

OIL PUMP

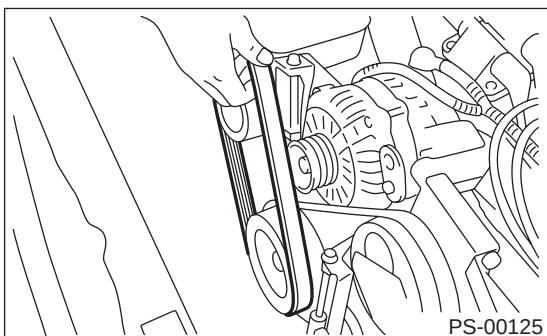
POWER ASSISTED SYSTEM (POWER STEERING)

7. Oil Pump

A: REMOVAL

1. 2.5 L MODEL

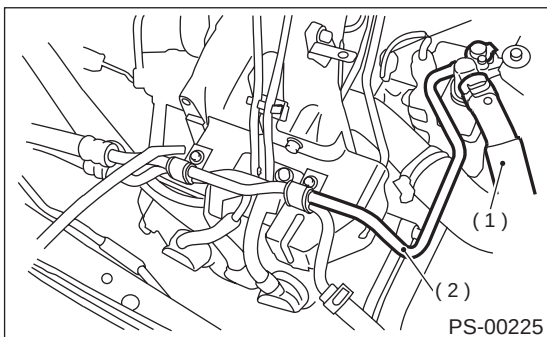
- 1) Remove ground cable from battery.
- 2) Remove pulley belt cover bracket.
- 3) Loosen lock bolt and slider bolt and remove power steering pump drive V-belt.



- 4) Disconnect connector from power steering pump switch.
- 5) Disconnect pipe C and suction hose from oil pump.

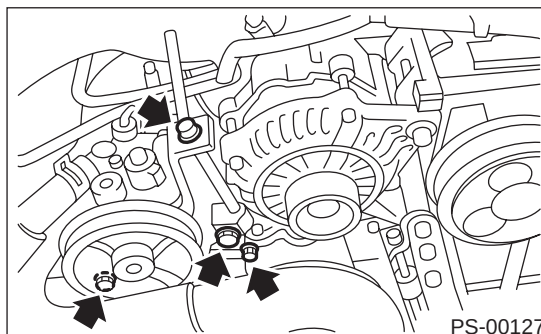
CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Suction hose
(2) Pipe C

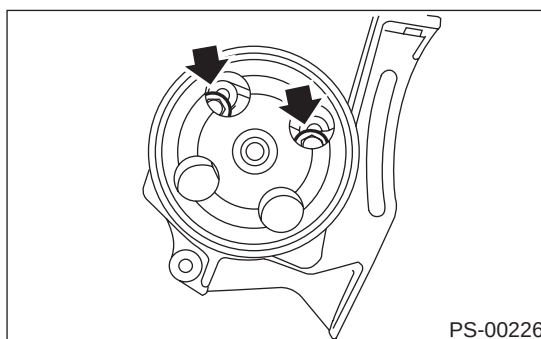
- 6) Remove bolts which install power steering pump bracket.



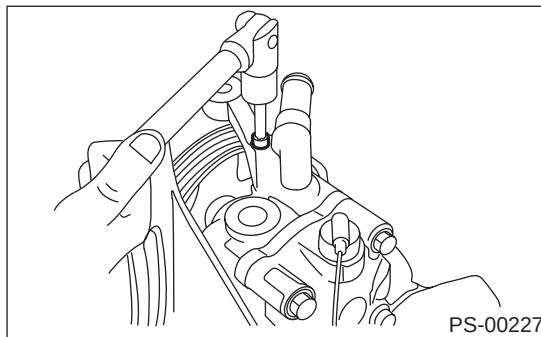
- 7) Place oil pump bracket in a vise, remove two bolts from the front side of oil pump.

CAUTION:

Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



- 8) Remove socket from oil pump.

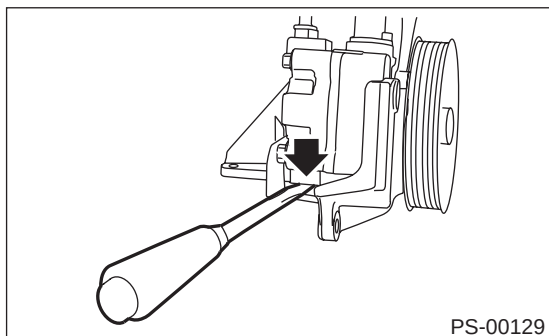


- 9) Remove bolt from the rear side of oil pump.

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10) Disassemble oil pump and bracket by inserting a screwdriver as shown in the figure.

