

ENGINE LUBRICATION SYSTEM

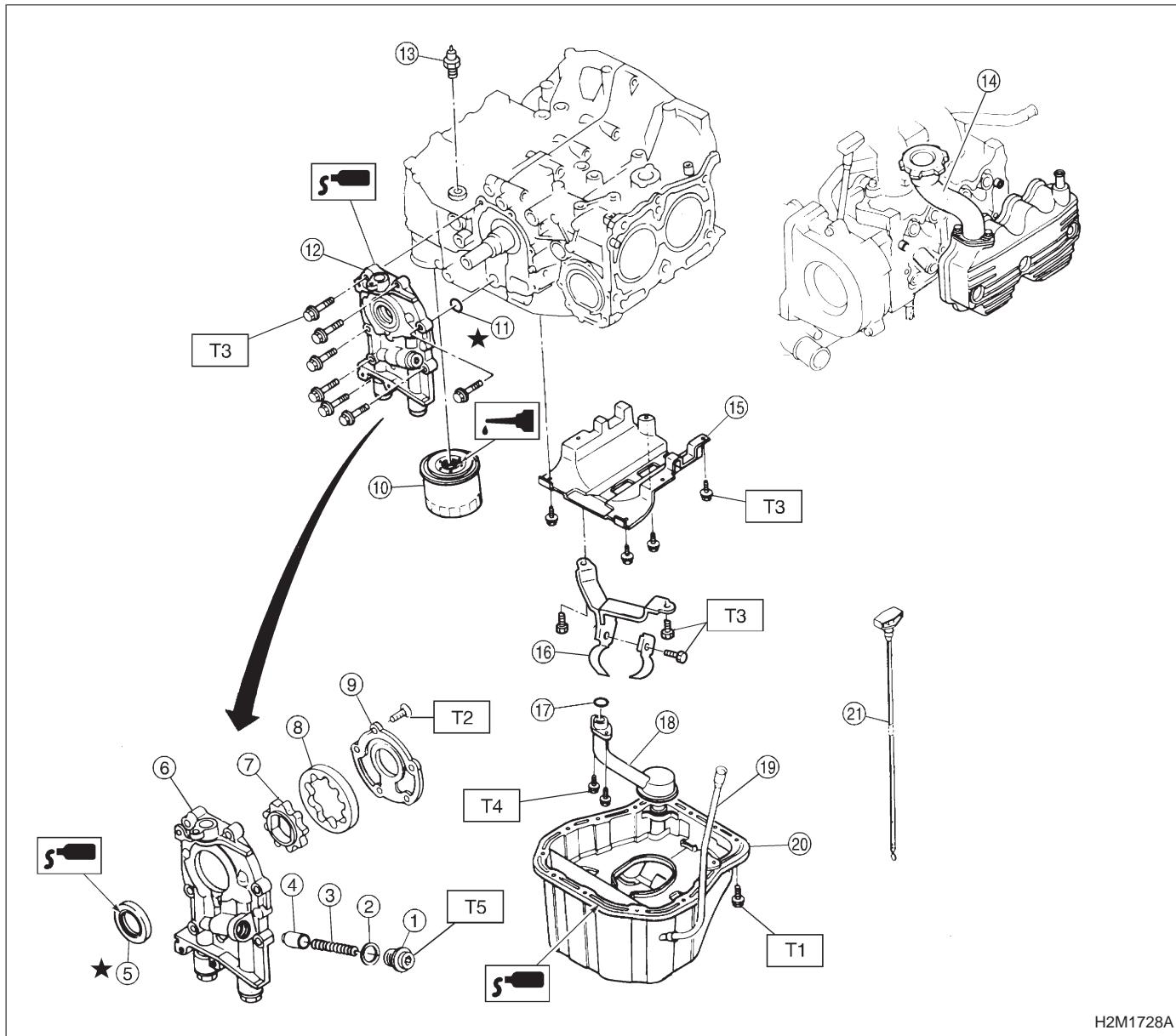
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1. Specifications

Lubrication method				Forced lubrication		
Oil pump	Pump type					
	Number of teeth	Inner rotor		9		
		Outer rotor		10		
	Outer rotor diameter x thickness					
	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)		
Oil filter	Capacity at 80°C (176°F)	600 rpm	Discharge	- pressure		
				98 kPa (1.0 kg/cm ² , 14 psi) or more		
		5,000 rpm	Discharge	- quantity		
				4.2 ℥ (4.4 US qt, 3.7 Imp qt)/min.		
	Relief valve operation pressure	600 rpm	Discharge	- pressure		
				294 kPa (3.0 kg/cm ² , 43 psi) or more		
		5,000 rpm	Discharge	- quantity		
				42.0 ℥ (11.10 US gal, 9.24 Imp gal)/min.		
				490 kPa (5.0 kg/cm ² , 71 psi)		
				490 kPa (5.0 kg/cm ² , 71 psi)		
Oil pressure switch	Type					
	Filtration area					
	By-pass valve opening pressure					
	Outer diameter x width					
	Oil filter to engine thread size					
Relief valve (on rocker shaft) operation pressure				69 kPa (0.7 kg/cm ² , 10 psi)		
Oil capacity (at replacement)	Type					
	Working voltage — wattage					
	Warning light activation pressure					
	Proof pressure					
Oil capacity (at replacement)				4.0 ℥ (4.2 US qt, 3.5 Imp qt)		

1. Lubrication System



H2M1728A

- 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 duct

- ⑯ Baffle plate
- ⑯ Oil strainer stay
- ⑯ O-ring
- ⑯ Oil strainer
- ⑯ Oil level gauge guide
- ⑯ Oil pan
- ⑯ Oil level gauge

