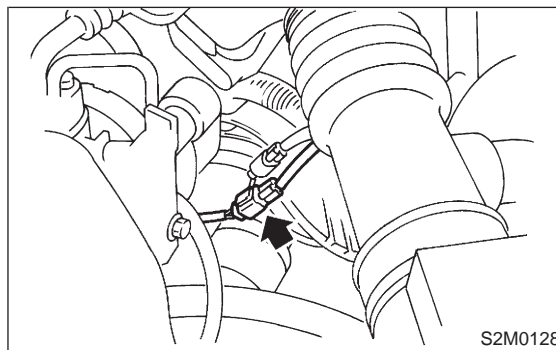
- 2) Remove front wheels.
- 3) Remove air intake duct and air intake chamber.



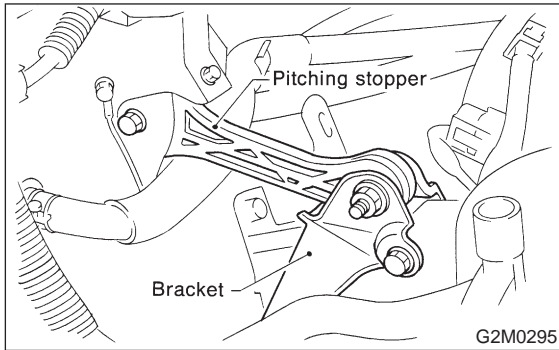
- 4) Disconnect front oxygen sensor connector.



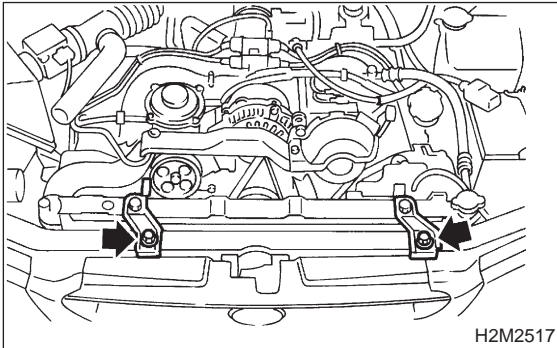
- 5) Disconnect rear oxygen sensor connector. (California spec. vehicles)



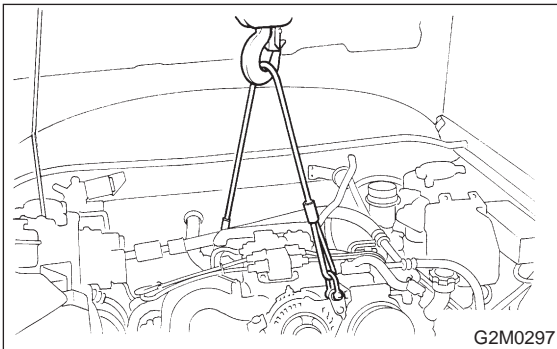
6) Remove pitching stopper.



7) Remove radiator upper bracket.



8) Support engine with a lifting device and wire ropes.

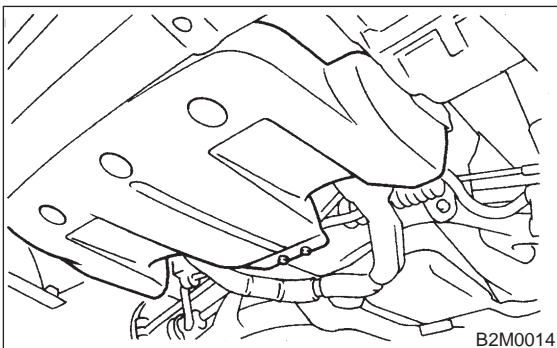


9) Lift-up the vehicle.

