

OIL PUMP

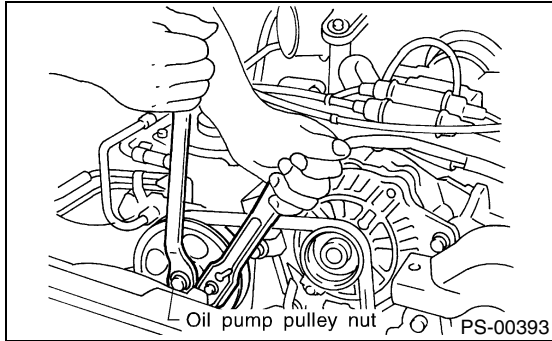
POWER ASSISTED SYSTEM (POWER STEERING)

7. Oil Pump

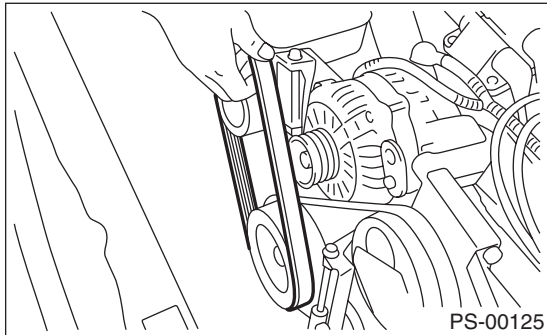
A: REMOVAL

1. NON-TURBO MODEL

- 1) Remove the ground terminal from battery.
- 2) Remove the pulley belt cover.
- 3) Loosen the oil pump pulley nut, then remove the bolts which secure alternator.



- 4) Loosen the lock bolt and slider bolt and remove the power steering pump drive V-belt.

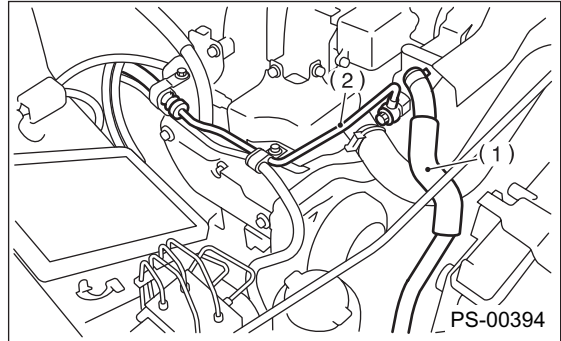


- 5) Disconnect the connector from the power steering pump switch.

- 6) Disconnect the pipe C and suction hose from the oil pump.

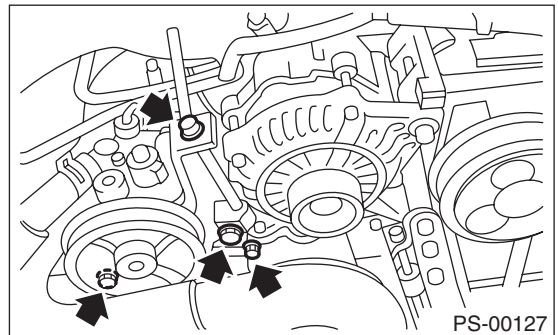
CAUTION:

- 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) Suction hose
- (2) Pipe C

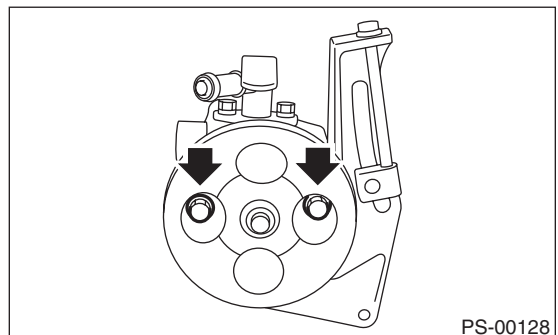
- 7) Remove the bolts, which install power steering pump bracket.



- 8) Place the oil pump bracket in a vise, remove the 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.

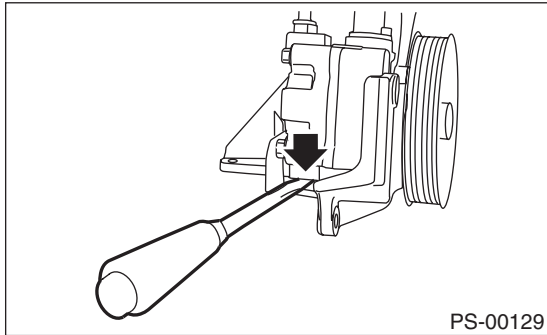


- 9) Remove the bolt from the rear side of oil pump.

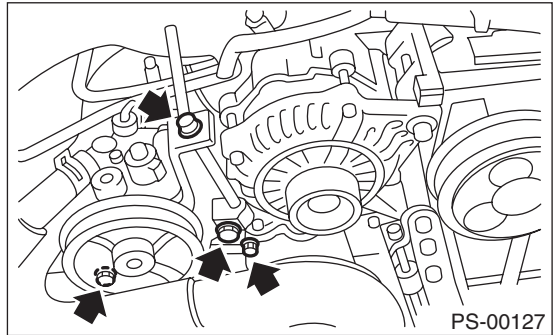
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10) Disassemble the oil pump and bracket by inserting a screwdriver as shown in the figure.

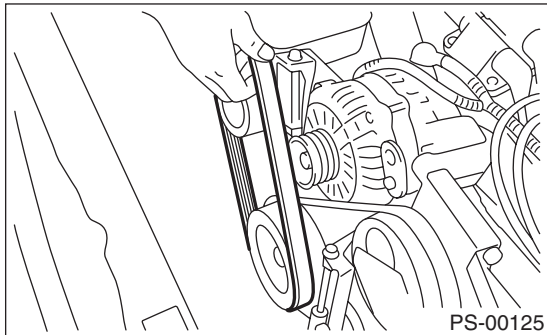


6) Remove the bolts which install power steering pump bracket.