Tightening torque: N·m (kg·m, ft·lb)

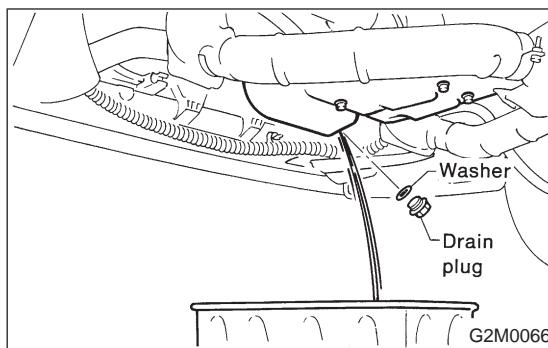
T1: 5 (0.5, 3.6)

T2: 5 — 6 (0.5 — 0.6, 3.6 — 4.3)

T3: 6.4 (0.65, 4.7)

T4: 9.8 (1.0, 7.0)

T5: 40.7 — 47.6 (4.15 — 4.85, 30.0 — 35.1)

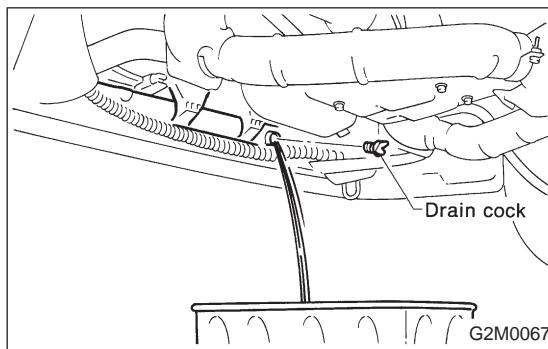


1. Oil Pump

A: REMOVAL

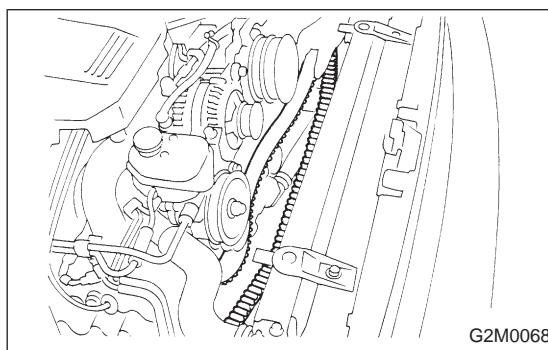
- 1) Drain engine oil.

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

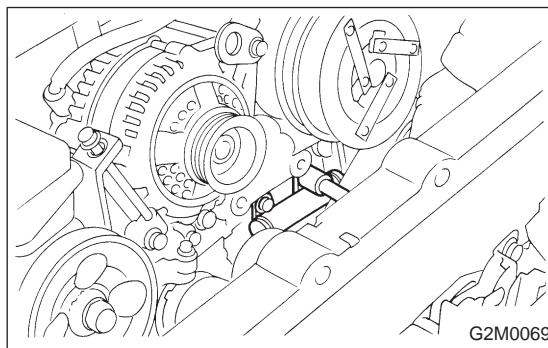


- 2) Drain coolant.

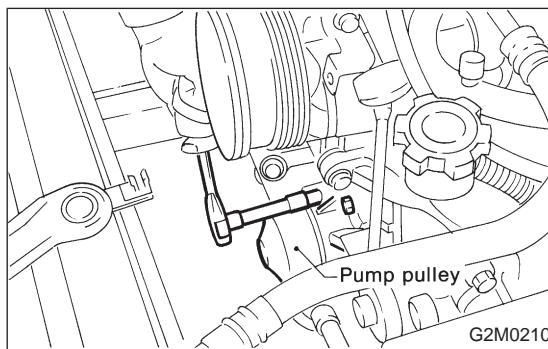
Set container under the vehicle, and remove drain cock from radiator.



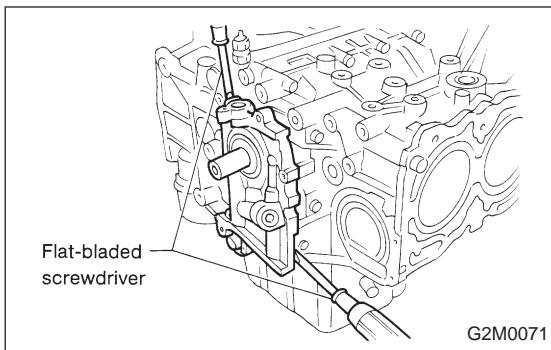
- 3) Remove belt covers, timing belt and related parts.
<Ref. to 1-5 [W2A0].>



- 4) Remove belt tensioner bracket.



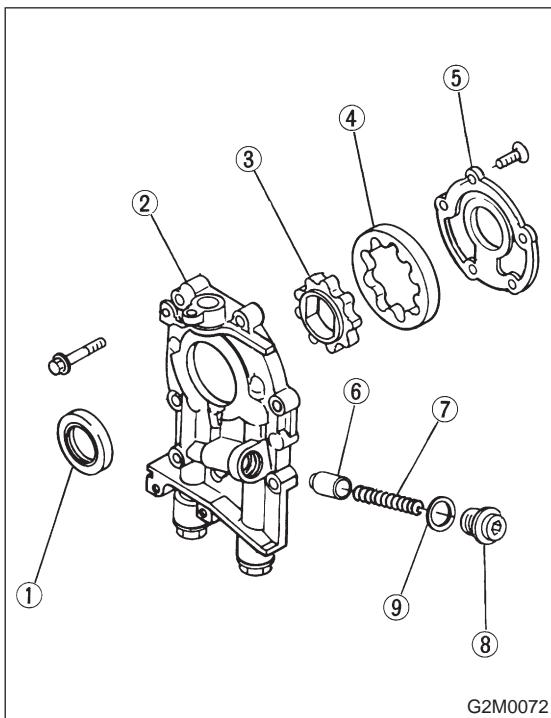
- 5) Remove left-hand camshaft sprocket and left-hand belt cover No. 2.
- 6) Remove water pump.