CAUTION:

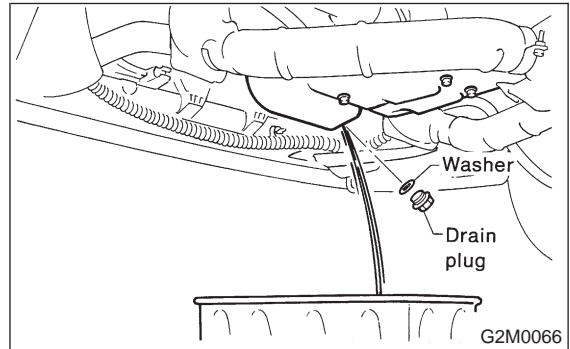
At this time, raise up wire ropes.

10) Remove under cover.

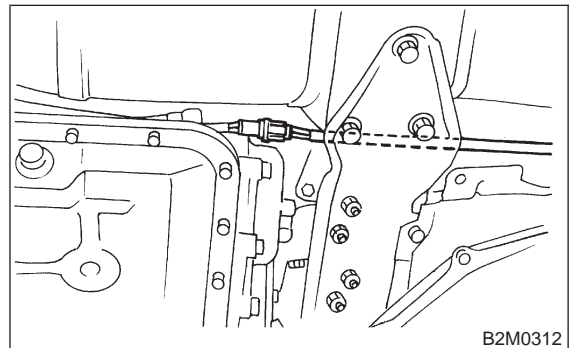


11) Drain engine oil.

Set container under the vehicle, and remove drain plug from oil pan.

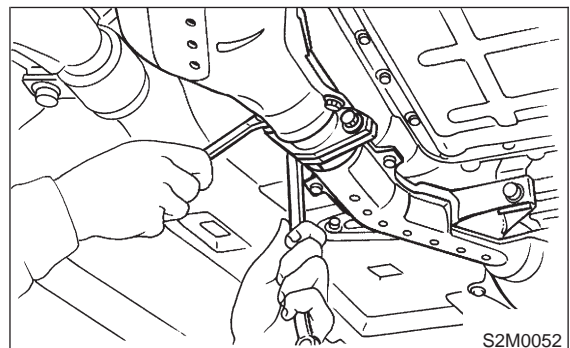


12) Disconnect connector from rear oxygen sensor. (Except California spec. vehicles)



13) Remove front exhaust pipe.

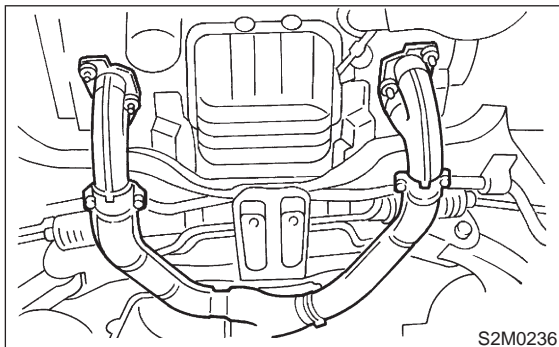
(1) Separate front catalytic converter from center exhaust pipe.



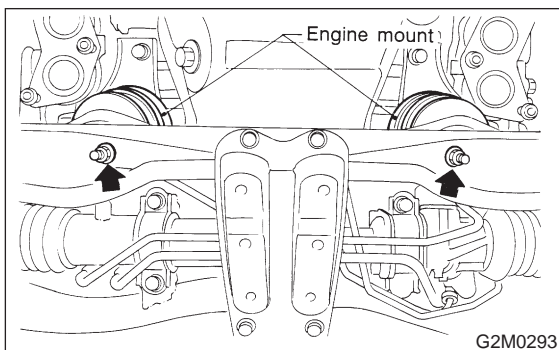
(2) Remove front exhaust pipe from engine.

CAUTION:

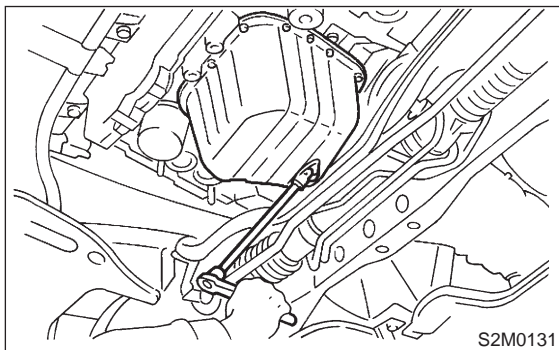
Be careful not to pull down front exhaust pipe.