2. TURBO MODEL

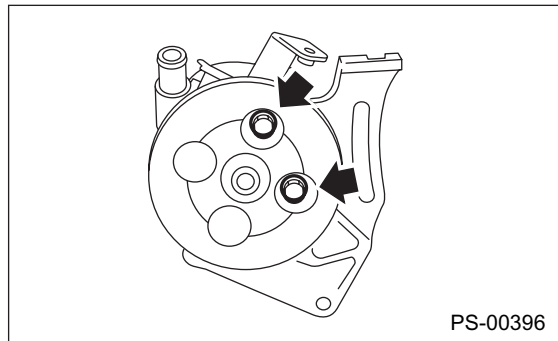
- 1) Remove the ground terminal from battery.
- 2) Remove the pulley belt cover.
- 3) Loosen the lock bolt and slider bolt and remove the power steering pump drive V-belt.



7) Place the oil pump bracket in a vise, remove the 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.

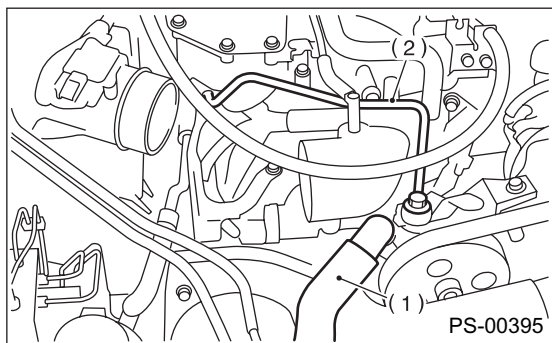


4) Disconnect the connector from the power steering pressure switch.

5) Disconnect the pipe C and suction hose from the oil pump.

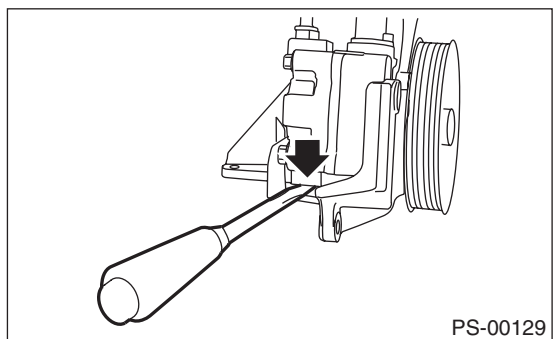
CAUTION:

- 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.



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

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



- (1) Suction hose
- (2) Pipe C

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B: INSTALLATION

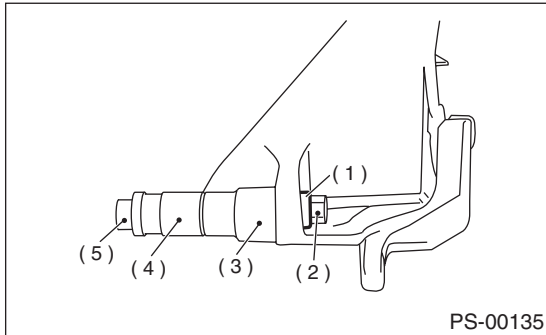
1. NON-TURBO MODEL

1) Install the oil pump to the bracket.

(1) Place the oil pump bracket in a vise. Tighten the 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.

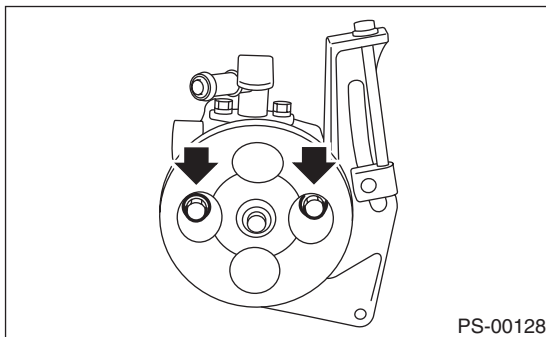


- (1) Bush
- (2) Nut
- (3) 21 mm
- (4) 14 mm
- (5) Bolt

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

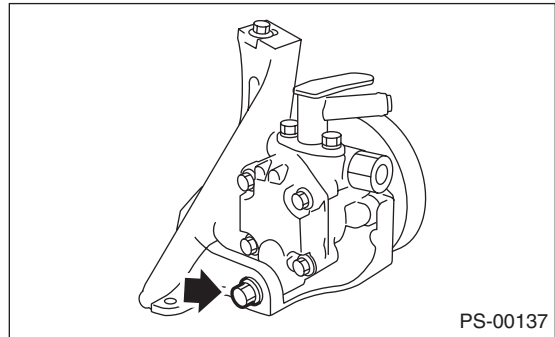
Tightening torque:

15.7 N·m (1.6 kgf-m, 11.6 ft-lb)



Tightening torque:

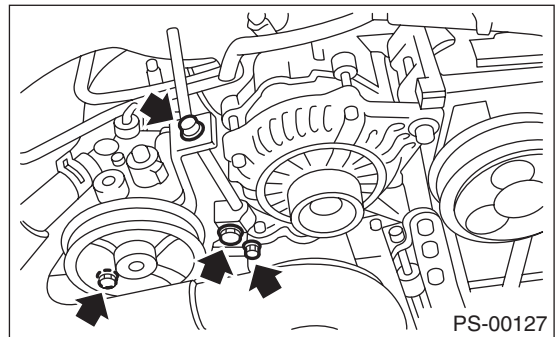
37.3 N·m (3.8 kgf-m, 27.5 ft-lb)



2) Tighten the bolt which installs power steering pump bracket.

Tightening torque:

22 N·m (2.2 kgf-m, 15.9 ft-lb)



3) Interconnect the pipe C and suction hose.