7) Remove oil pump by using flat-bladed screwdriver.

CAUTION:

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



B: DISASSEMBLY

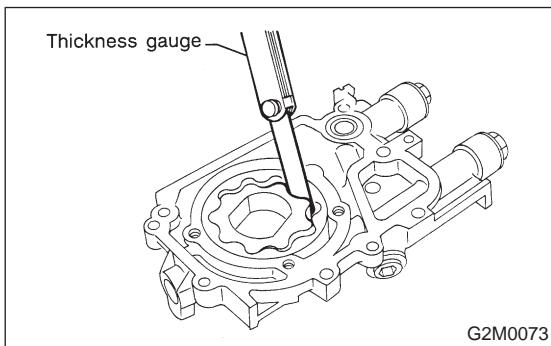
Remove screws which secure oil pump cover and disassemble oil pump.

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.

- ① Oil seal
- ② Pump case
- ③ Inner rotor
- ④ Outer rotor
- ⑤ Pump cover
- ⑥ Relief valve
- ⑦ Relief spring
- ⑧ Plug
- ⑨ 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.

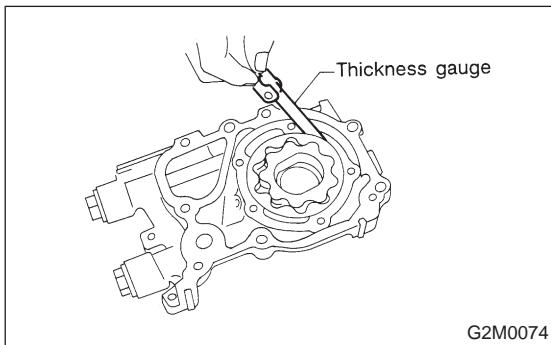
Case clearance:

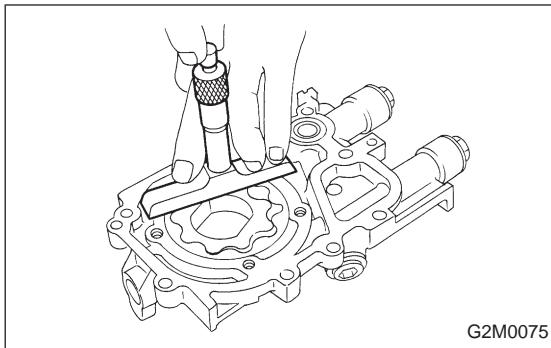
Standard

0.10 — 0.175 mm (0.0039 — 0.0069 in)

Limit

0.20 mm (0.0079 in)





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)

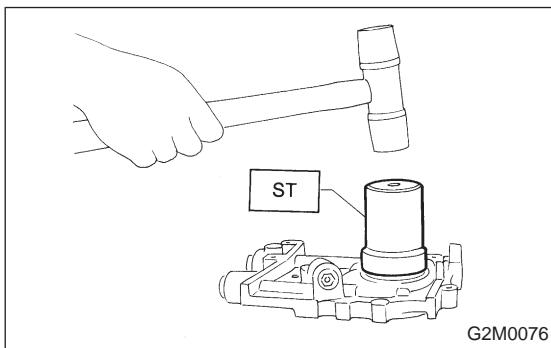
Load when installed; 77.08 N (7.86 kg, 17.33 lb)

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.



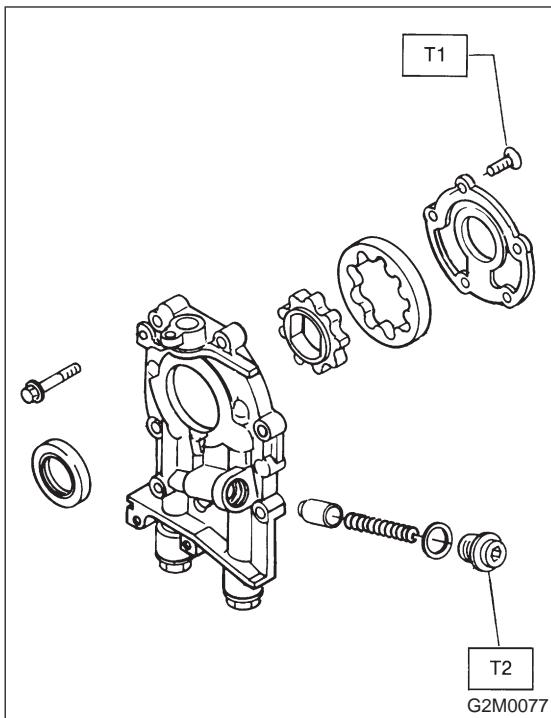
D: ASSEMBLY

1) Install front oil seal by using ST.

ST 499587100 OIL SEAL INSTALLER

CAUTION:

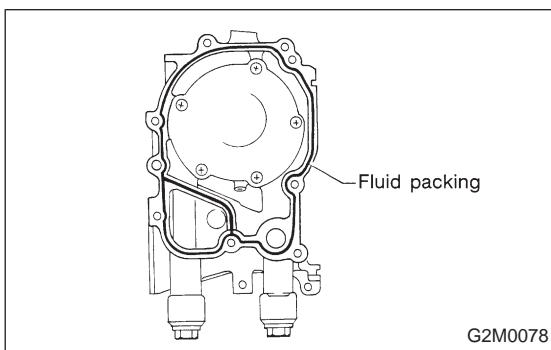
Use a new oil seal.