14) Remove nuts which install front cushion rubber onto front crossmember.



15) Remove bolts which install oil pan on cylinder block while raising up engine.

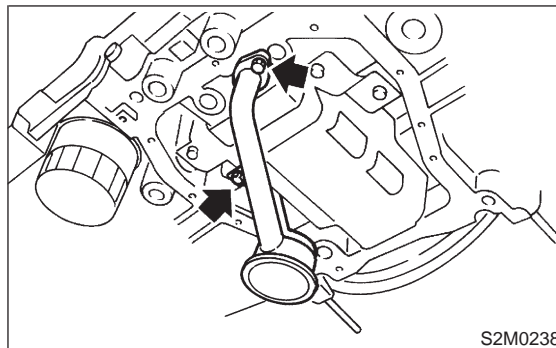


16) Insert oil pan cutter blade between cylinder block-to-oil pan clearance.

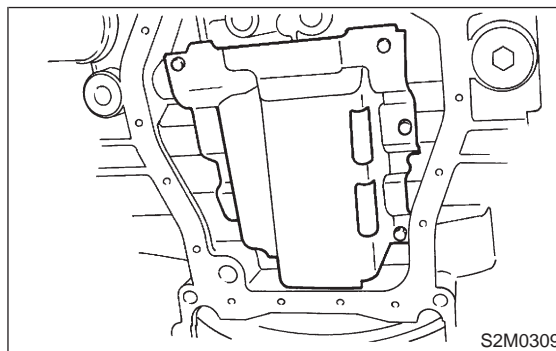
CAUTION:

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

17) Remove oil strainer.



18) Remove baffle plate.



B: INSPECTION

By visual check make sure oil pan, oil strainer and baffle plate are not damaged.

C: INSTALLATION

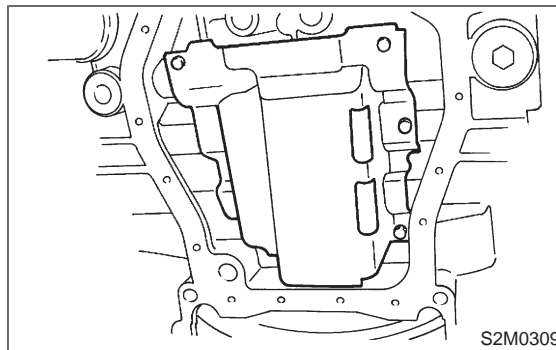
CAUTION:

Before installing oil pan, clean sealant from oil pan and engine block.

1) Install baffle plate.

Tightening torque:

6.4 N-m (0.65 kg-m, 4.7 ft-lb)



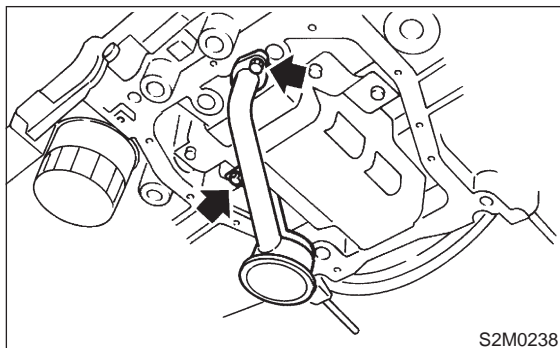
2) Install oil strainer onto baffle plate.

CAUTION:

Replace O-ring with a new one.