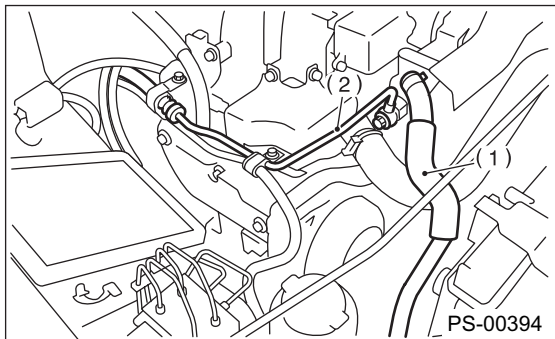
Tightening torque:

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

4) Connect the connector to the power steering pump switch.

5) Install the pulley belt to the oil pump.

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6) Tighten the oil pump pulley nut to the specified torque.

Tightening torque:

52 N·m (5.3 kgf·m, 38 ft·lb)

7) Check the pulley belt tension.

<Ref. to ME(H4SO)-43, INSPECTION, V-belt.>

8) Tighten the bolt belt tension.

Tightening torque:

8 N·m (0.8 kgf·m, 5.8 ft·lb)

9) Install the pulley belt cover.

10) Connect the ground terminal of battery.

11) Feed the specified power steering fluid. <Ref. to PS-71, Power Steering Fluid.>

CAUTION:

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

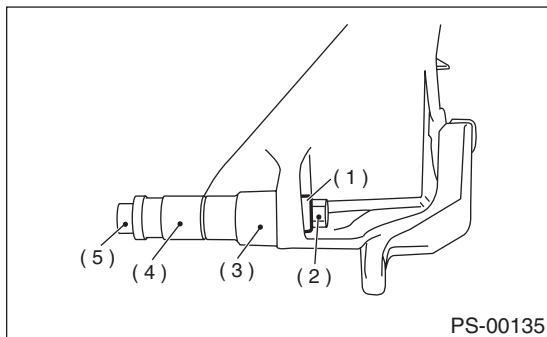
2. TURBO MODEL

1) Install the oil pump to the bracket.

(1) Place the oil pump bracket in a vise. Tighten the 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.

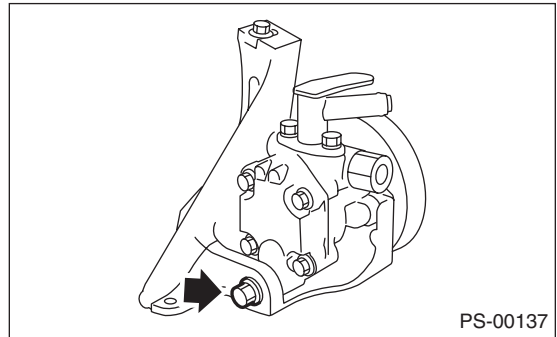


- (1) Bush
- (2) Nut
- (3) 21 mm
- (4) 14 mm
- (5) Bolt

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

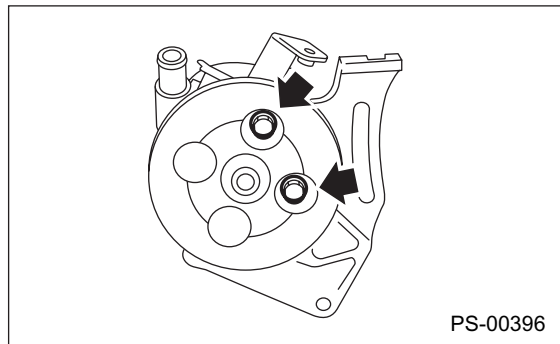
Tightening torque:

37.3 N·m (3.8 kgf·m, 27.5 ft·lb)



Tightening torque:

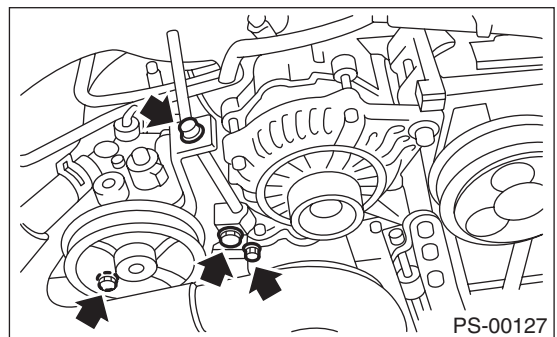
15.7 N·m (1.6 kgf·m, 11.6 ft·lb)



2) Tighten the bolt which install power steering pump bracket.

Tightening torque:

22 N·m (2.2 kgf·m, 15.9 ft·lb)



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3) Interconnect the pipes C and suction hose.

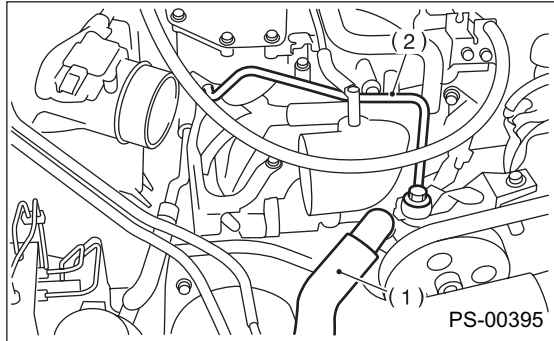
Tightening torque:

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

- 4) Connect the connector to the power steering oil pressure switch.
- 5) Install the pulley belt to the oil pump.
- 6) Check the pulley belt tension. <Ref. to ME(H4DOTC)-45, INSPECTION, V-belt.>
- 7) Tighten the bolt belt tension.