- 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

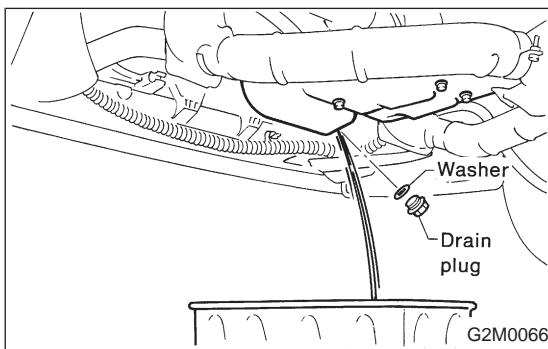
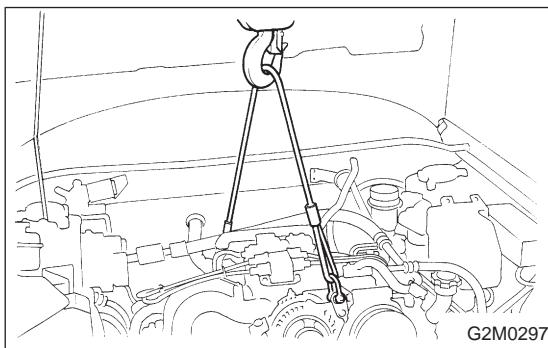
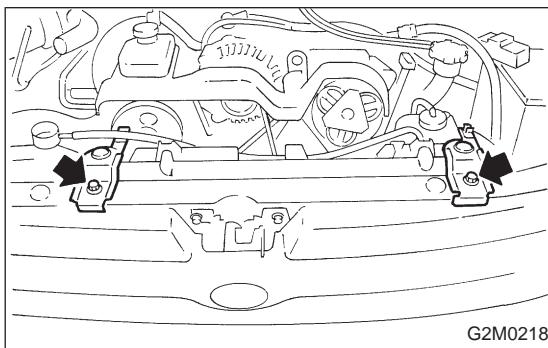
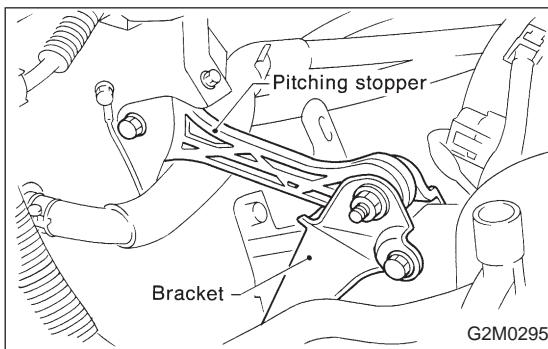
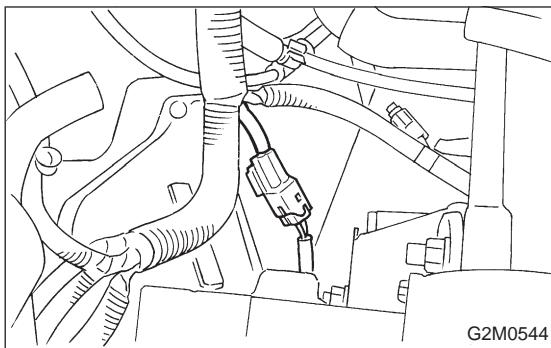
- 2) Replace O-ring with a new one.
- 3) Be careful not to scratch oil seal when installing oil pump on cylinder block.

CAUTION:

Apply fluid packing to oil pressure switch threads before installation.

Fluid packing:

THREE BOND 1215 or equivalent



2. Oil Pan and Oil Strainer

A: REMOVAL

- 1) Remove front wheels.
- 2) Remove air intake duct and air intake chamber.
- 3) Disconnect connector from front oxygen sensor.

- 4) Remove pitching stopper.

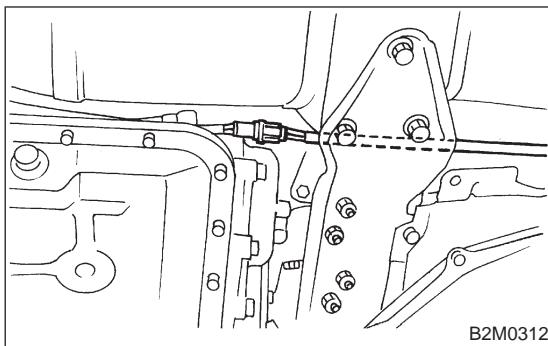
- 5) Remove radiator upper brackets.

- 6) Support engine with a lifting device and wire ropes.

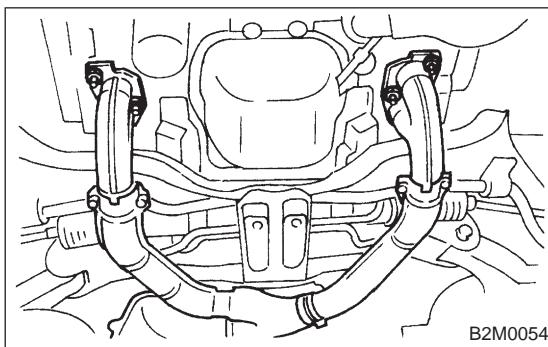
- 7) Lift-up the vehicle.

CAUTION:

At this time, raise up wire ropes.