Tightening torque:

10 N·m (1.0 kg-m, 7 ft-lb)

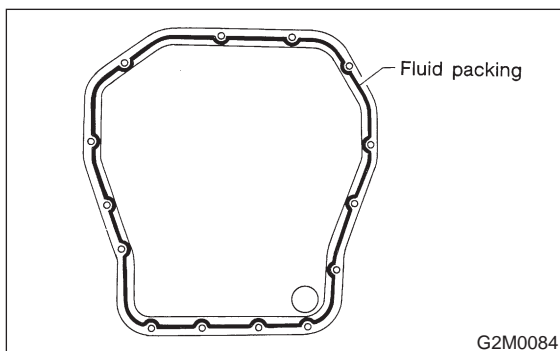


S2M0238

3) Apply fluid packing to mating surfaces and install oil pan.

Fluid packing:

THREE BOND 1215 or equivalent

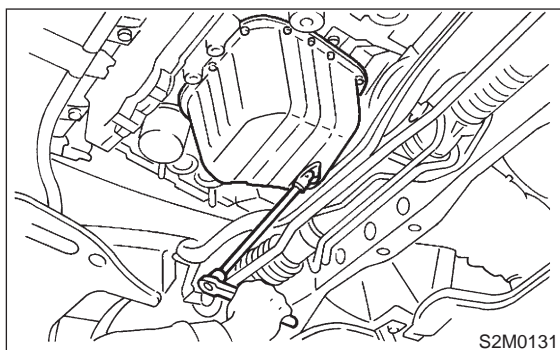


G2M0084

4) Tighten bolts which install oil pan onto engine block.

Tightening torque:

5 N·m (0.5 kg-m, 3.6 ft-lb)



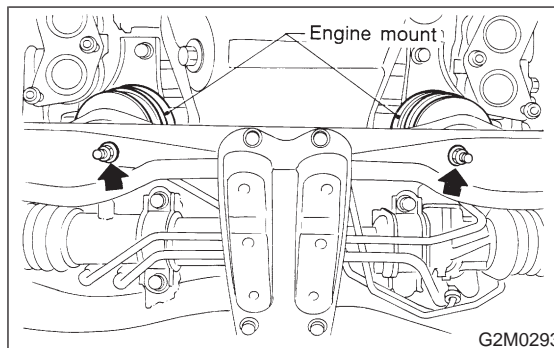
S2M0131

5) Lower engine onto front crossmember.

6) Tighten nuts which install front cushion rubber onto front crossmember.

Tightening torque:

69±15 N·m (7.0±1.5 kg-m, 51±11 ft-lb)



G2M0293

7) Install front exhaust pipe.

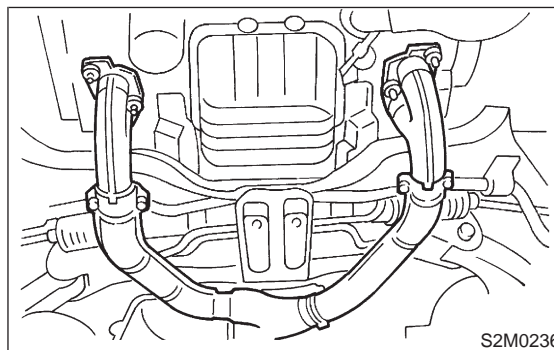
CAUTION:

Always use the new gaskets.

- (1) Place front exhaust pipe on bracket.
- (2) Tighten nuts which install front exhaust pipe on engine.

Tightening torque:

30±5 N·m (3.1±0.5 kg-m, 22.4±3.6 ft-lb)

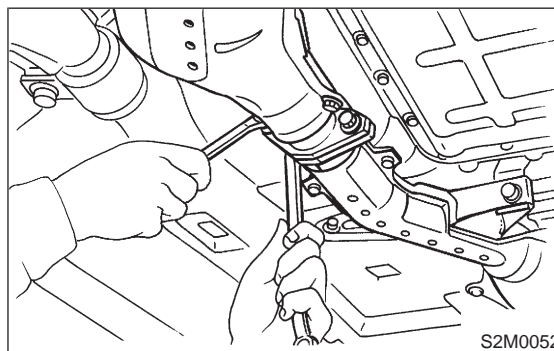


S2M0236

(3) Tighten nuts which install front catalytic converter to center exhaust pipe.