Tightening torque:

8 N·m (0.8 kgf·m, 5.8 ft·lb)

- 8) Install the pulley belt cover.
- 9) Connect the ground terminal of battery.
- 10) Feed the specified power steering fluid <Ref. to PS-71, Power Steering Fluid.>

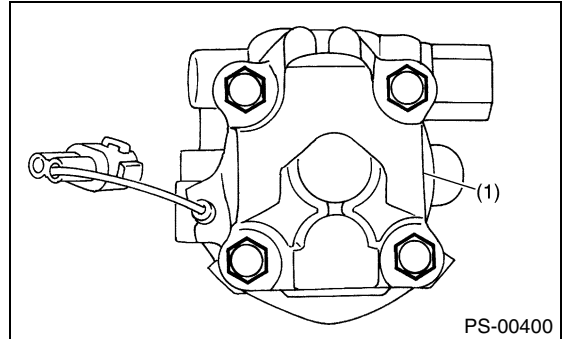
CAUTION:

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

C: DISASSEMBLY

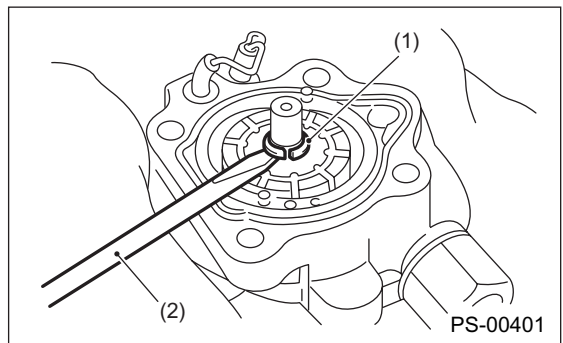
1. NON-TURBO MODEL

- 1) Remove the nut and detach oil pump pulley.
- 2) Remove the stay from the oil pump.
- 3) Remove the four bolts which secure rear cover.



- (1) Rear cover

- 4) Using a screwdriver, pry the retaining ring off.



- (1) Retaining ring
- (2) Screwdriver

- 5) Extract the shaft from the front casing.

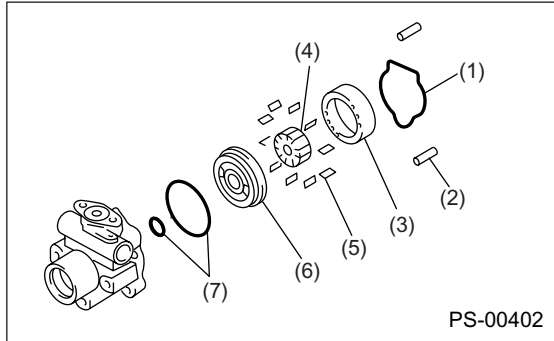
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6) Remove the following parts from the front casing.

CAUTION:

Discard old seal washer; replace with a new one.

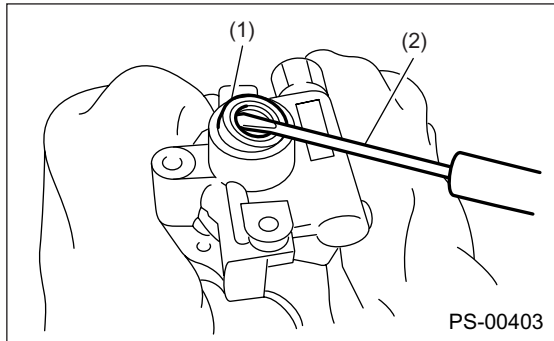


- (1) O-ring
- (2) Straight pin (2 ea.)
- (3) Cam ring
- (4) Rotor
- (5) Vane (10 ea.)
- (6) Pressure plate
- (7) O-ring (2 ea.)

7) Pry the oil seal off using a screwdriver.

CAUTION:

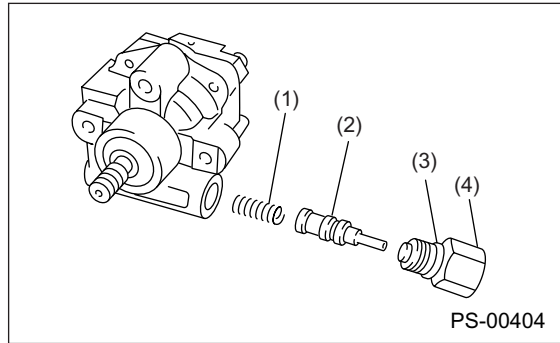
Be careful not to scratch inner surface of casing.



- (1) Oil seal
- (2) Screwdriver

8) Remove the pressure switch.

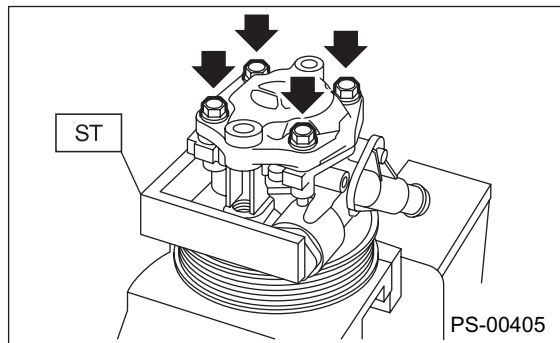
9) Slightly loosen the outlet connector, and remove the connector.



- (1) Flow control spring
- (2) Spool valve assembly
- (3) O-ring
- (4) Connector

2. TURBO MODEL

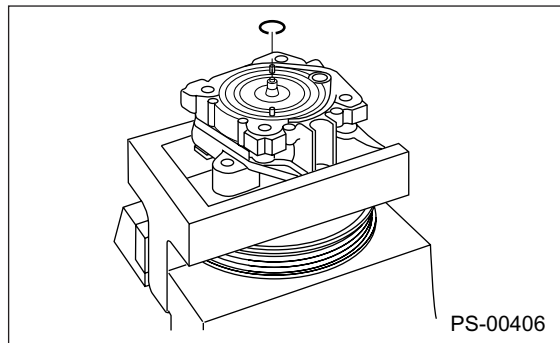
1) Using ST, place the oil pump in a vise and remove the four bolts which secure rear cover. ST 34199AE020 MOUNT



2) Using a screwdriver, pry the retaining ring off.