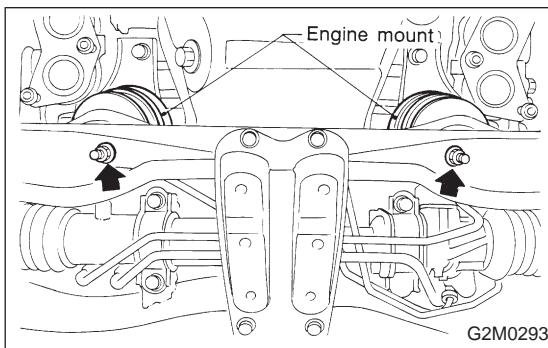


9) Disconnect connector from rear oxygen sensor.

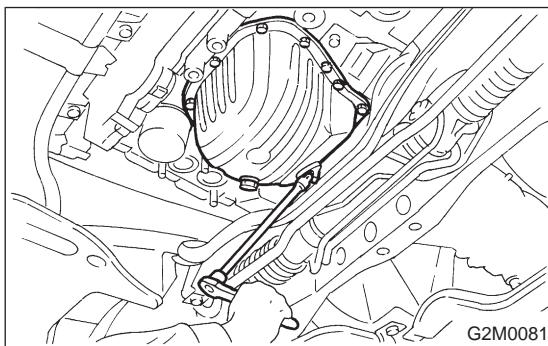


10) Remove front exhaust pipe.

- (1) Separate front catalytic converter from center exhaust pipe.
- (2) Remove front exhaust pipe from engine.
- (3) Remove bolt which installs front exhaust pipe on bracket.



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

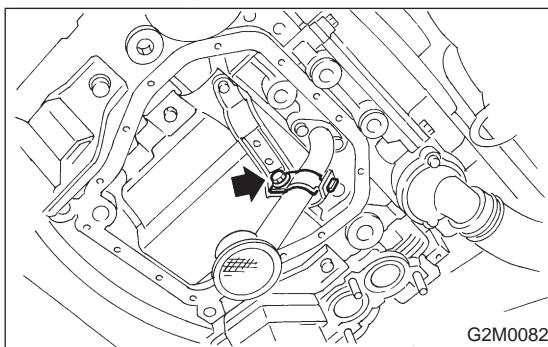


12) Remove bolts which install oil pan on cylinder block while raising up engine.

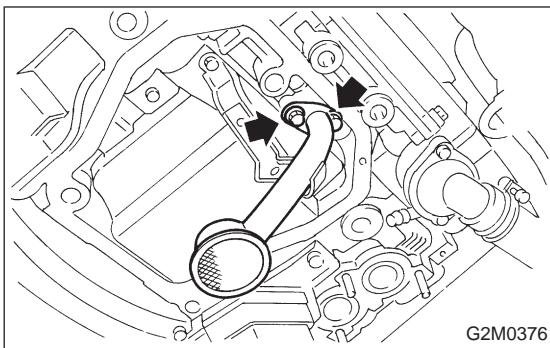
13) Insert oil pan cutter blade between cylinder block-to-oil pan clearance.

CAUTION:

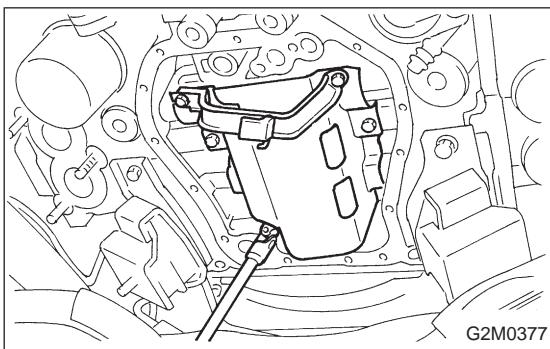
Do not use a screwdriver or similar tool in place of oil pan cutter.



14) Separate oil strainer from oil strainer stay.



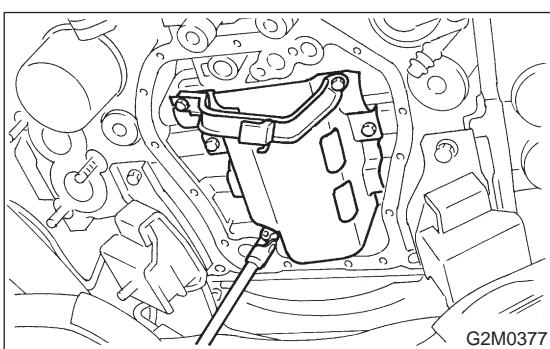
15) Remove oil strainer.



16) Remove baffle plate and oil strainer stay.

B: INSPECTION

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



C: INSTALLATION

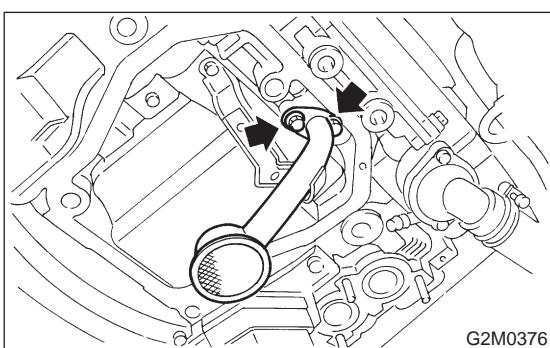
CAUTION:

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

1) Install baffle plate and oil strainer stay.