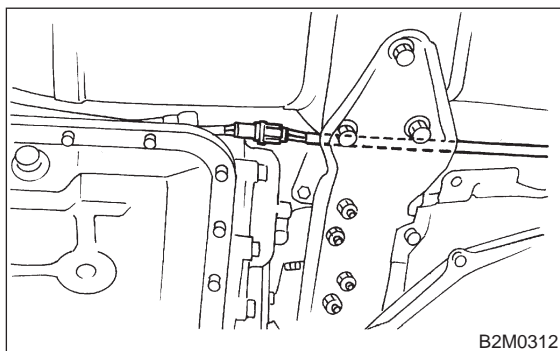
Tightening torque:

35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)

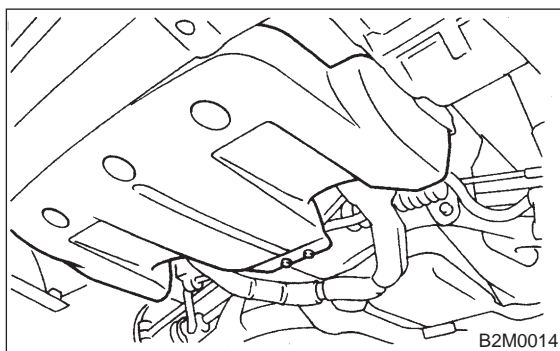


S2M0052

- 8) Connect connector to rear oxygen sensor.
(Except California spec. vehicles)



- 9) Install under cover.

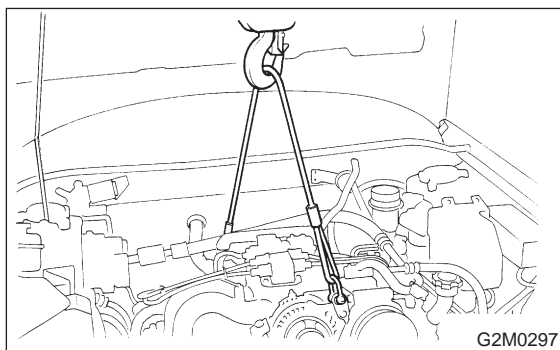


- 10) Lower the vehicle.

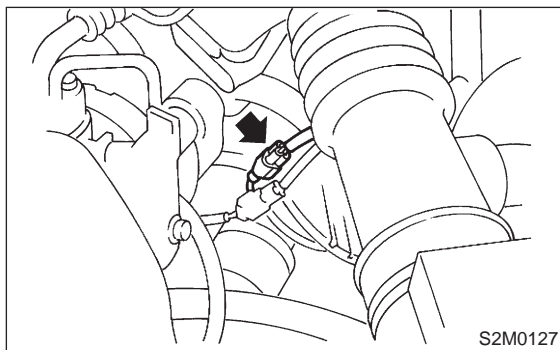
CAUTION:

At this time, lower lifting device and release steel cables.

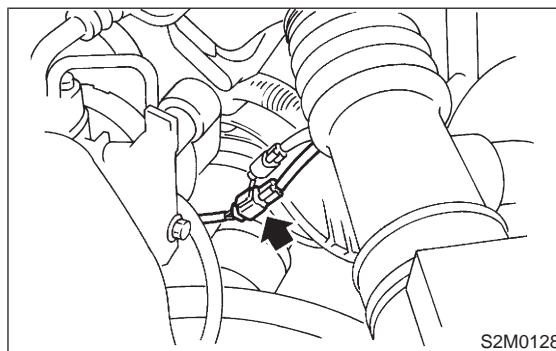
- 11) Remove lifting device and steel cables.



- 12) Connect connector to front oxygen sensor.