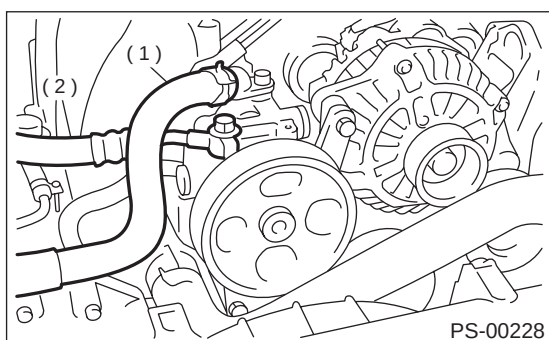


2. 3.0 L MODEL

- 1) Remove ground cable from battery.
- 2) Remove pulley belt cover.
- 3) Remove V-belt.
- 4) Disconnect connector from power steering pressure switch.
- 5) Remove tensioner adjuster.
- 6) Disconnect pressure hose and suction hose from oil pump.

CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose, cover the open ends of them with a clean cloth.



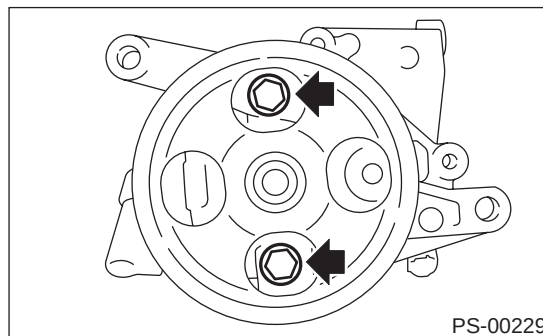
- (1) Pressure hose
(2) Suction hose

7) Remove bolts, which install power steering pump bracket.

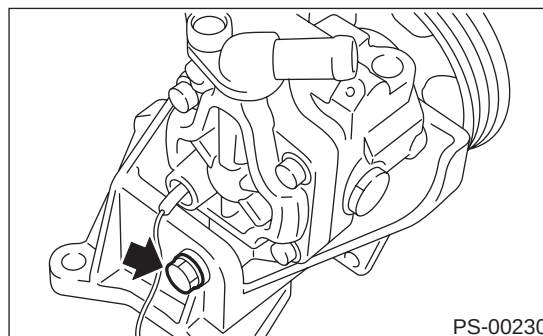
8) Place oil pump bracket in a vise, remove two bolts from the front side of oil pump.

CAUTION:

Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



9) Remove bolt from the rear side of oil pump.



10) Remove oil pump from bracket.

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POWER ASSISTED SYSTEM (POWER STEERING)

B: INSTALLATION

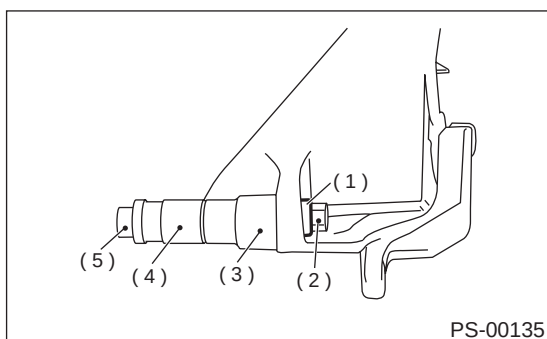
1. 2.5 L MODEL

1) Install oil pump to bracket.

(1) Place oil pump bracket in a vise. Tighten bushing using a 12.7 mm (1/2") type 14- and 21-mm box wrench until it is in contact with oil pump mounting surface.

CAUTION:

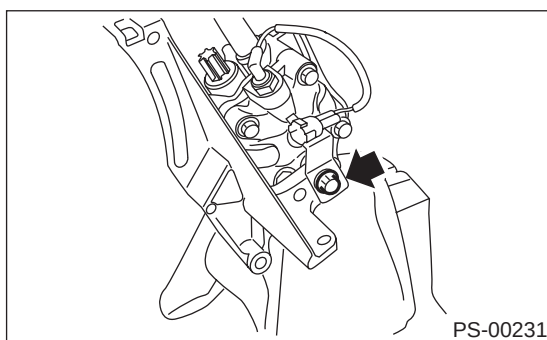
Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



- (1) Bushing
- (2) Nut
- (3) 21 mm
- (4) 14 mm
- (5) Bolt

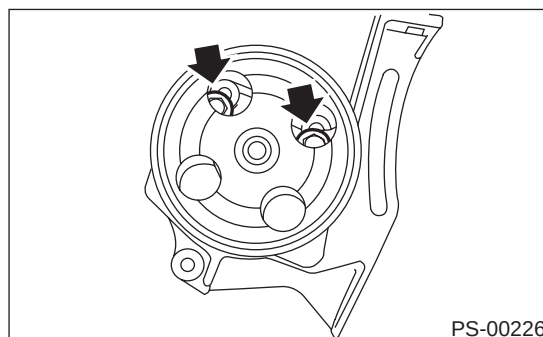
(2) Tighten bolt which installs oil pump and switch bracket to bracket.

Tightening torque:
37.3 N·m (3.8 kgf-m, 27.5 ft-lb)



Tightening torque:

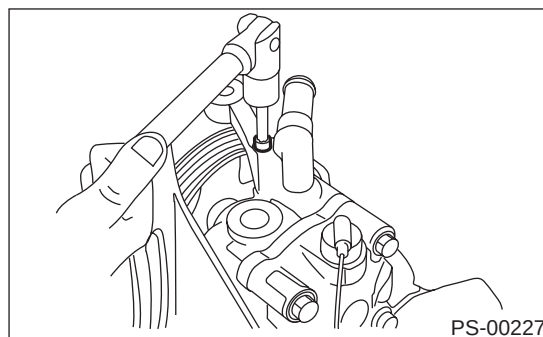
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)



2) Install socket to oil pump.

Tightening torque:

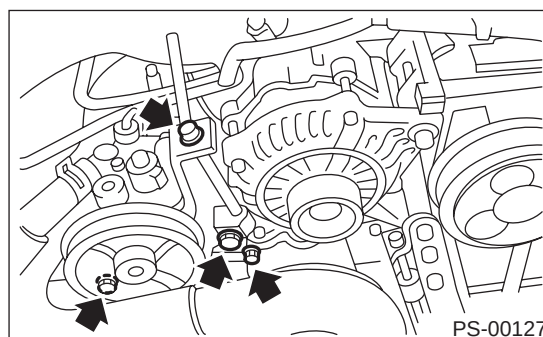
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



3) Tighten bolts which install power steering pump bracket.

Tightening torque:

22 N·m (2.2 kgf-m, 15.9 ft-lb)



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4) Interconnect pipes C and suction hose.

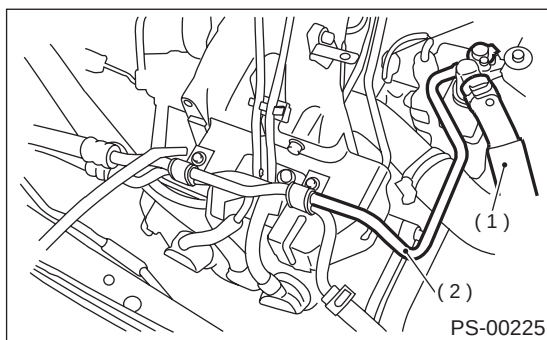
Tightening torque:

Joint nut

39.2 N·m (4 kgf-m, 28.9 ft-lb)

CAUTION:

If a hose is twisted at this step, the hose may come into contact with some other parts.



- (1) Suction hose
(2) Pipe C

5) Connect connector to power steering oil pressure switch.

6) Install pulley belt to oil pump.

7) Check pulley belt tension. <Ref. to ME(H4SO)-42, V-belt.> and <Ref. to ME(H6DO)-28, V-belt.>

8) Tighten lock bolt.

Tightening torque:

24.5 N·m (2.5 kgf-m, 18.1 ft-lb)

9) Tighten bolt belt tension.

Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

10) Install pulley belt cover bracket.

11) Connect ground terminal of battery.

12) Feed the specified power steering fluid <Ref. to PS-63, Power Steering Fluid.>

CAUTION:

Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

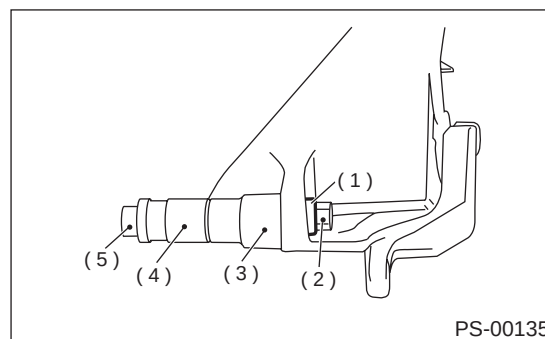
2. 3.0 L MODEL

1) Install oil pump to bracket.

(1) Place oil pump bracket in a vise. Tighten bushing using a 12.7 mm (1/2") type 14 and 21-mm box wrench until it is in contact with oil pump mounting surface.

CAUTION:

Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.

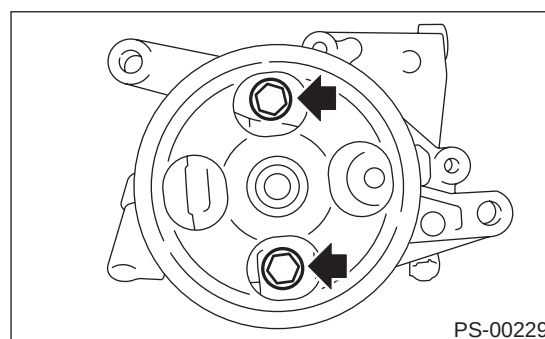


- (1) Bushing
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

(2) Tighten bolt which installs oil pump to bracket.

Tightening torque:

15.7 N·m (1.6 kgf-m, 11.6 ft-lb)



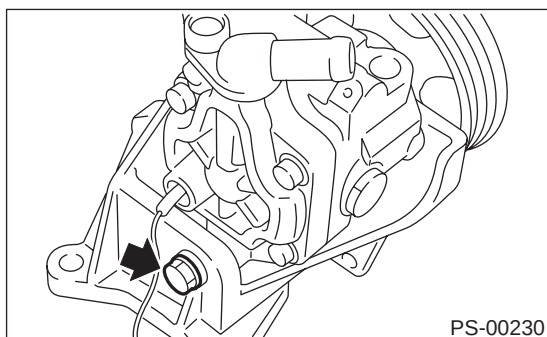
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POWER ASSISTED SYSTEM (POWER STEERING)

Tightening torque:

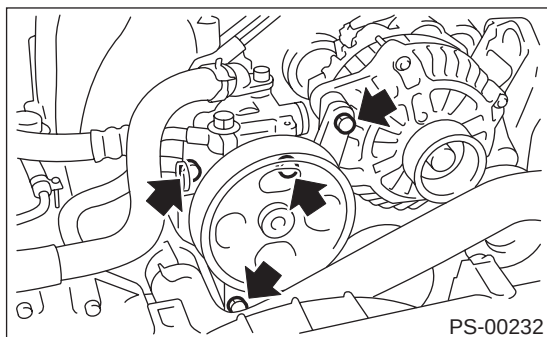
37.3 N·m (3.8 kgf-m, 27.5 ft-lb)



2) Tighten bolts which install power steering pump bracket.

Tightening torque:

33.3 N·m (3.4 kgf-m, 24.5 ft-lb)



3) Interconnect pressure hose and suction hose.

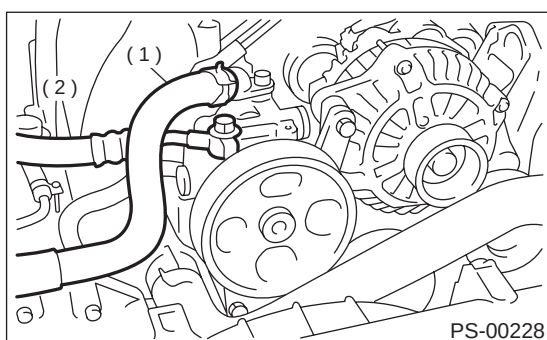
Tightening torque:

Eye bolt

39.2 N·m (4 kgf-m, 28.9 ft-lb)

CAUTION:

If a hose is twisted at this step, the hose may come into contact with some other parts.



- (1) Suction hose
- (2) Pressure hose

- 4) Connect connector to power steering oil pressure switch.
- 5) Install tensioner adjuster.
- 6) Install V-belt.

7) Install pulley belt cover.

8) Connect ground terminal of battery.

9) Feed the specified power steering fluid. <Ref. to PS-63, Power Steering Fluid.>

CAUTION:

Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

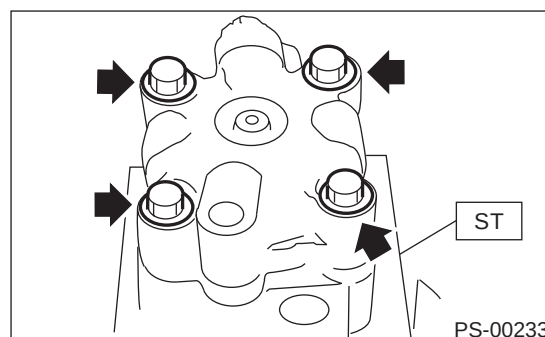
C: DISASSEMBLY

NOTE:

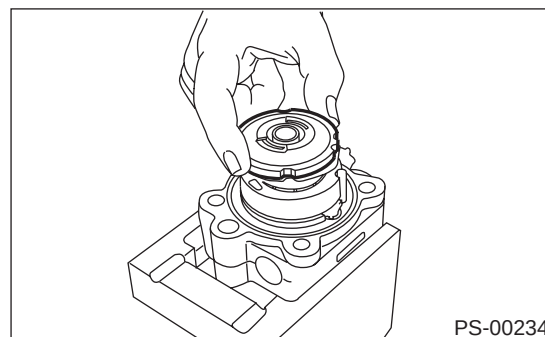
Oil pump for 3.0 L model cannot be disassembled. If the oil pump is malfunctioning, replace the oil pump as an assembly.

1) Using ST, place oil pump in a vise and remove four bolts which secure rear cover.

ST 34199AE020 ATTACHMENT



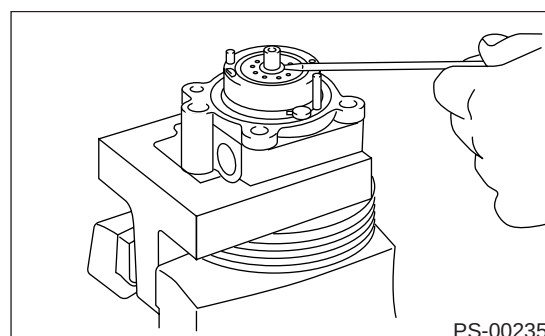
2) Remove pressure plate.



3) Using a screwdriver, pry retaining ring off.

CAUTION:

Do not remove cam ring, rotor, etc.



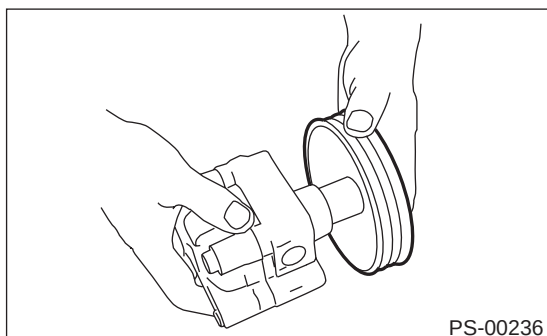
4) Install pressure plate.

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POWER ASSISTED SYSTEM (POWER STEERING)

- 5) Temporarily install rear cover to front casing.
- 6) Remove oil pump pulley.



- 7) Place oil pump in a vise.

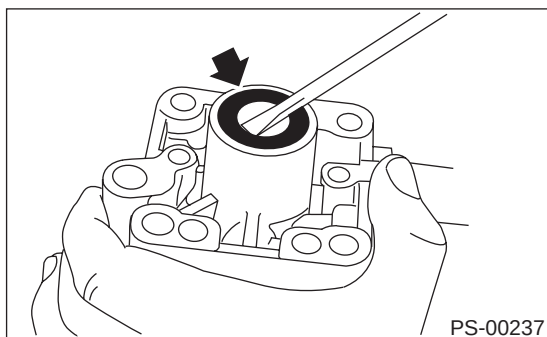
CAUTION:

Do not place oil pump directly in the vise, use soft pads and hold oil pump lightly to protect the pump.

- 8) Pry oil seal off using a screwdriver.

CAUTION:

Be careful not to scratch inner surface of casing.



D: ASSEMBLY

- 1) Reassembly precautions

- (1) Whenever O-rings, oil seals, and snap rings are removed, they must be replaced with new ones.
- (2) Thoroughly wash parts and allow to dry. They must be kept free from cleaning oil and dust.
- (3) Reassembly procedure must be performed in clean place. Ensure that parts are kept away from waste threads or other dust particles.
- (4) Cleaning oil tends to stay inside the front casing. Remove it completely by blowing compressed air.
- (5) Ensure that parts are free from rust. (Use specified hydraulic oil for rust prevention after cleaning and drying.)
- (6) Reverse the sequence of disassembly procedures.

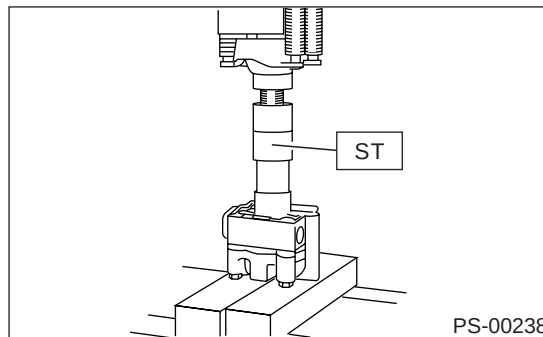
- 2) Apply grease to oil seal and inner surface of front casing (at bearing location).

CAUTION:

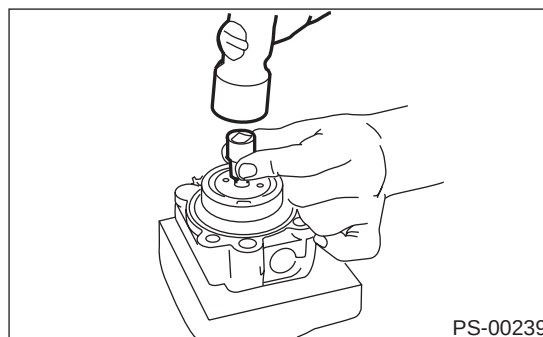
Make sure that the front body internal surfaces are free from damage.

- 3) Temporarily install rear cover to front body.
- 4) Attach ST to front body. Using a press, install oil seal.

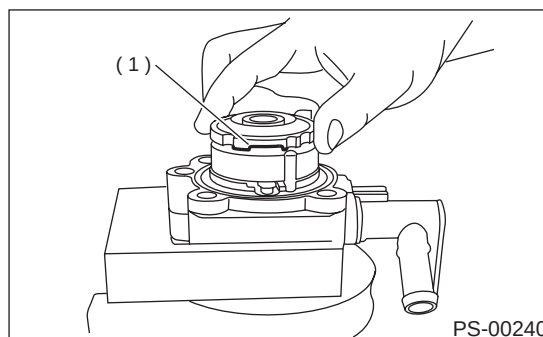
ST 34199AE030 INSTALLER



- 5) Install pump pulley to front body.
 - 6) Using ST, place oil pump in a vise.
- ST 34199AE020 ATTACHMENT
- 7) Remove rear cover.
 - 8) Using 10-mm box wrench, tap retaining ring into shaft groove.



- 9) Install pressure plate as shown in the figure.



(1) Groove

- 10) Apply specified hydraulic oil to O-rings and fit them into front casing and pressure plate.
- 11) Install seal ring to pressure plate.

PS-55

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

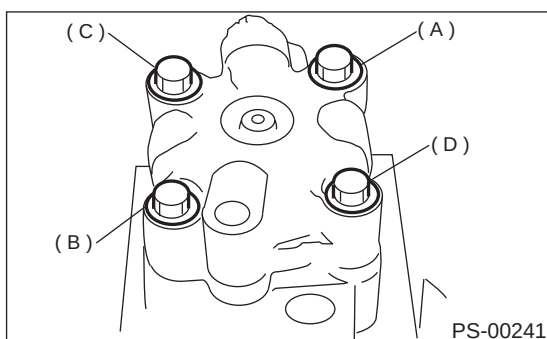
12) With knock pin positions aligned, install rear cover.

Tightening torque:

27.5 N·m (2.8 kgf-m, 20.3 ft-lb)

CAUTION:

Loosely tighten bolts in the sequence (A), (B), (C), and (D) shown in figure. Then, tighten in the same sequence.



13) When reassembly procedures have been completed, turn shaft by hand to ensure it turns smoothly. If it binds or other unusual conditions are evident, disassemble again and check for foreign matter trapped on sliding surfaces and improper installation. Eliminate the cause of trouble.

14) Check followings by referring to "CHECK" article.

- Excessive play in pulley shaft
- Ditch deflection of pulley
- Resistance to rotation of pulley
- Measurement of generated oil pressure

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

E: INSPECTION**1. BASIC INSPECTION**

Perform the following inspection procedures and repair or replace defective parts.

Part name	Description	Remedy
1. Front casing	1) Damage on body surfaces 2) Excessive wear on hole, into which spool valve is inserted. 3) Wear and damage on cartridge assembly mounting surface 4) Wear and damage on surfaces in contact with shaft and oil seal	Replace with a new one together with spool valve as selective fit is made.
2. Rear cover	1) Damage on body surfaces 2) Wear and damage on sliding surfaces	Replace with a new one.
3. Shaft	1) Shaft bend 2) Wear and damage on surfaces in contact with bushing and oil seal 3) Wear and damage on rotor mounting surfaces 4) Bearing damage	Replace with a new one.
4. Pressure plate	Wear and damage on sliding surfaces	Replace with a new one.
5. Cam ring	Ridge wear on sliding surfaces	If damage is serious, replace with a new cartridge assembly.
6. Vane	Excessive wear on nose radius and side surfaces	
7. Rotor	1) Wear and damage on sliding surfaces 2) Ridge wear on vane sliding grooves (If light leaks with vane in slit against light source) 3) Damage resulting from snap ring removal	
8. Connector	Damage on threads	Replace with a new one.
9. Spring	Damage	Replace with a new one.
10. Bolts and nuts	Damage on threads	Replace with a new one.

- In accordance with the following table, check all removed parts for wear and damage, and make repair or replacement if necessary.

No.	Parts	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace oil pump with a new one.
		(2) Play of pulley shaft	Measure radial play and axial play. If any of these exceeds the service limit, replace oil pump with a new one.
2	Pulley	(1) Damage	Replace it with a new one.
		(2) Bend	Measure V ditch deflection. If it exceeds the service limit, replace pulley with a new one.
3	Oil pump (Interior)	(1) Defect or burning of vane pump	Check resistance to rotation of pulley. If it is past the service limit, replace oil pump with a new one.
		(2) Bend in the shaft or damage to bearing	Oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump when turning with a string put around its pulley, replace oil pump with a new one.
4	O-ring	Crack or deterioration	Replace it with a new one.
5	Bracket	Crack	Replace it with a new one.

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2. SERVICE LIMIT

Make a measurement as follows. If it exceeds the specified service limit, replace the parts with new ones.

CAUTION:

- Fix oil pump on a vise to make a measurement. At this time, hold oil pump with the least possible force between two wood pieces.
- Do not set outside of flow control valve or pulley on a vise; otherwise outside or pulley might be deformed. Select properly sized wood pieces.

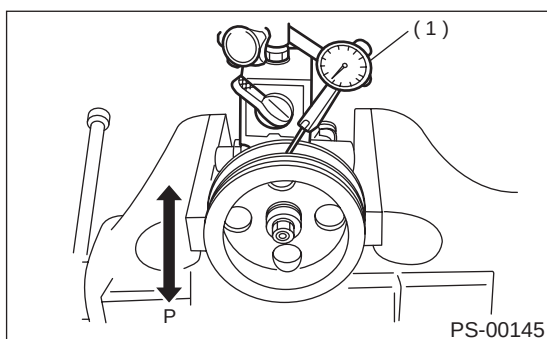
1) Play of pulley shaft

On condition:

P: 9.8 N (1.0 kgf, 2.2 lb)

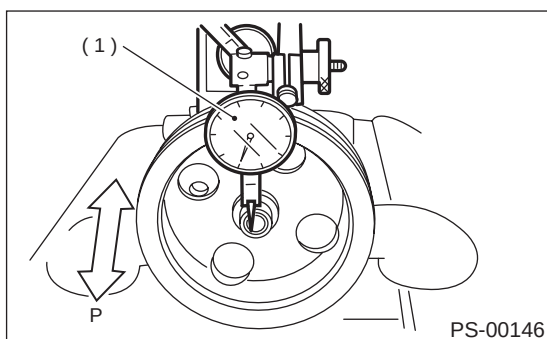
Service limit:

Radial play (Direction $\longleftrightarrow$)
0.4 mm (0.016 in) or less



(1) Dial indicator

Axial play (Direction $\longleftrightarrow$)
0.6 mm (0.024 in) or less



(1) Dial indicator

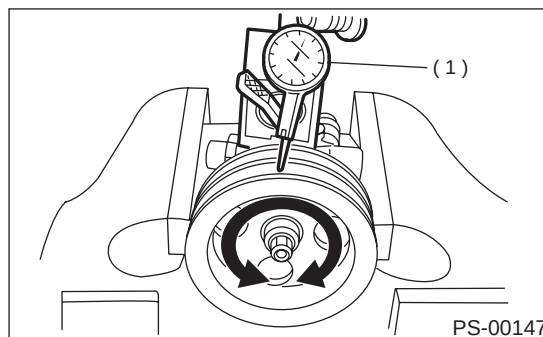
2) Ditch deflection of pulley

Service limit:

1.0 mm (0.039 in) or less

NOTE:

Read the value for one surface of V ditch, and then the value for another off the dial.



(1) Dial indicator

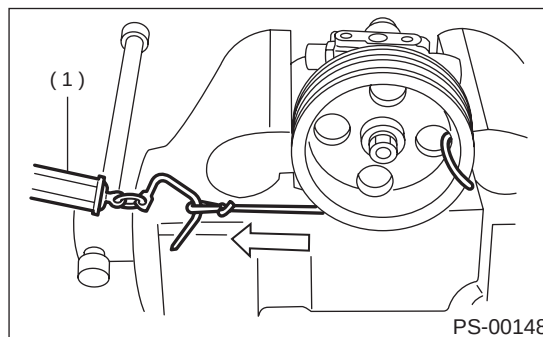
3) Resistance to rotation of pulley

Service limit:

Maximum load; 9.22 N (0.94 kgf, 2.07 lb) or less

NOTE:

- A rather higher value may be indicated when pulley starts turning.
- Measure the load during rotation and make a judgment.



(1) Spring balance

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3. HYDRAULIC PRESSURE

CAUTION:

- Be sure to complete all items aforementioned in "INSPECTION", prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-65, INSPECTION, General Diagnostic Table.>
- Do not leave the valve of pressure gauge closed or hold the steering wheel at stop end for 5 seconds or more in any case, as the oil pump may be damaged due to long keep of these conditions.
- Put cotton cloth waste at a place where fluid drops before pressure gauge is installed. Wipe off split fluid thoroughly after the measurement.

NOTE:

Keep engine idling during the measurement.

1) REGULAR PRESSURE MEASUREMENT

- (1) Connect ST1, ST2 and ST3.

ST1 92511000 PRESSURE GAUGE

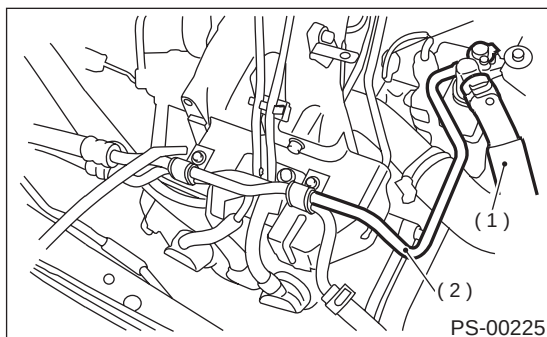
ST2 34099AC020 ADAPTER HOSE B

ST3 34099AC010 ADAPTER HOSE A

- (2) Disconnect pressure hose from the pump.

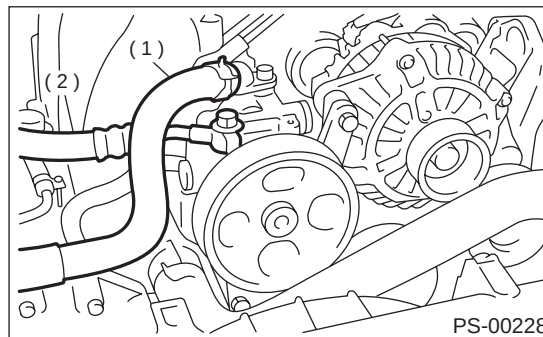
- (3) Using gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), instal ST2 to the pump instead of pressure hose.

2.5 L model:



- (1) Suction hose
(2) Pressure hose

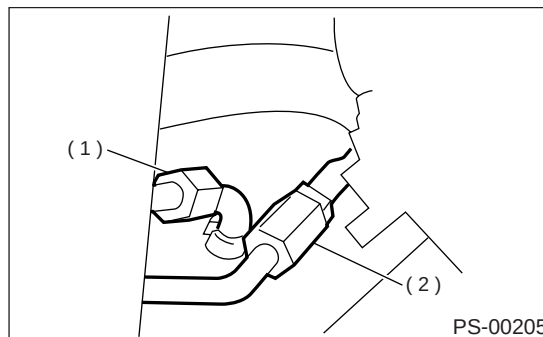
3.0 L model:



- (1) Suction hose
(2) Pressure hose

- (4) Disconnect pipe C from pipe (on gearbox side).

- (5) Install ST3 to pipe C.



- (1) Pipe C
(2) Pipe D

- (6) Replenish power steering fluid up to specified level.

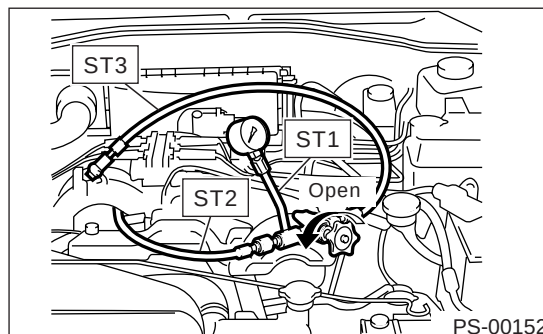
- (7) Open valve, and start the engine.

- (8) Measure regular pressure.

ST1 925711000 PRESSURE GAUGE

ST2 34099AC020 ADAPTER HOSE B

ST3 34099AC010 ADAPTER HOSE A



Service limit:

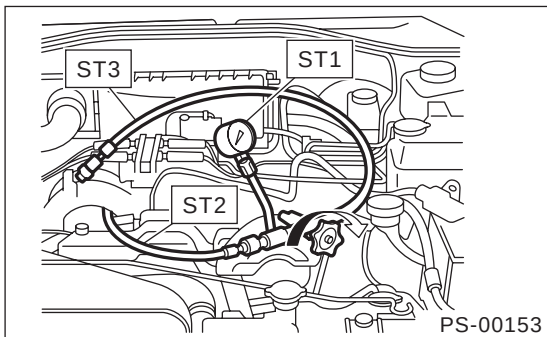
981 kPa (10 kg/cm², 142 psi) or less

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- (9) If it is not within the specified value, replace the troubled part caused by the following symptoms; pipe or hose clogged, leaks from fluid line, and mix of foreign objects in fluid line.
- 2) Measure relief pressure.
- (1) Using STs, measure relief pressure.
 - (2) Close valve.
 - (3) Measure relief pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



Service limit:

2.5 L model

9,611 — 10,199 kPa (98 — 104 kg/cm²,
1,394 — 1,479 psi)

3.0 L model

7,650 — 8,340 kPa (78.03 — 88.13 kg/cm²,
1,109 — 1,209 psi)

- (4) If it is within the specified value, measure steering effort. <Ref. to PS-68, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specified value, replace control valve itself or control valve and pinion as a single unit with new ones.

Service limit:

2.5 L model

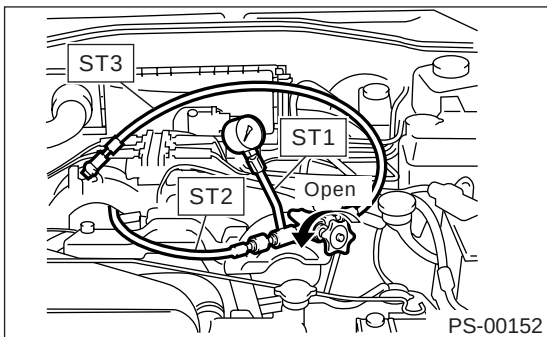
9,611 — 10,199 kPa (98 — 104 kg/cm²,
1,394 — 1,479 psi)

3.0 L model

7,650 — 8,340 kPa (78.03 — 88.13 kg/cm²,
1,109 — 1,209 psi)

- (4) If it is not within the specified value, replace the oil pump.
- 3) Measure working pressure.
- (1) Using STs, measure working pressure.
 - (2) Open valve.
 - (3) Measure working pressure of control valve by turning wheel from stop to stop.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



PS-60