Tightening torque:

6.4 N·m (0.65 kg·m, 4.7 ft-lb)



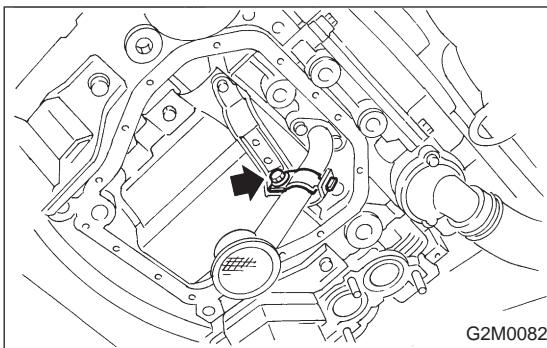
2) Install oil strainer onto baffle plate.

CAUTION:

Replace O-ring with a new one.

Tightening torque:

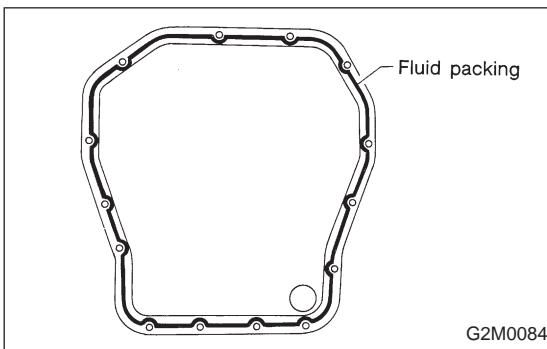
9.8 N·m (1.0 kg·m, 7 ft-lb)



3) Hold oil strainer to oil strainer stay.

Tightening torque:

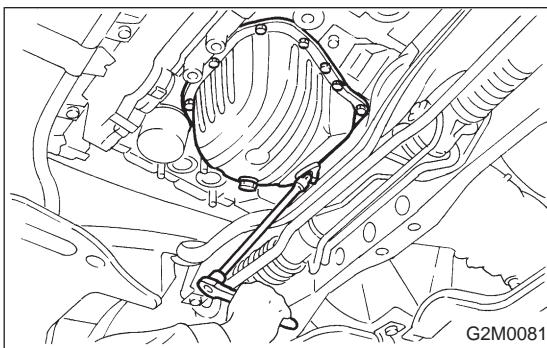
9.8 N·m (1.0 kg-m, 7 ft-lb)



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

Fluid packing:

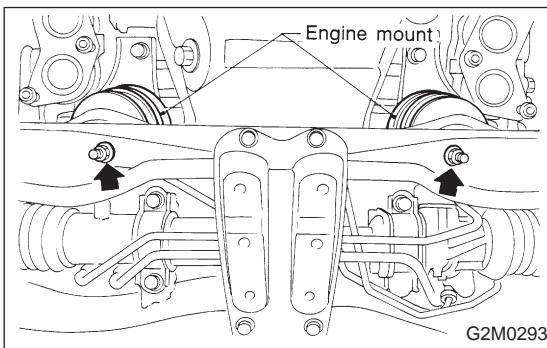
THREE BOND 1215 or equivalent



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

Tightening torque:

5 N·m (0.5 kg-m, 3.6 ft-lb)

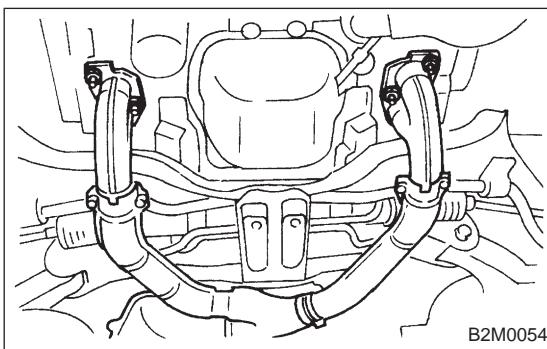


6) Lower engine onto front crossmember.

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

Tightening torque:

69 ± 15 N·m (7.0 \pm 1.5 kg-m, 51 \pm 11 ft-lb)



8) Install front exhaust pipe.

CAUTION:

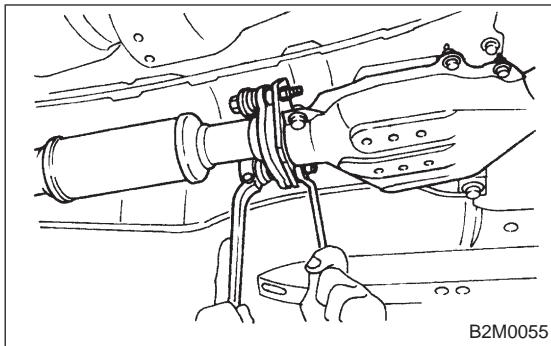
Always use the new gaskets.

(1) Place front exhaust pipe on bracket.

(2) Tighten nuts which install front exhaust pipe on engine.

Tightening torque:

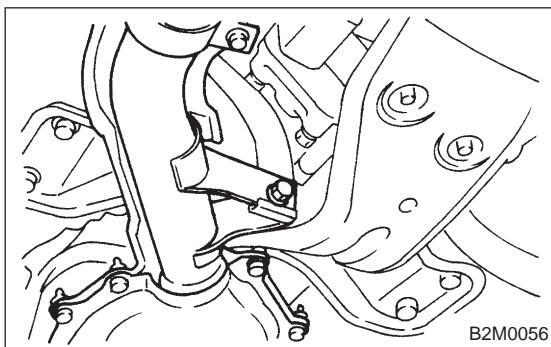
30 ± 5 N·m (3.1 \pm 0.5 kg-m, 22.4 \pm 3.6 ft-lb)



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

Tightening torque:

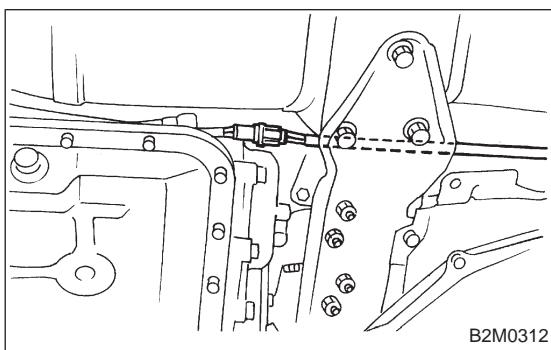
$35 \pm 5 \text{ N}\cdot\text{m}$ ($3.6 \pm 0.5 \text{ kg}\cdot\text{m}$, $26.0 \pm 3.6 \text{ ft-lb}$)



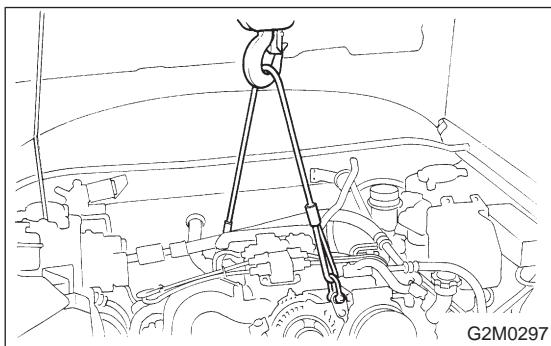
(4) Tighten bolt which installs front exhaust pipe on bracket.

Tightening torque:

$24 \pm 3 \text{ N}\cdot\text{m}$ ($2.4 \pm 0.3 \text{ kg}\cdot\text{m}$, $17.4 \pm 2.2 \text{ ft-lb}$)



9) Connect connector to rear oxygen sensor.

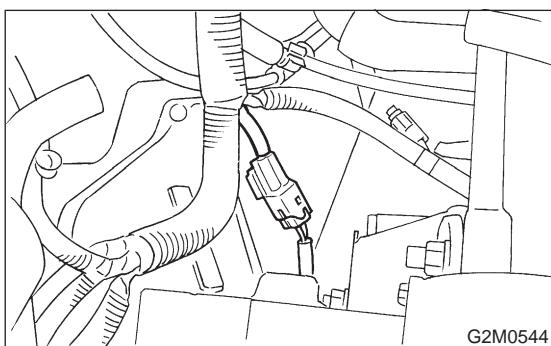


10) Lower the vehicle.

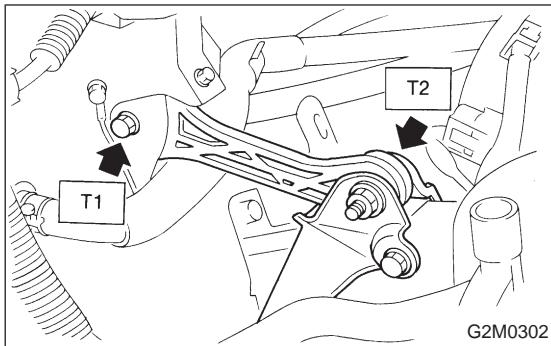
CAUTION:

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

11) Remove lifting device and steel cables.



12) Connect connector to front oxygen sensor.

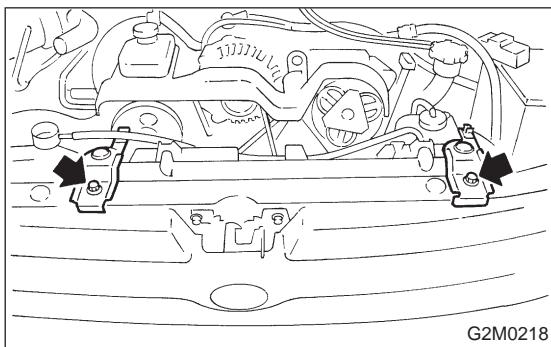


13) Install pitching stopper.

Tightening torque:

T1: $49\pm5\text{ N}\cdot\text{m}$ ($5.0\pm0.5\text{ kg}\cdot\text{m}$, $36.2\pm3.6\text{ ft-lb}$)

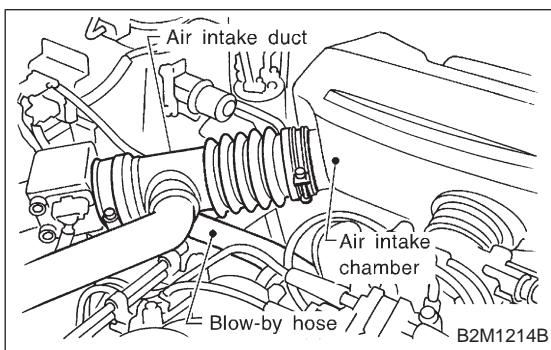
T2: $57\pm10\text{ N}\cdot\text{m}$ ($5.8\pm1.0\text{ kg}\cdot\text{m}$, $42\pm7\text{ ft-lb}$)



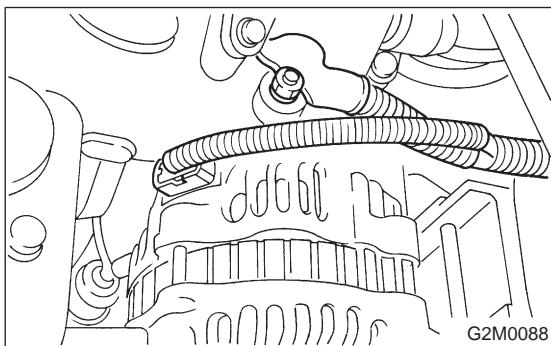
14) Install radiator upper brackets.

Tightening torque:

T1: $18\pm5\text{ N}\cdot\text{m}$ ($1.8\pm0.5\text{ kg}\cdot\text{m}$, $13\pm4\text{ ft-lb}$)



15) Install air intake duct and air intake chamber.



3. Oil Pressure Switch

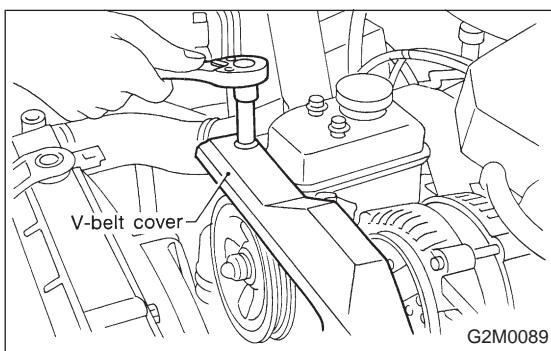
A: REMOVAL

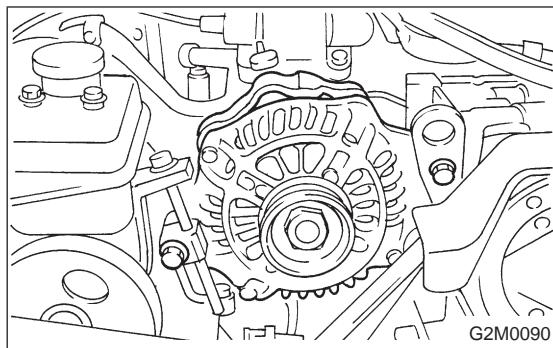
1) Remove alternator from bracket.

(1) Disconnect connector and terminal from generator.

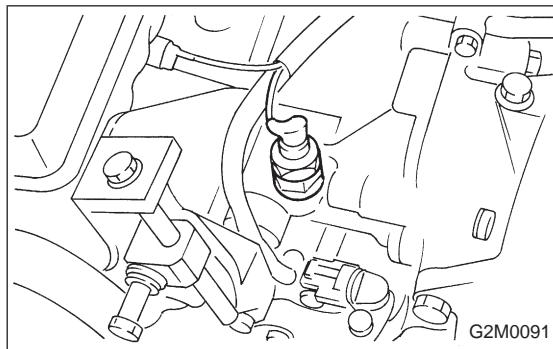
(2) Remove V-belt cover.

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

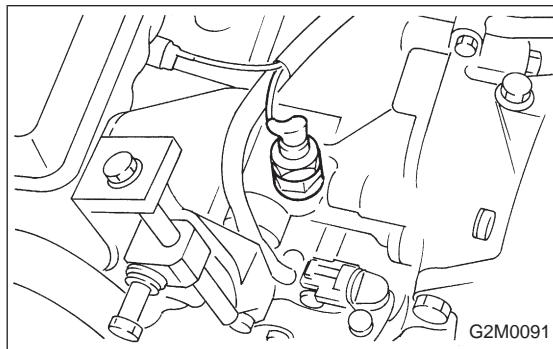




- (4) Remove bolts which install generator on bracket.



- 2) Disconnect terminal from oil pressure switch.
- 3) Remove oil pressure switch.



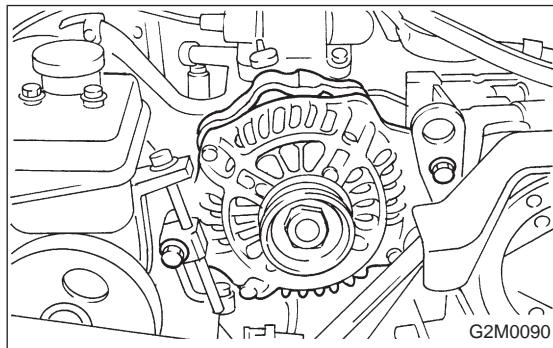
B: INSTALLATION

- 1) Install oil pressure switch onto engine block.

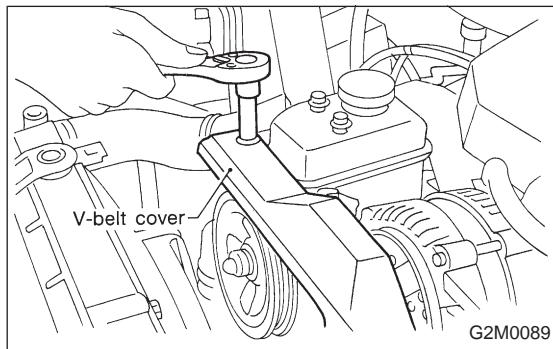
Tightening torque:

$25\pm3\text{ N}\cdot\text{m}$ (2.5±0.3 kg-m, 18.1±2.2 ft-lb)

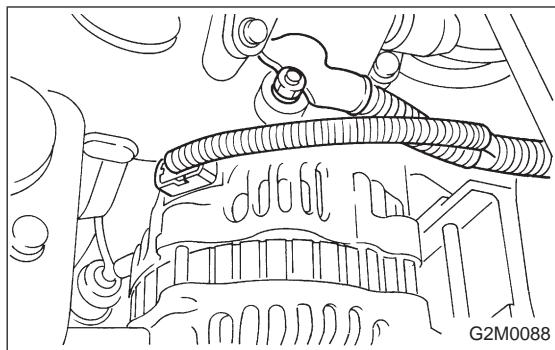
- 2) Connect terminal of oil pressure switch.



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



- 4) Install front side V-belt and adjust it.
<Ref. to 1-5 [01B0].>
- 5) Install V-belt cover.



- 6) Connect connector and terminal to generator.

1. Engine Lubrication System Trouble in General

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)