- 13) Connect connector to rear oxygen sensor.
(California spec. vehicles)

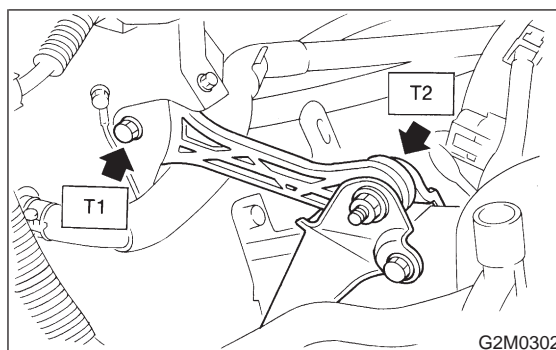


- 14) Install pitching stopper.

Tightening torque:

T1: 49 ± 5 N-m (5.0 ± 0.5 kg-m, 36.2 ± 3.6 ft-lb)

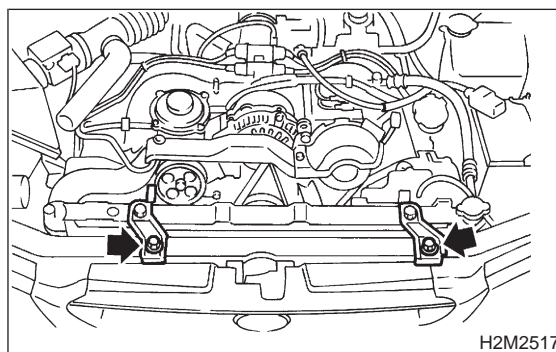
T2: 57 ± 10 N-m (5.8 ± 1.0 kg-m, 42 ± 7 ft-lb)



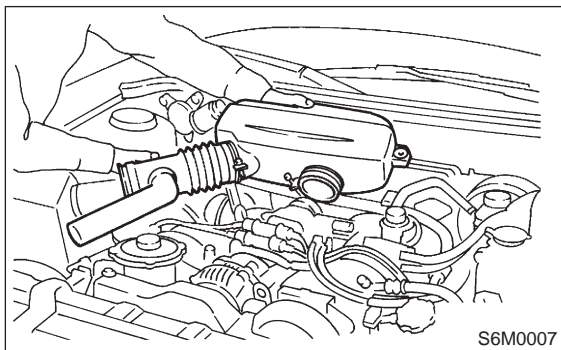
- 15) Install radiator upper brackets.

Tightening torque:

18 ± 5 N-m (1.8 ± 0.5 kg-m, 13 ± 4 ft-lb)



16) Install air intake duct and air intake chamber.



17) Fill engine oil. <Ref. to 1-5 [G400].>

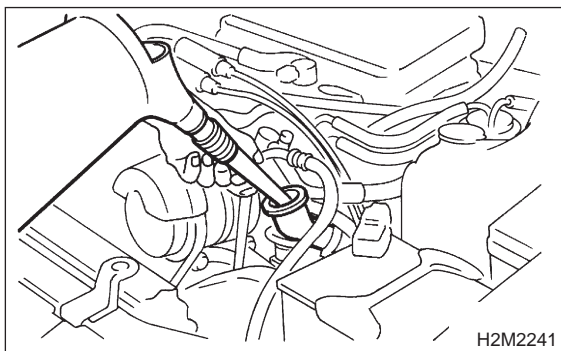
Oil capacity

2200 cc model:

4.0 l (4.2 US qt, 3.5 Imp qt)

2500 cc model:

4.5 l (4.8 US qt, 4.0 Imp qt)