CAUTION:

Do not remove cam ring, rotor, etc.

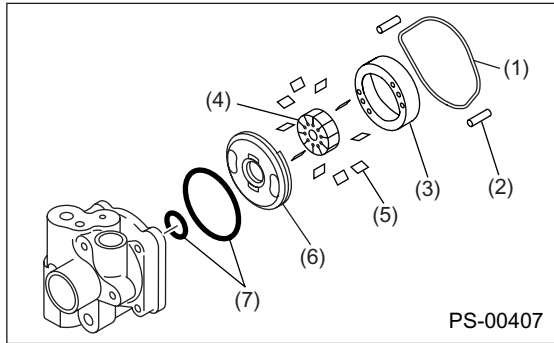


3) Extract the oil pump pulley from the front casing.

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POWER ASSISTED SYSTEM (POWER STEERING)

4) Remove the following parts from the front casing.



- (1) O-ring
- (2) Straight pin (2 ea.)
- (3) Cam ring
- (4) Rotor
- (5) Vane (10 ea.)
- (6) Pressure plate
- (7) O-ring (2 ea.)

5) Place the oil pump in a vise.

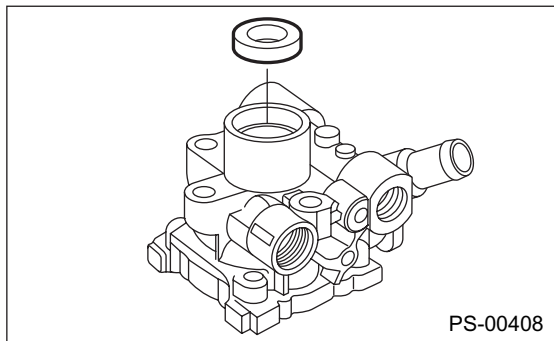
CAUTION:

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

6) Pry the oil seal off using a screwdriver.

CAUTION:

Be careful not to scratch inner surface of casing.



D: ASSEMBLY

1. NON-TURBO MODEL

1) Reassembly precautions

(1) Whenever the O-rings, oil seals, and snap rings are removed, they must be replaced with new ones.

(2) Thoroughly wash the 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 the parts are kept away from the 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 the parts are free from rust. (Use specified hydraulic oil for rust prevention after cleaning and drying.)

(6) Reverse the sequence of disassembly procedures.

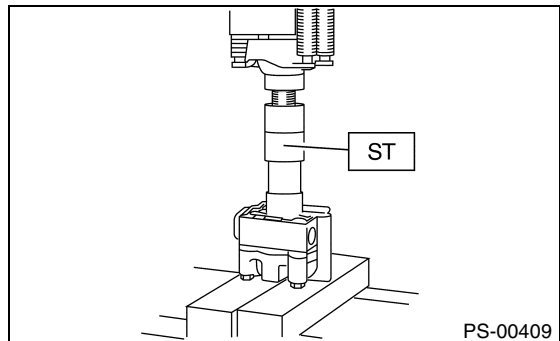
2) Apply the grease to the oil seal and inner surface of front casing (at bearing location).

CAUTION:

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

3) Attach ST to the front body. Using a press, install the oil seal.

ST 34199AE030



4) Press-fit the shaft assembly into the front body.

5) Apply the specified hydraulic oil to the O-rings and fit them into the front casing.

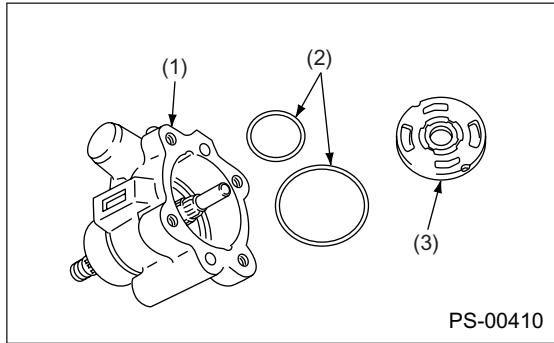
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6) Install the side plate to the front casing.

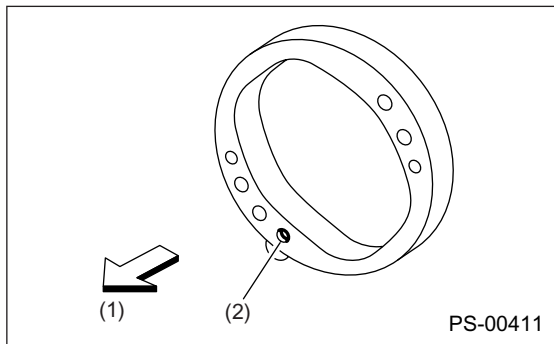
CAUTION:

Use care not to let side plate gall.



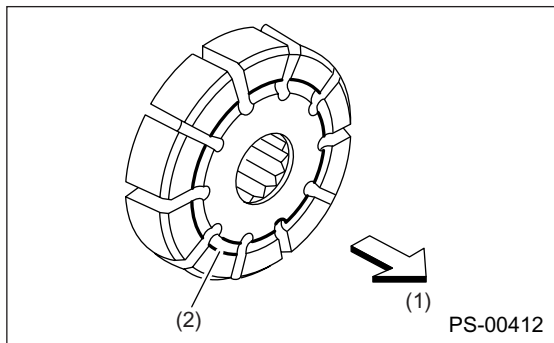
- (1) Front casing
- (2) O-ring
- (3) Side plate

7) Install the cam ring to the front casing with alignment mark facing forward.



- (1) Front
- (2) Alignment mark

8) Install the rotor to the front casing with groove facing rearward.



- (1) Rear
- (2) Groove

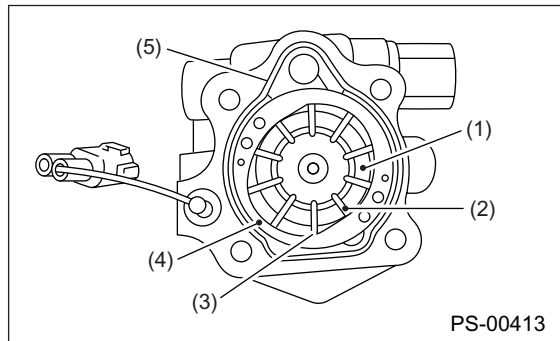
9) Install the 10 vanes into the rotor with their nose radius facing toward cam ring.

10) Install the cam ring to the front casing, securing with knock pins.

CAUTION:

Do not use hammer to fit knock pins in position.

11) Mount the O-ring on the front casing.



- (1) Rotor
- (2) Vane
- (3) Radius facing
- (4) Cam ring
- (5) O-ring

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12) Using STs, press the retaining ring into the shaft groove.

CAUTION:

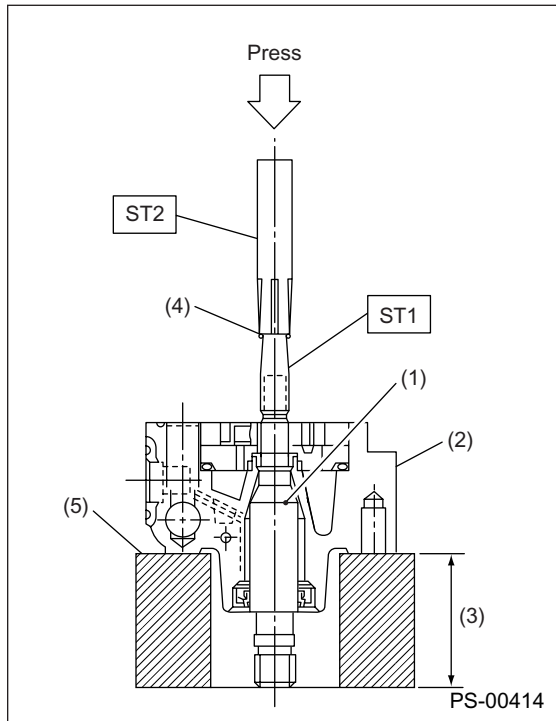
Discard retaining ring and replace with a new one.

NOTE:

Use ST2, bending its top edge slightly toward the inside.

ST1 34099AC030 INSTALLER RETAINING RING CAP

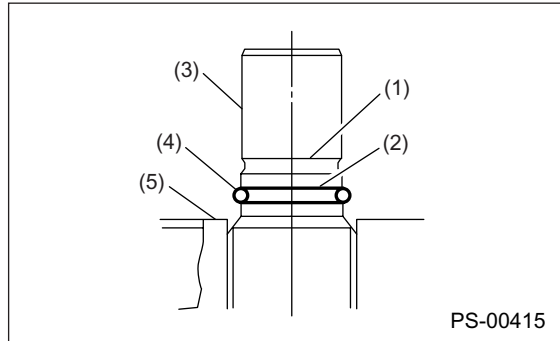
ST2 34099AC040 INSTALLER RETAINING RING PIPE



- (1) Shaft
- (2) Front casing
- (3) 48 mm (1.89 in)
- (4) Retaining ring
- (5) Block

CAUTION:

Make sure the retaining ring is fit in the second groove of the shaft.



- (1) First groove
- (2) Second groove
- (3) Shaft
- (4) Retaining ring
- (5) Rotor

13) Mount on pressure switch on front casing.

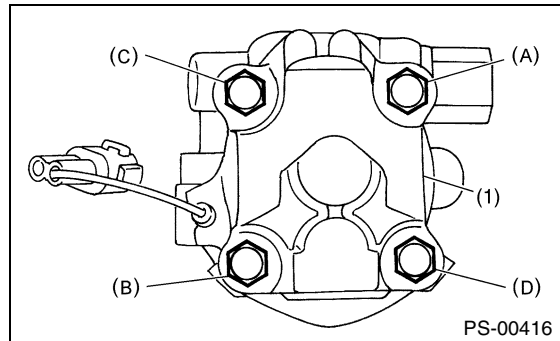
14) With knock pin positions aligned, install the rear cover.

CAUTION:

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

Tightening torque:

21 N·m (2.14 kgf-m, 15.5 ft-lb)



- (1) Rear cover

15) Install the spring into the front casing. Then, with spool valve dipped in specified hydraulic oil, install it into the front casing.

16) Using a 5-mm dia. round bar, ensure that the valve moves smoothly.

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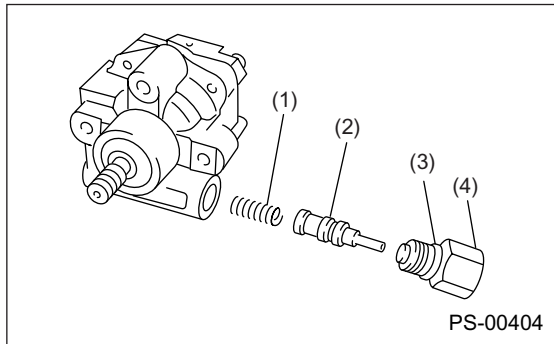
17) Set the O-ring, with grease applied to it, onto the connector and secure connector to the front casing.

CAUTION:

- Use care to prevent damage to O-ring at installation.
- When tightening the connector, ensure that the O-ring does not protrude or get caught.

Tightening torque:

49 N·m (5.0 kgf·m, 36.2 ft·lb)



- (1) Flow control spring
- (2) Spool valve assembly
- (3) O-ring
- (4) Connector

18) Fix the oil pump pulley temporarily.

19) When the reassembly procedures have been completed, turn the 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.

20) 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

2. TURBO MODEL

1) Reassembly precautions

(1) Whenever the O-rings, oil seals, and snap rings are removed, they must be replaced with new ones.

(2) Thoroughly wash the 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 the parts are kept away from the 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 the parts are free from rust. (Use specified hydraulic oil for rust prevention after cleaning and drying.)

(6) Reverse the sequence of disassembly procedures.

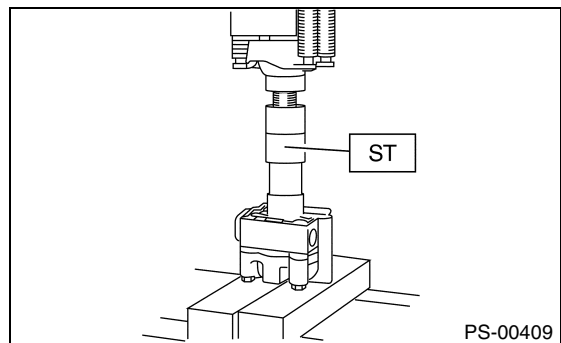
2) Apply grease to the oil seal and inner surface of front casing (at bearing location).

CAUTION:

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

3) Attach ST to front body. Using a press, install the oil seal.

ST 34199AE030 INSTALLER



4) Install the pump pulley to front body.

5) Using ST, place the oil pump in a vise.

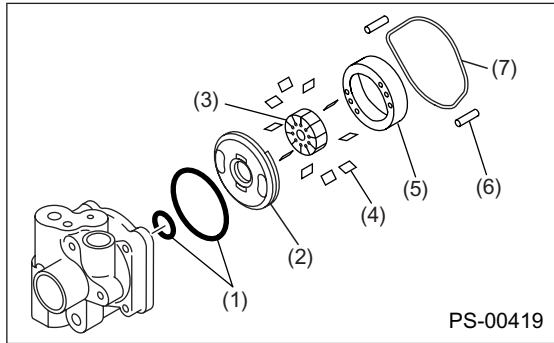
ST 34199AE020 MOUNT

6) Remove the rear cover.

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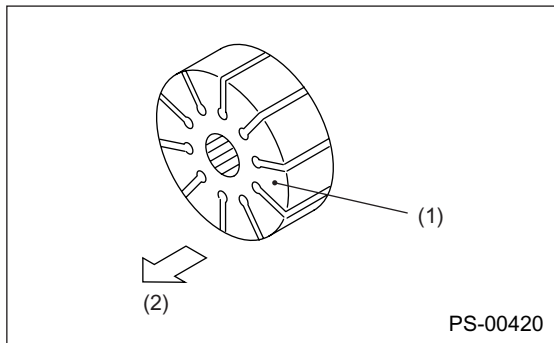
7) Install the following parts to casing.



- (1) O-ring
- (2) Pressure plate
- (3) Rotor
- (4) Vane
- (5) Cam ring
- (6) Straight pin
- (7) O-ring

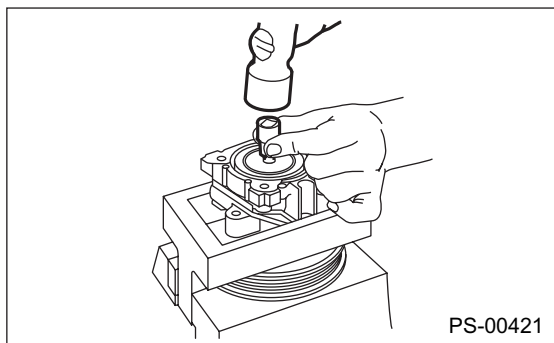
NOTE:

Install the rotor with the mark facing the rear case side.



- (1) Mark
- (2) Rear

8) Using 8-mm box wrench, tap the retaining ring into the shaft groove.



9) Install the O-ring to the rear cover.

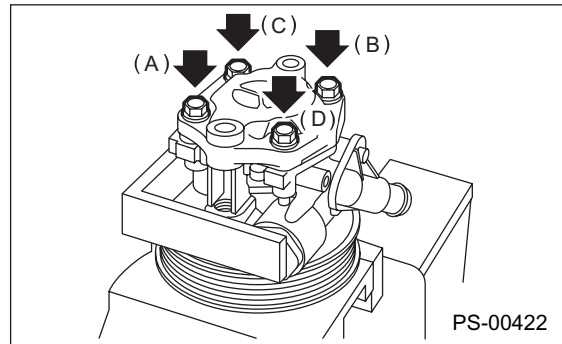
10) Install the rear cover.

Tightening torque:

27.5 N·m (2.8 kgf-m, 20.3 ft-lb)

CAUTION:

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



11) When the reassembly procedures have been completed, turn the 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.

12) 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

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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 the 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)	Correct with oil stone. If the damage is serious, replace with a new cartridge assembly.
	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 the oil pump with a new one.
		(2) Play of pulley shaft	Measure the radial play and axial play. If any of these exceeds the service limit, replace the oil pump with a new one.
2	Pulley	(1) Damage	Replace it with a new one.
		(2) Bend	Measure the V ditch deflection. If it exceeds the service limit, replace the pulley with a new one.
3	Oil pump (Interior)	(1) Defect or burning of vane pump	Check the resistance to the rotation of pulley. If it is past the service limit, replace the 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 the 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.

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

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.

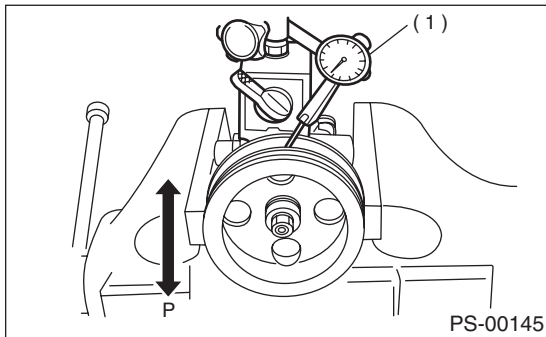
1) Play of pulley shaft

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

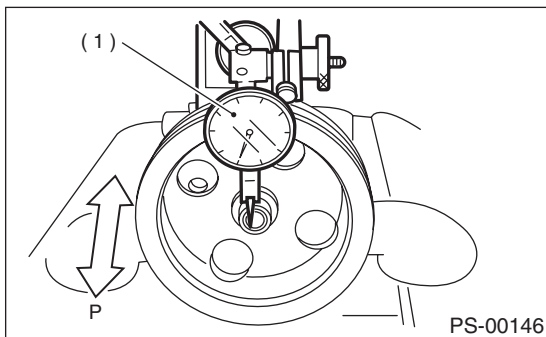
Axial play (Direction \longleftrightarrow)

Non-TURBO model

0.4 mm (0.016 in) or less

TURBO model

0.8 mm (0.031 in) or less



(1) Dial indicator

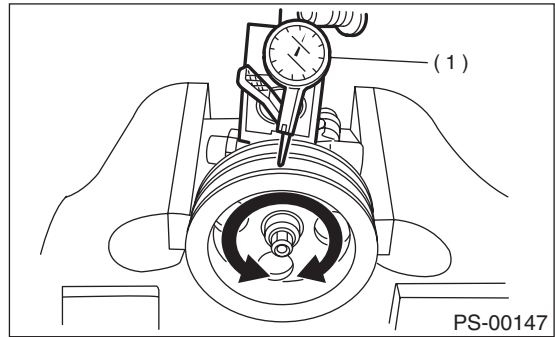
2) Ditch deflection of pulley

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

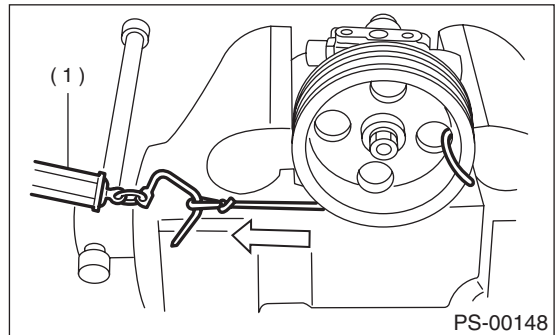
3) Resistance to rotation of pulley

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

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

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-73, 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 spilt fluid thoroughly after the measurement.

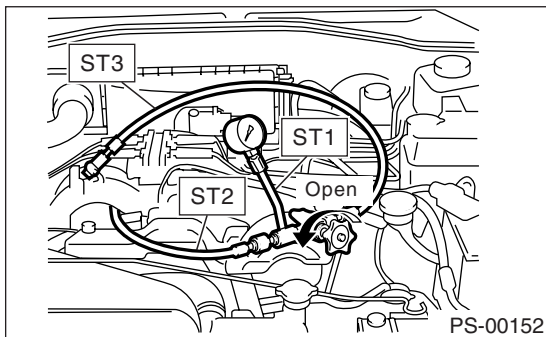
NOTE:

Keep engine idling during the measurement.

1) MEASURE REGULAR PRESSURE.

- (1) Remove the two bolts securing power steering pipes to the engine.
- (2) Install ST1, 2 and 3 between power steering pump and pipes using gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010).
- (3) Replenish the power steering fluid up to specified level.
- (4) Open the valve, and start the engine.
- (5) Measure the regular pressure.

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



Service limit:

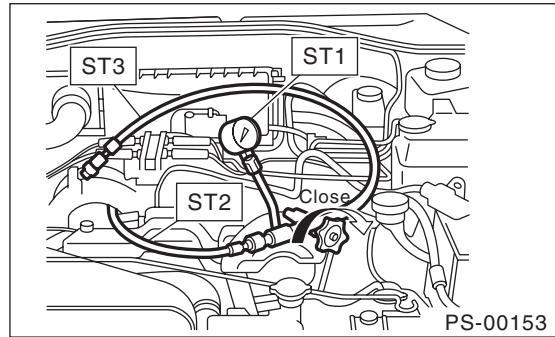
981 kPa (10 kg/cm², 142 psi) or less

- (6) 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 the relief pressure.
- (2) Close the valve.
- (3) Measure the relief pressure.

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



Service limit:

TURBO model

7,350 — 8,036 kPa

(75 — 82 kg/cm², 1,067 — 1,165 psi)

Non-TURBO model

7,164 — 7,840 kPa

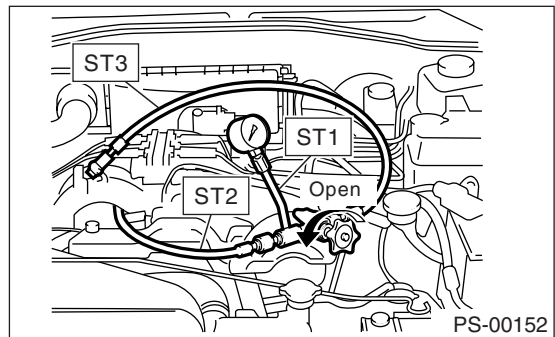
(73 — 80 kg/cm², 1,040 — 1,137 psi)

- (4) If it is not within the specified value, replace the oil pump.

3) Measure working pressure.

- (1) Using STs, measure the working pressure.
- (2) Open the valve.
- (3) Measure the 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



Service limit:

TURBO model

7,350 — 8,036 kPa

(75 — 82 kg/cm², 1,067 — 1,165 psi)

Non-TURBO model

7,164 — 7,840 kPa

(73 — 80 kg/cm², 1,040 — 1,137 psi)

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

(4) If it is within the specified value, measure the steering effort. <Ref. to PS-77, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specified value, replace the control valve itself or control valve and pinion as a single unit with new ones.