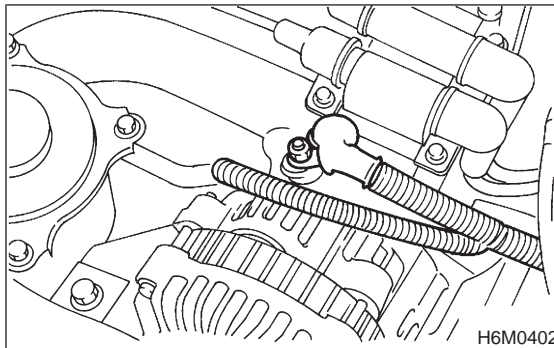


3. Oil Pressure Switch

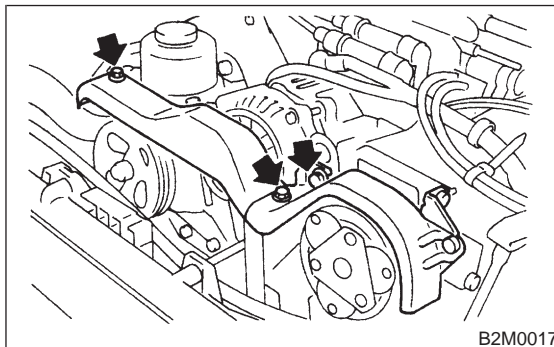
A: REMOVAL

1) Remove alternator from bracket.

(1) Disconnect connector and terminal from generator.

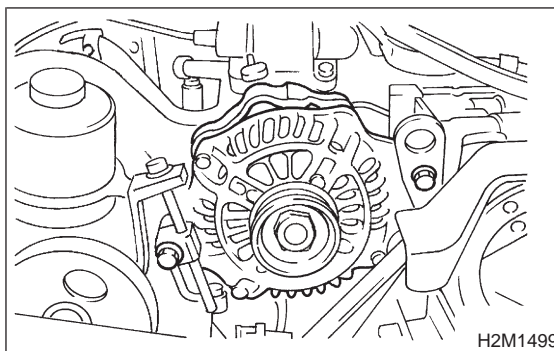


(2) Remove V-belt cover.

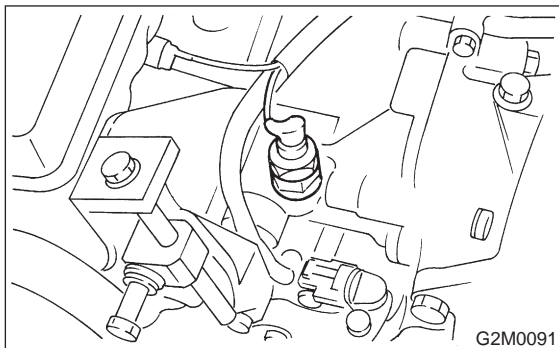


(3) Loosen lock bolt and slider bolt, and remove front side V-belt.

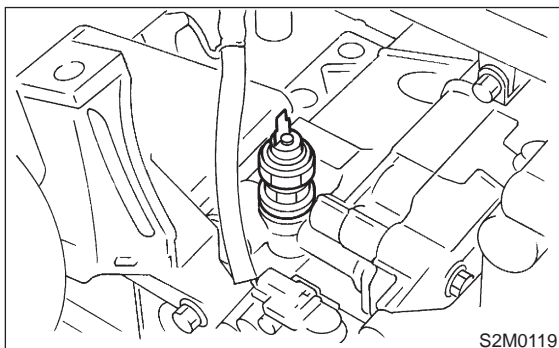
(4) Remove bolts which install generator on bracket.



- 2) Disconnect terminal from oil pressure switch.



- 3) Remove oil pressure switch.

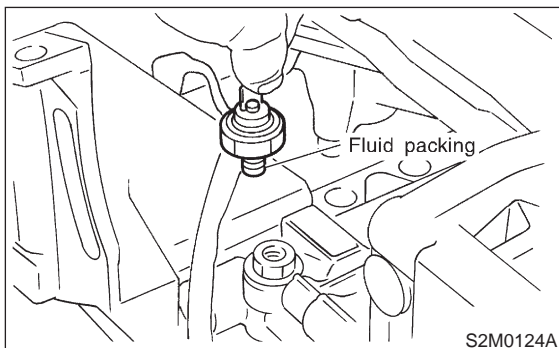


B: INSTALLATION

- 1) Apply fluid packing to oil pressure switch threads before installation.

Fluid packing:

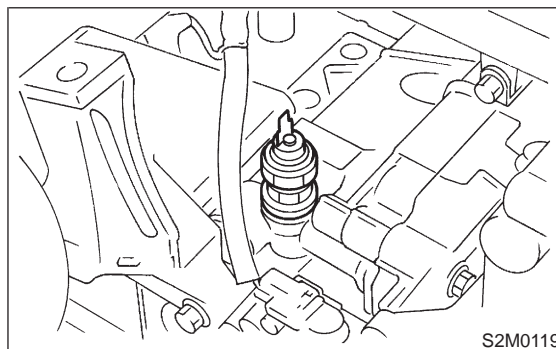
THREE BOND 1215 or equivalent



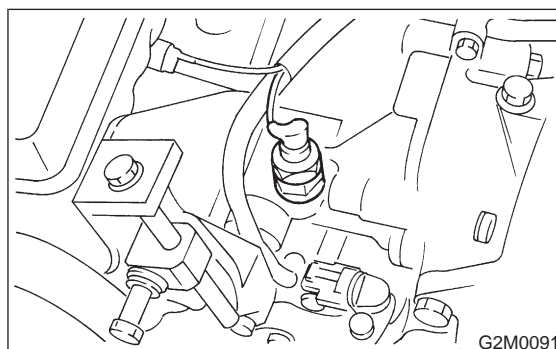
- 2) Install oil pressure switch onto engine block.

Tightening torque:

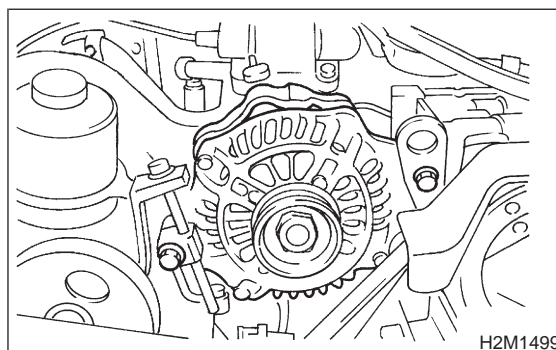
$25 \pm 3 \text{ N-m}$ ($2.5 \pm 0.3 \text{ kg-m}$, $18.1 \pm 2.2 \text{ ft-lb}$)



- 3) Connect terminal of oil pressure switch.

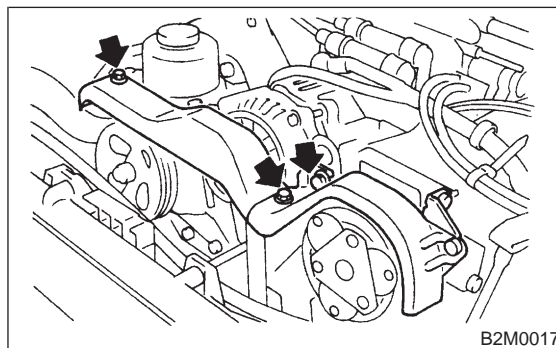


- 4) Install generator on bracket and temporary tighten installing bolts.

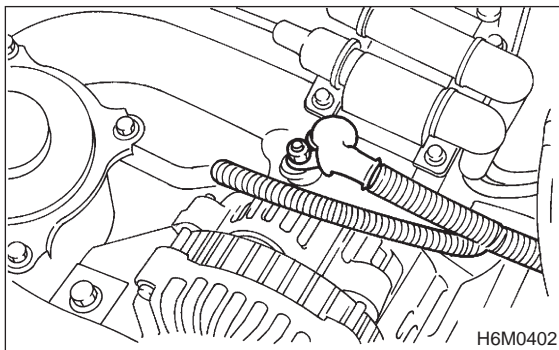


- 5) Install front side V-belt and adjust it. <Ref. to 1-5 [G200].>

- 6) Install V-belt cover.



7) Connect connector and terminal to generator.



1. Engine Lubrication System Trouble in General

NOTE:

Before troubleshooting, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	Replace.
2. Warning light does not go on.	1) Burn-out bulb		Replace.
	2) Poor contact of switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1.—2)

MEMO: