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POWER ASSISTED SYSTEM (POWER STEERING)

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1. General Description

A: SPECIFICATION

Model			Non-turbo	Turbo	
			2.5i, OUTBACK	WRX	STI
Whole system	Minimum turning radius m (ft)		5.4 (17.7)		5.7 (18.7)
	Steering angle (inside — outside)		34.5° — 30.3°		32.9° — 28.5°
	Steering wheel diameter mm (in)		375 (14.76)		375 (14.76)
	Steering rotations from lock to lock (while turning, from lock to lock. Gearbox)		3.0	2.7	2.6
Gearbox	Type		Rack and Pinion, Integral		
	Backlash		0 (Automatic adjusting)		
	Valve (Power steering system)		Rotary valve		
Pump (Power steering system)	Type		Vane pump		
	Oil tank		Installed on body		
	Specific output cm^3 (cu in)/rev.		7.2 (0.39)	7.2 (0.439)	
	Relief pressure kPa (kgf/cm^2, psi)		6,700 — 7,400 (68 — 75, 972 — 1,073)	7,350 — 8,036 (75 — 82, 1,067 — 1,165)	
	Hydraulic fluid control		Engine speed sensitive		
	Hydraulic fluid ℓ (US qt, Imp qt)		1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)	7.5 (7.9, 6.6)	
	RPM range rpm		700 — 9,000		
	Direction of rotation		Clockwise		
Hydraulic oil (Power steering system)	Capacity ℓ (US qt, Imp qt)	Oil tank	0.3 (0.3, 0.3)		
		Whole system	0.7 (0.7, 0.6)		

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Steering wheel	Free play		mm (in)	17 (0.67)
Steering angle	Inner wheel	2.5i, OUTBACK, WRX		34.5°±1.5°
		STI		32.9°±1.5°
	Outer wheel	2.5i, OUTBACK, WRX		30.3°±1.5°
		STI		28.5°±1.5°
Steering shaft	Clearance between the steering wheel and column cover		mm (in)	4.0 (0.16)
Steering gearbox (Power steering system)	Sliding resistance		N (kgf, lbf)	400 (41, 90) or less
	Rack shaft play in the radial direction	Right-turn steering	mm (in)	0.19 (0.0075) or less
		Left-turn steering	mm (in)	Horizontal free play: 0.15 (0.0059) or less Vertical free play: 0.3 (0.012) or less
	Input shaft play	In radial direction	mm (in)	0.18 (0.0071) or less
		In axial direction	mm (in)	0.5 (0.020) or less
	Rotation resistance		N (kgf, lbf)	Maximum allowable value: 10.5 (1.1, 2.4) or less Difference between right and left sliding resistance: 20% or less
Oil pump (Power steering system)	Pulley shaft	Radial play	mm (in)	0.4 (0.016) or less
		Axial play	mm (in)	0.9 (0.035) or less
	Pulley	Ditch deflection	mm (in)	1.0 (0.039) or less
		Rotation resistance	N (kgf, lbf)	9.22 (0.94, 2.07) or less
	Regular pressure (Unloaded)		kPa (kgf/cm^2, psi)	981 (10, 142) or less
Steering wheel effort (Power steering system)	At standstill with engine idling on paved road		N (kgf, lbf)	31.4 (3.2, 7.1) or less
	At standstill with engine stalled on paved road		N (kgf, lbf)	294.2 (30, 66.2) or less

Recommended power steering fluid
SUBARU ATF or ATF DEXRON III

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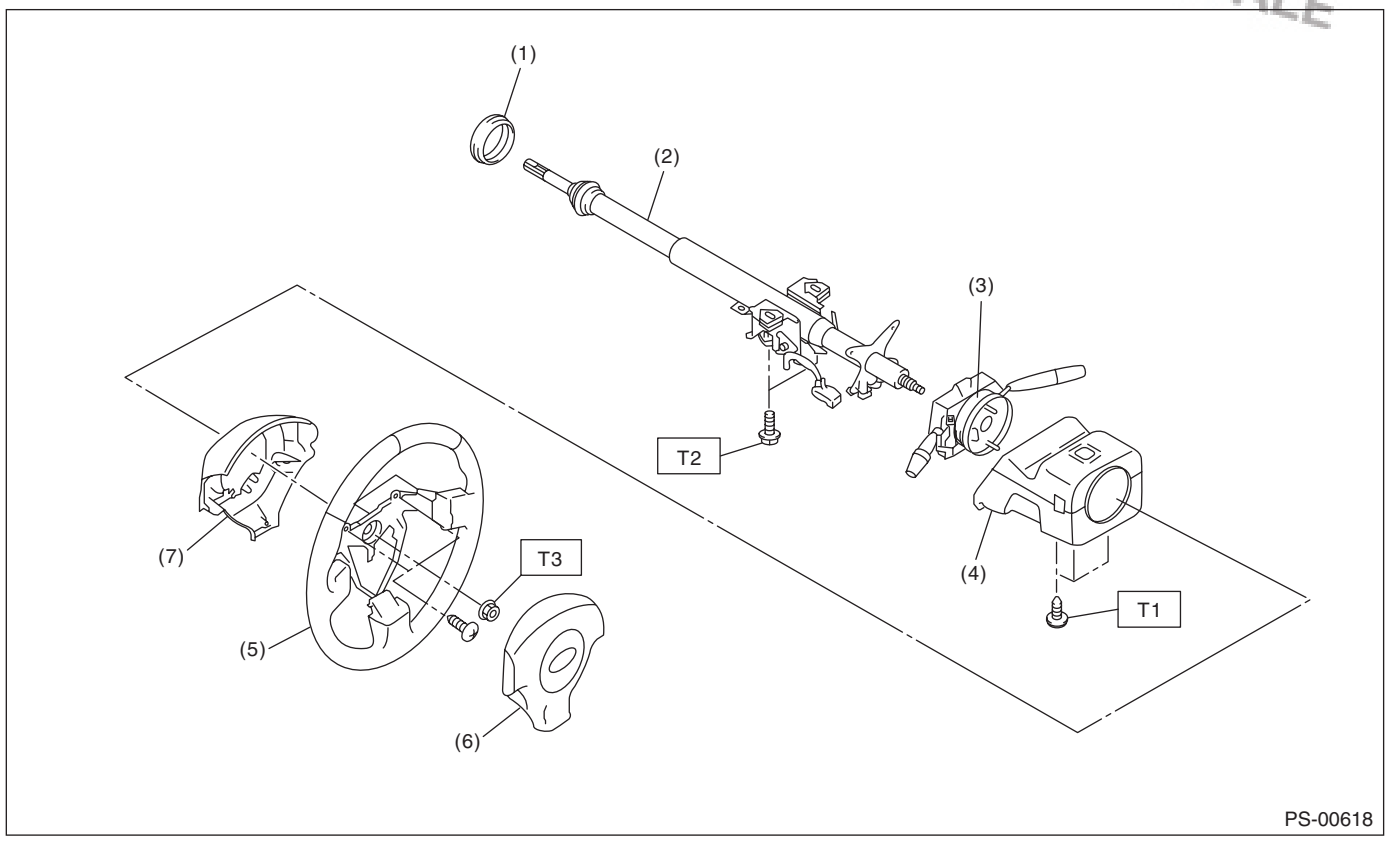
B: COMPONENT

1. STEERING WHEEL AND COLUMN



(1)	Bushing	(5)	Steering wheel	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Steering shaft	(6)	Airbag module	***T1: 1.2 (0.12, 0.9)***
(3)	Steering roll connector	(7)	Steering wheel lower cover	***T2: 25 (2.5, 18.1)***
(4)	Column cover			***T3: 45 (4.6, 33.2)***

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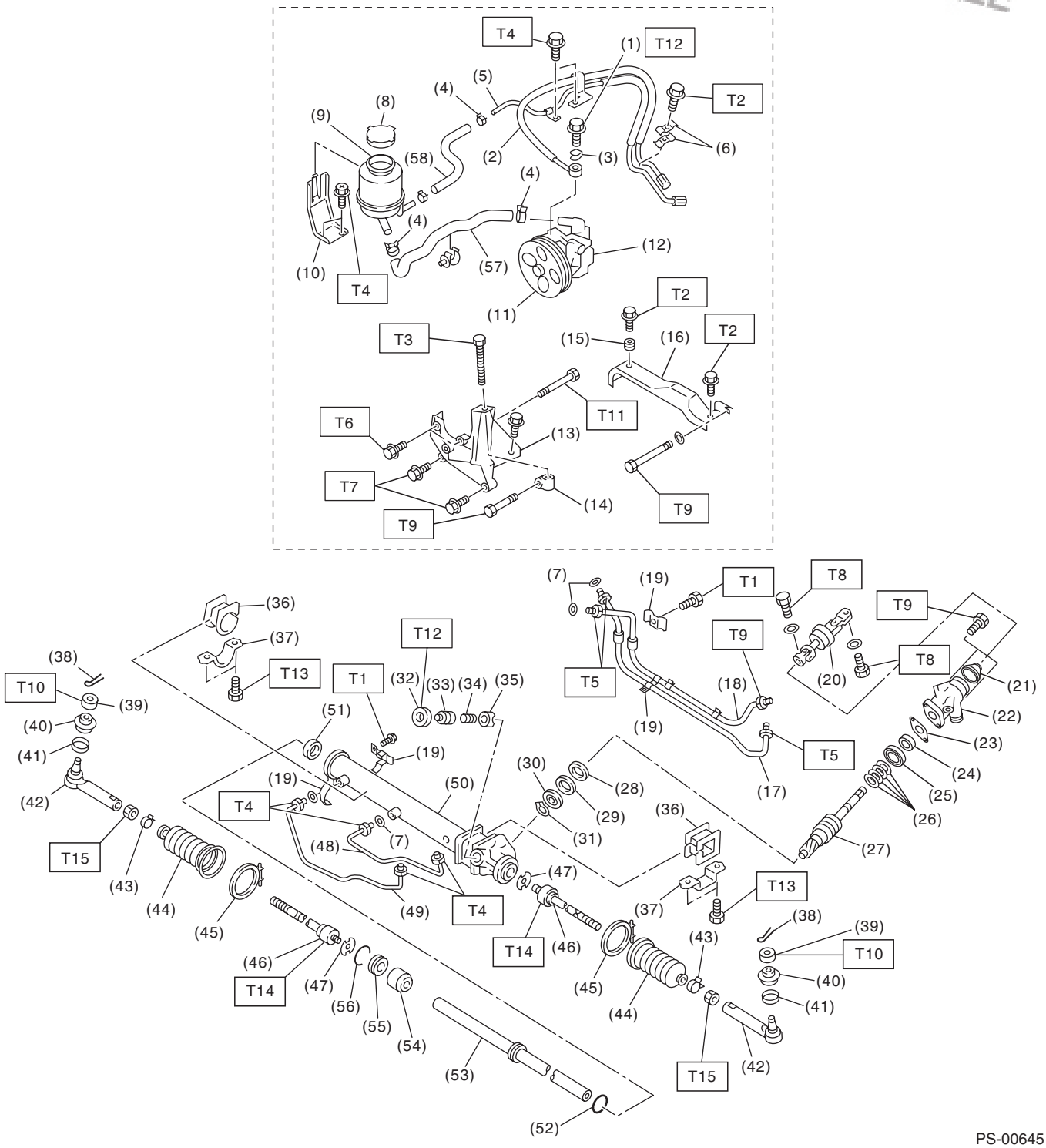
2. POWER ASSISTED SYSTEM

Non-turbo model



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(1) Eyebolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Reservoir tank
(10) Reservoir tank bracket
(11) Pulley
(12) Oil pump
(13) Bracket
(14) Belt tension nut
(15) Bushing
(16) Belt Cover
(17) Pipe E
(18) Pipe F
(19) Clamp plate
(20) Universal joint
(21) Dust seal
(22) Valve housing
(23) Gasket
(24) Oil seal
(25) Ball bearing
(26) Seal ring
(27) Pinion and valve ASSY
(28) Oil seal
(29) Back-up washer
(30) Ball bearing
(31) Snap ring
(32) Lock nut
(33) Adjusting screw
(34) Spring
(35) Sleeve
(36) Adapter
(37) Clamp
(38) Cotter pin
(39) Castle nut
(40) Dust cover
(41) Clip
(42) Tie-rod end
(43) Clip
(44) Boot
(45) Band
(46) Tie-rod
(47) Lock washer
(48) Pipe B
(49) Pipe A
(50) Steering body
(51) Oil seal
(52) Piston ring
(53) Rack
(54) Rack bushing
(55) Rack stopper
(56) Snap ring
(57) Suction hose
(58) Hose

Tightening torque:N·m (kgf-m, ft-lb)

T1:	***6 (0.6, 4.3)***
T2:	***7.4 (0.75, 5.4)***
T3:	***8 (0.8, 5.8)***
T4:	***13 (1.3, 9.4)***
T5:	***15 (1.5, 10.8)***
T6:	***15.7 (1.6, 11.6)***
T7:	***22 (2.2, 15.9)***
T8:	***24 (2.4, 17.4)***
T9:	***25 (2.5, 18.1)***
T10:	***27 (2.75, 19.9)***
T11:	***37.3 (3.8, 27.5)***
T12:	***40 (4.1, 29.5)***
T13:	***60 (6.1, 44.3)***
T14:	***78 (8.0, 57.9)***
T15:	***83 (8.5, 61.5)***

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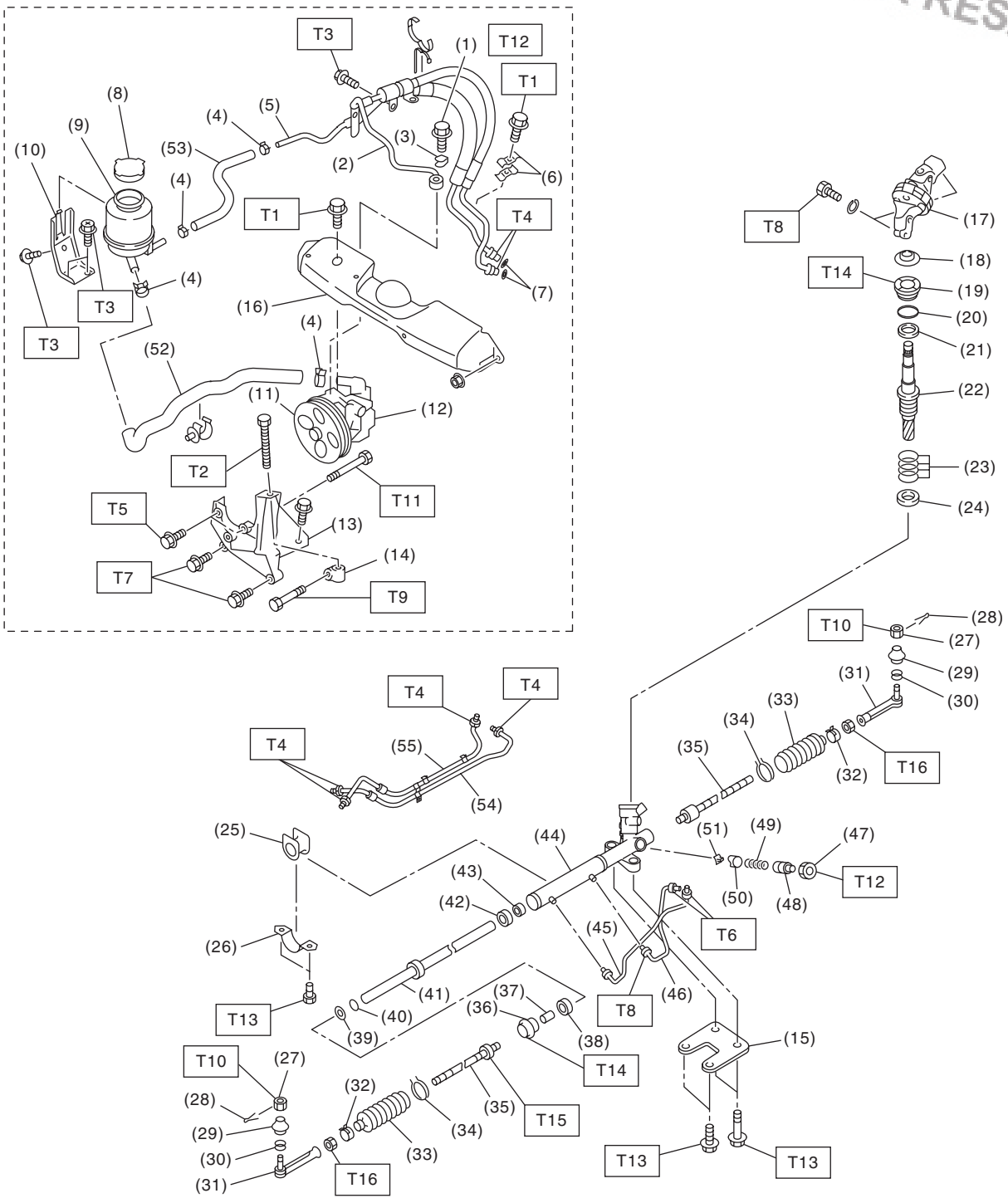
Turbo model and STI model



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(1) Eyebolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Reservoir tank
(10) Reservoir tank bracket
(11) Pulley
(12) Oil pump
(13) Bracket
(14) Belt tension nut
(15) Stiffener
(16) Belt Cover
(17) Universal joint
(18) Dust cover
(19) Plug
(20) O-ring
(21) Oil seal
(22) Pinion
(23) Seal ring
(24) Oil seal
(25) Adapter
(26) Clamp
(27) Castle nut
(28) Cotter pin
(29) Dust seal
(30) Clip
(31) Tie-rod end
(32) Clip
(33) Boot
(34) Wire
(35) Tie-rod
(36) Holder
(37) Bushing
(38) Oil seal
(39) Oil seal
(40) O-ring
(41) Rack
(42) Oil seal
(43) Back-up washer
(44) Steering body
(45) Pipe A
(46) Pipe B
(47) Lock nut
(48) Adjusting screw
(49) Spring
(50) Sleeve
(51) Sheet pad
(52) Suction hose
(53) Return hose
(54) Pipe G
(55) Pipe H

Tightening torque:N·m (kgf-m, ft-lb)

T1:	***7.4 (0.75, 5.4)***
T2:	***8 (0.8, 5.8)***
T3:	***13 (1.3, 9.4)***
T4:	***15 (1.5, 10.8)***
T5:	***15.7 (1.6, 11.6)***
T6:	***20 (2.0, 14.5)***
T7:	***22 (2.2, 15.9)***
T8:	***24 (2.4, 17.4)***
T9:	***25 (2.5, 18.1)***
T10:	***27 (2.75, 19.9)***
T11:	***37.3 (3.8, 27.5)***
T12:	***40 (4.1, 29.5)***
T13:	***60 (6.1, 44.3)***
T14:	***64 (6.5, 47.0)***
T15:	***90 (9.0, 65.1)***
T16:	***85 (8.6, 62.2)***

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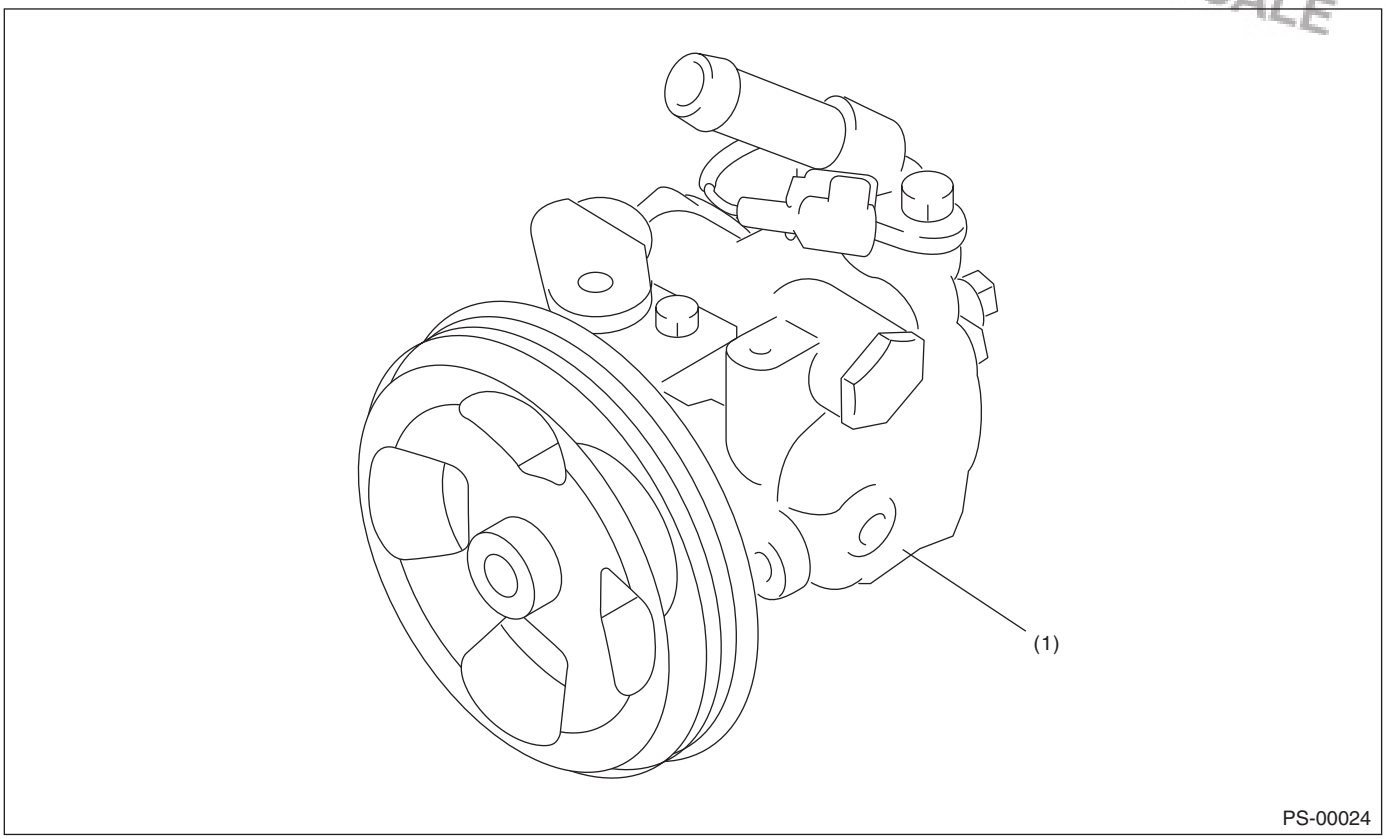
3. OIL PUMP

Non-turbo model



(1) Power steering oil pump ASSY

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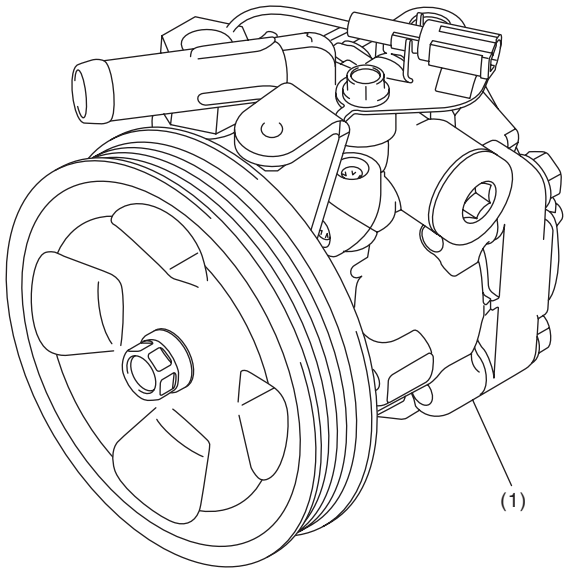
Turbo model and STI model



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(1) Power steering oil pump ASSY

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use the genuine power steering fluid, grease etc. or the equivalent. Do not mix fluid, grease etc. of different grades or manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before securing a part on a vise, place cushioning material such as wooden blocks, aluminum plate or cloth between the part and the vise.

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D: PREPARATION TOOL

1. SPECIAL TOOL

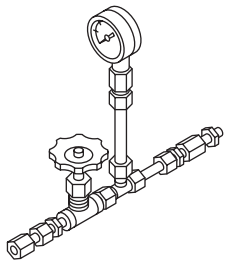
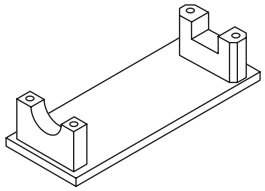
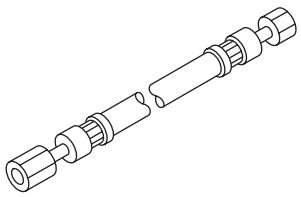
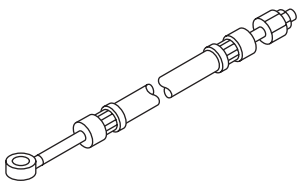
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925711000	925711000	PRESSURE GAUGE	Used for measuring oil pressure.
 ST-926200000	926200000	STAND	• Used when inspecting characteristic of gear-box assembly and disassembling it. • For non-turbo model.
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used together with the PRESSURE GAUGE (925711000).
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used together with the PRESSURE GAUGE (925711000).

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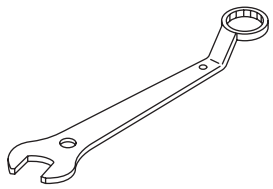
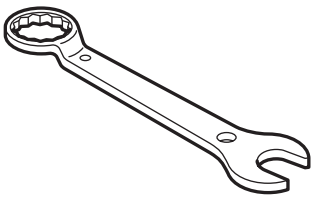
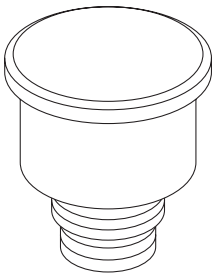
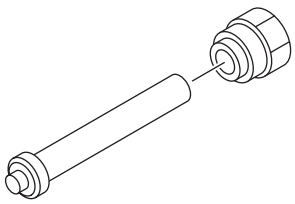
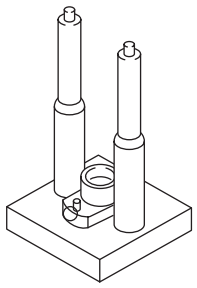
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926230000	926230000	SPANNER	For the lock nut when adjusting backlash of gear-box.
 ST34099PA100	34099PA100	SPANNER	Used when measuring the rotating resistance of gearbox assembly.
 ST34199AE040	34199AE040	OIL CHARGE GUIDE	Used for charging power steering fluid.
 ST-926420000	926420000	PLUG	When fluid leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check oil leaking points.
 ST-926370000	926370000	INSTALLER A	• Used for installing the valve assembly into the valve housing assembly. • Used together with the STAND BASE (34099FA100).

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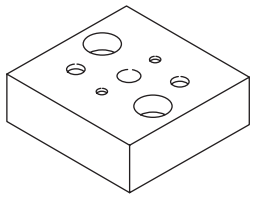
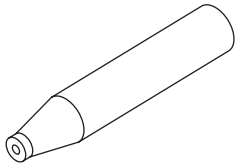
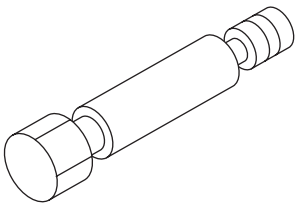
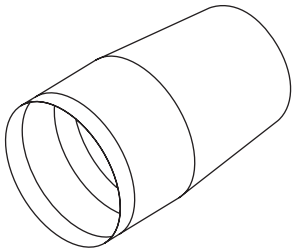
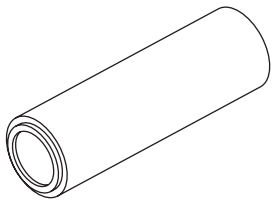
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099FA100	34099FA100	STAND BASE	Used for assembling power steering gearbox.
 ST-926390001	926390001	COVER & REMOVER ASSY	Used for assembling rack assembly.
 ST-926400000	926400000	GUIDE	• Used for installing rack bushing on the right side of the rack. • Used together with the GUIDE (927660000).
 ST-927660000	927660000	GUIDE	• Used for installing rack bushing on the right side of the rack. • Used together with the GUIDE (926400000).
 ST-927620000	927620000	INSTALLER B	• Used for installing oil seal of valve housing. • Used together with the INSTALLER A (926360000).

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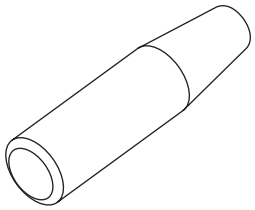
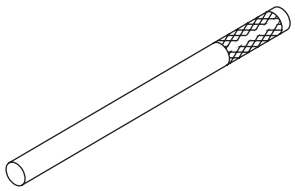
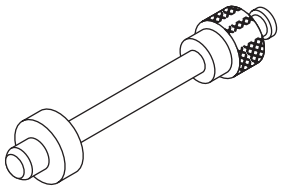
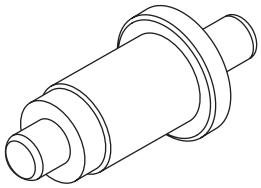
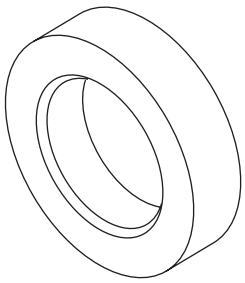
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926360000	926360000	INSTALLER A	• Used as a guide to install oil seal. • Used together with the INSTALLER B (927620000).
 ST34199AE050	34199AE050	OIL SEAL REMOVER	Used for removing the oil seal.
 ST34099FA110	34099FA110	INSTALLER	Used for installing the oil seal.
 ST34099FA120	34099FA120	INSTALLER & REMOVER SEAL	• Used for installing oil seal of valve housing. • Used together with the INSTALLER SEAL. (34099FA130) • Used for installing ball bearing of valve housing. • Used for removing oil seal and ball bearing from valve housing.
 ST34099FA130	34099FA130	INSTALLER SEAL	• Used for installing oil seal of valve housing. • Used together with the INSTALLER & REMOVER SEAL (34099FA120).

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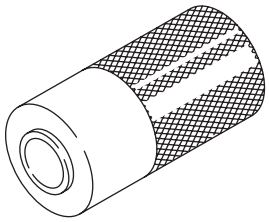
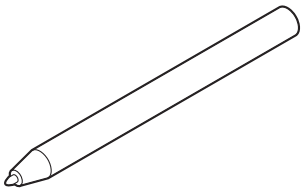
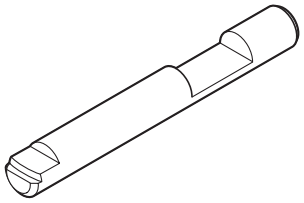
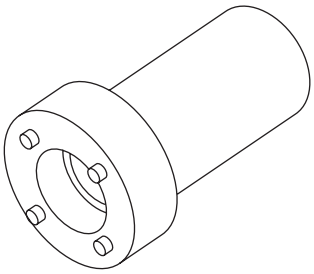
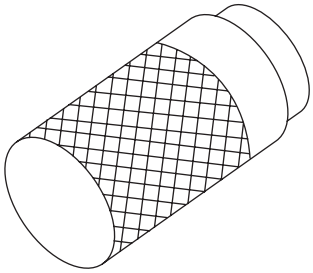
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927640000	927640000	INSTALLER B	Used for installing the ball bearing into housing.
 ST34099FA060	34099FA060	PUNCH HOLDER	• Used for crimping. • For turbo model and STI model.
 ST34099FA080	34099FA080	PUNCH	• Used for removing crimps. • For turbo model and STI model.
 ST34199AE090	34199AE090	PLUG WRENCH	• Used for removing the plug. • For turbo model and STI model.
 ST34199AE100	34199AE100	OIL SEAL PLUG REMOVER	• Used for removing the oil seal plug. • For turbo model and STI model.

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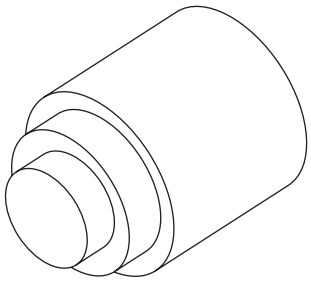
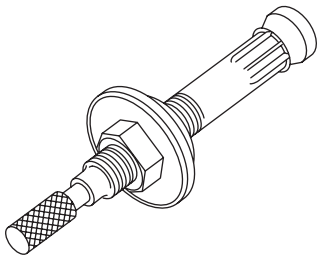
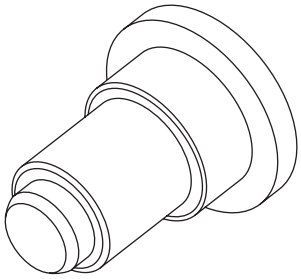
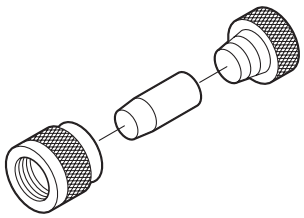
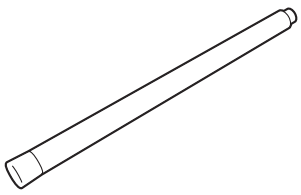
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE110	34199AE110	OIL SEAL PLUG INSTALLER	• Used for installing the oil seal plug. • For turbo model and STI model.
 ST34199AE120	34199AE120	GEARBOX OIL SEAL REMOVER	• Used for removing the gearbox oil seal. • For turbo model and STI model.
 ST34199AE130	34199AE130	GEARBOX OIL SEAL INSTALLER	• Used for installing the gearbox oil seal. • For turbo model and STI model.
 ST34199FE040	34199FE040	INSTALLER A, B, C	• Used for installing the oil seal to the rack assembly. • For turbo model and STI model.
 ST34199FE010	34199FE010	REMOVER	• Used for removing the back-up ring and oil seal. • For turbo model and STI model.

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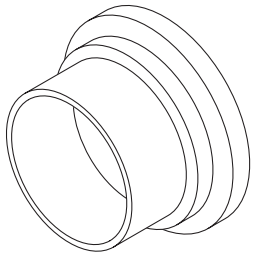
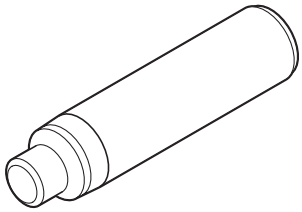
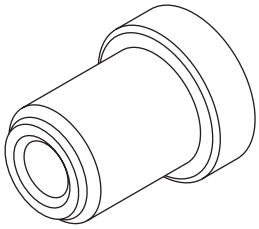
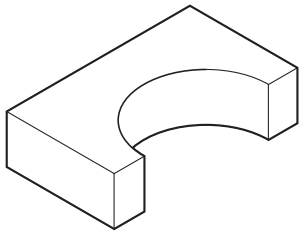
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199FE050	34199FE050	GUIDE	• Used for installing the rack and seal into housing assembly. • For turbo model and STI model.
 ST34199FE000	34199FE000	INSTALLER & REMOVER	• Used for removing and installing the rack oil seal (outer & inner). • For turbo model and STI model.
 ST34199FE060	34199FE060	INSTALLER	• Used for installing the rack oil seal (outer). • For turbo model and STI model.
 ST34199FE020	34199FE020	BASE	• Used for the support housing assembly. • For turbo model and STI model.

2. GENERAL TOOL

TOOL NAME	REMARKS
Spring scale	Used for measuring tightening torque.
Snap ring pliers	Used for removing and installing snap ring.
Dial gauge	Used for measuring the steering gearbox.
C clamp	Used for disassembling and assembling the steering gearbox of turbo model and STI model.

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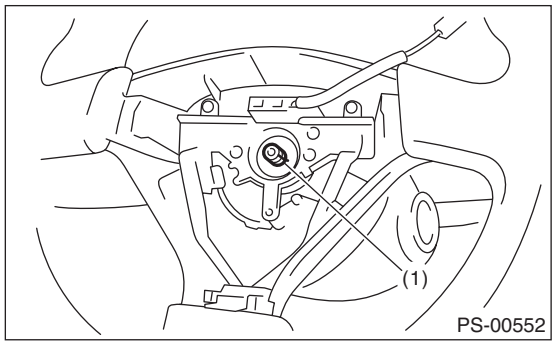
2. Steering Wheel

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Set the tire to the straight-ahead position.
3) Remove the airbag module. <Ref. to AB-13, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-3, CAUTION, General Description.>
4) Place alignment marks on the steering wheel and steering shaft.



(1) Alignment mark

5) Remove the steering wheel nut, and then draw out the steering wheel from the shaft using a steering puller.

B: INSTALLATION

WARNING:
Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-3, CAUTION, General Description.>
1) Align the center position of the roll connector. <Ref. to AB-19, ADJUSTMENT, Roll Connector.>
2) Install in the reverse order of removal.

NOTE:
Align the alignment marks on the steering wheel and steering shaft.

Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)

Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

CAUTION:
Insert the roll connector guide pin into the guide hole on the lower end of the steering wheel surface. Avoid damaging the pin.

C: INSPECTION

1) Check the steering wheel for deformation. If the deformation is excessive, replace the steering wheel.
2) Check the splines on the steering wheel for damage. If the damage is excessive, replace the steering wheel.

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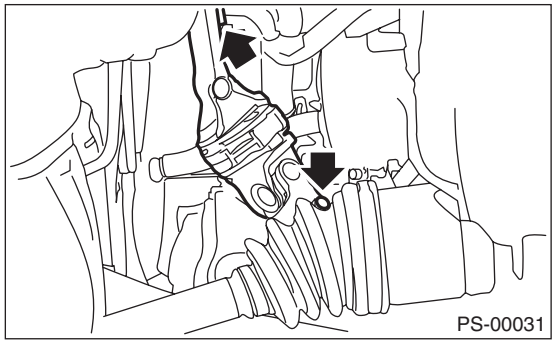
3. Universal Joint

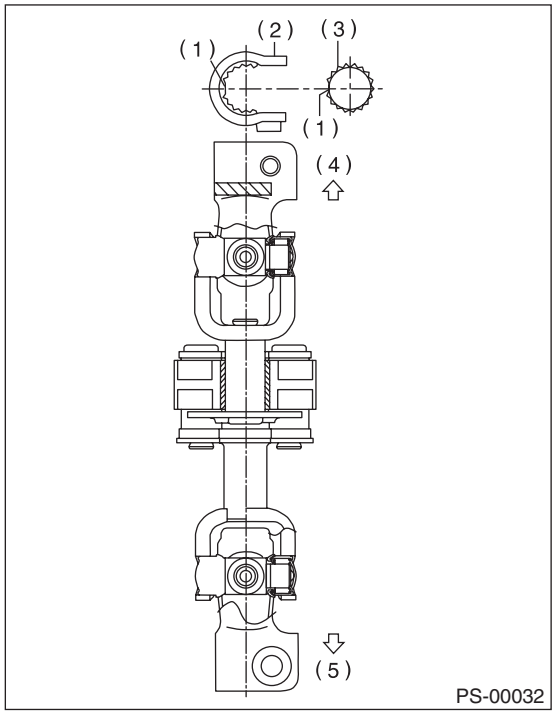
A: REMOVAL

1) Remove the steering wheel. <Ref. to PS-18, REMOVAL, Steering Wheel.>
2) Place alignment marks on universal joint.
3) Remove the universal joint bolt, and then remove the universal joint.



B: INSTALLATION

1) Align the cutout portion at the serrated section of the column shaft and yoke, then insert the universal joint into the column shaft.



(1) Cutout portion
(2) Yoke
(3) Column shaft
(4) Column shaft side
(5) Gearbox side

2) Match the alignment marks, and insert the universal joint into the serrations of gearbox assembly.
3) Tighten the bolt.

Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:
Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox to DOJ:
14 mm (0.55 in) or more

4) Align the center position of the roll connector. <Ref. to AB-19, ADJUSTMENT, Roll Connector.>
5) Install the steering wheel and airbag module. <Ref. to PS-18, INSTALLATION, Steering Wheel.>

WARNING:
Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-3, CAUTION, General Description.>

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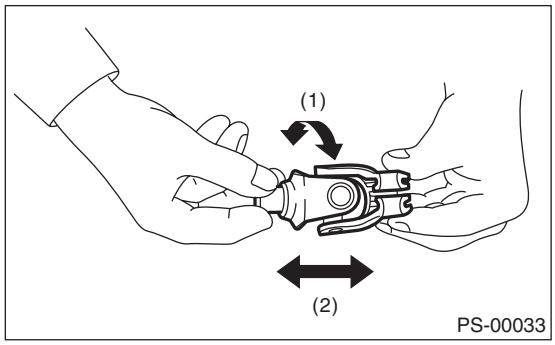
C: INSPECTION

Check for wear, damage or any other faults. Replace if necessary.

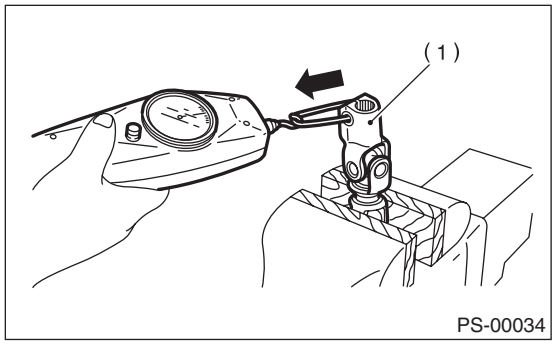
Service limit:
Universal joint play:
0 mm (0 in)
Maximum swing torque:
0.3 N (0.03 kgf, 0.07 lbf)



(1) Swing torque
(2) Play

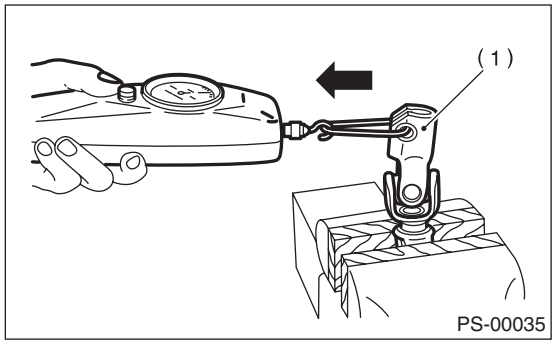
Measure the swing torque of universal joint.

Service limit:
Maximum load: 3.8 N (0.39 kgf, 0.86 lbf) or less



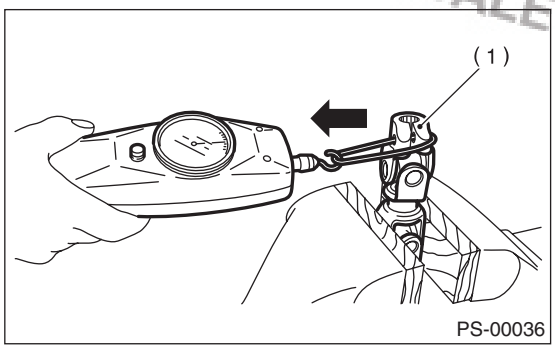
(1) Yoke (Gearbox side)

Service limit:
Maximum load: 3.8 N (0.39 kgf, 0.86 lbf) or less



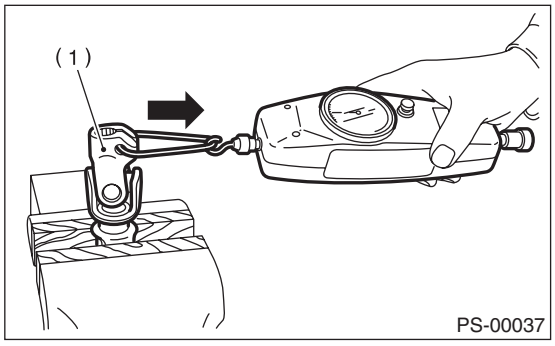
(1) Yoke (Gearbox side)

Service limit:
Maximum load: 7.3 N (0.74 kgf, 1.64 lbf) or less



(1) Yoke (Steering column side)

Service limit:
Maximum load: 7.3 N (0.74 kgf, 1.64 lbf) or less



(1) Yoke (Steering column side)

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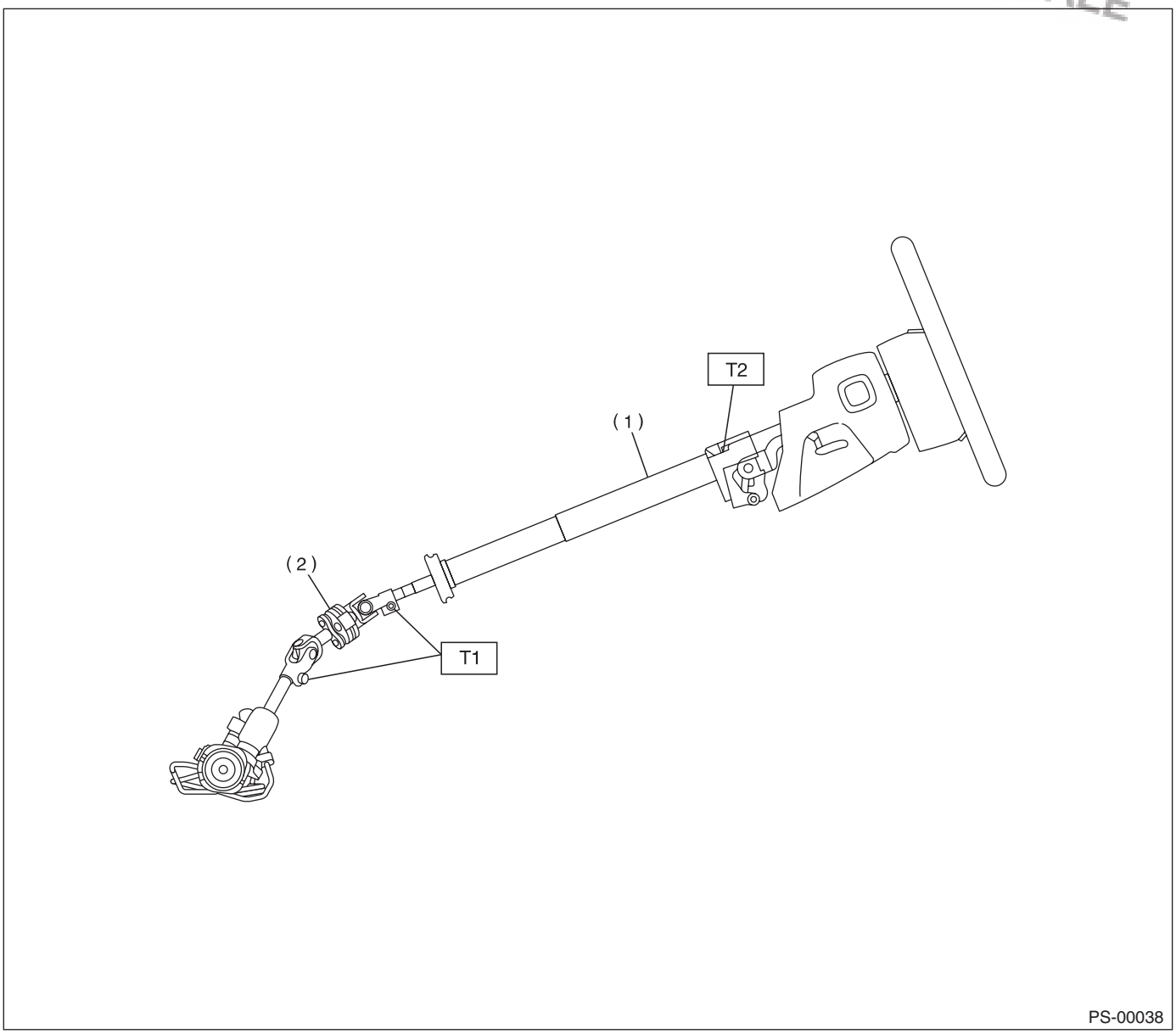
4. Tilt Steering Column

A: REMOVAL



(1) Tilt steering column (2) Universal joint

Tightening torque:N·m (kgf-m, ft-lb)
T1: 24 (2.4, 17.4)
T2: 25 (2.5, 18.1)

1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.
3) Remove the airbag module. <Ref. to AB-13, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-3, CAUTION, General Description.>

4) Remove the steering wheel. <Ref. to PS-18, REMOVAL, Steering Wheel.>
5) Remove the universal joint. <Ref. to PS-19, REMOVAL, Universal Joint.>
6) Remove the trim panel under instrument panel.
7) Remove the steering column lower cover.
8) Remove all connectors from the steering column.

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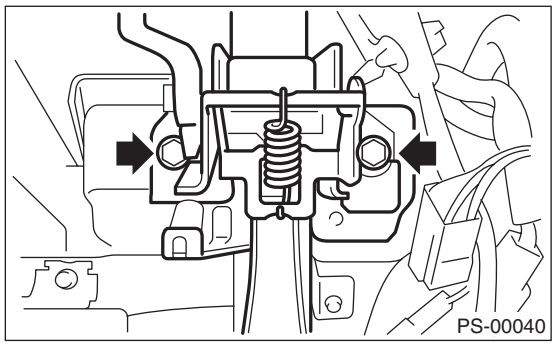
9) Remove the two bolts under instrument panel securing the steering column.

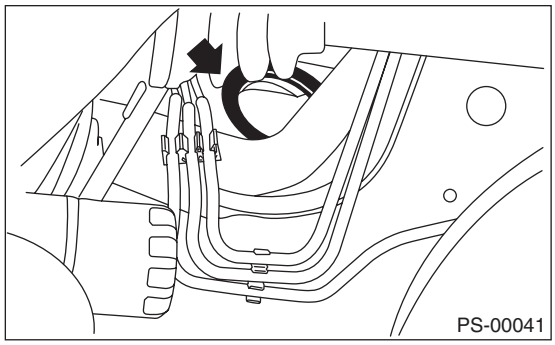


10) Pull out the steering shaft assembly from the hole on toe board.

CAUTION:
• Be sure to remove the universal joint before removing steering shaft assembly installing bolts when removing steering shaft assembly or when lowering it for servicing other parts.
• Do not loosen the tilt lever when the steering column is not secured to the vehicle.

B: INSTALLATION

1) Set the grommet to the toe board.



2) Insert the end of the steering shaft into the toe board grommet.
3) With the tilt lever secured, tighten the steering shaft mounting bolts under instrument panel.

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

4) Connect all the connectors under the instrument panel.
5) Connect the airbag system connector at the harness spool.

NOTE:
Make sure to apply double lock.

6) Install the lower column cover with the tilt lever held in the lowered position.
7) Install the universal joint. <Ref. to PS-19, INSTALLATION, Universal Joint.>
8) Align the center position of the roll connector. <Ref. to AB-19, ADJUSTMENT, Roll Connector.>
9) Install the steering wheel. <Ref. to PS-18, INSTALLATION, Steering Wheel.>

CAUTION:
Insert the roll connector guide pin into the guide hole on lower end of steering wheel surface to prevent damage.

10) Install the airbag module to the steering wheel.

WARNING:
Always refer to "Airbag System" before performing the service operation. <Ref. to AB-3, CAUTION, General Description.>

C: DISASSEMBLY

Remove the two screws securing the upper steering column covers, and the two screws securing the combination switch, and then remove related parts.

D: ASSEMBLY

1) Insert the combination switch to the upper column shaft, and install the upper column cover. Then route the ignition key harness and combination switch harness between the column cover mounting bosses.

Tightening torque:
1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

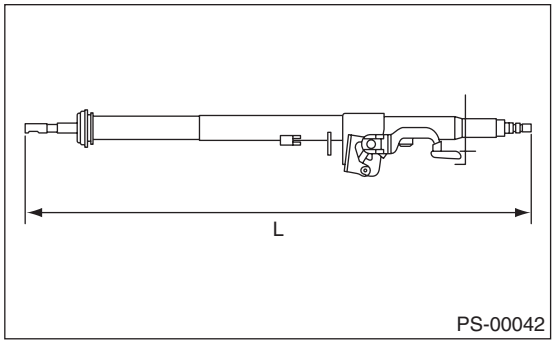
CAUTION:
Do not overtighten the screw.

E: INSPECTION

1. BASIC INSPECTION

Measure the overall length of steering column. If not within specification, replace it.

Standard:
Overall length L
818.7±1.5 mm (32.23±0.059 in)



2. AIRBAG MODEL INSPECTION

WARNING:
Refer to "Airbag System" for airbag inspection procedure. <Ref. to AB-3, CAUTION, General Description.>

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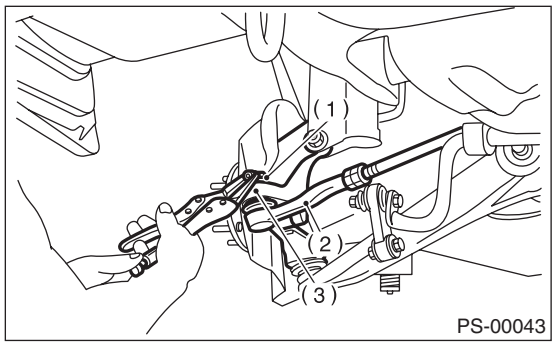
5. Steering Gearbox

A: REMOVAL

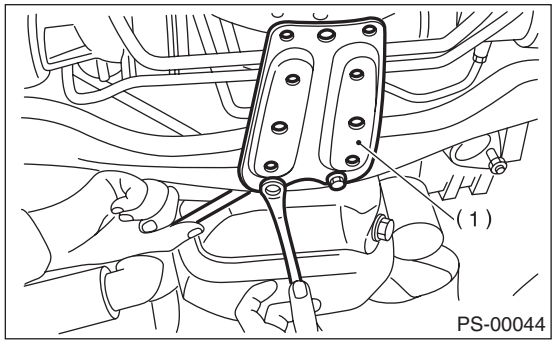
1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.
3) Loosen the front wheel nuts.
4) Lift up the vehicle, and remove the front wheels.
5) Remove the under cover. <Ref. to EI-23, REMOVAL, Front Under Cover.>
6) Remove the sub frame. <Ref. to FS-23, REMOVAL, Sub Frame.>
7) Remove the front exhaust pipe assembly. (Non-turbo model)
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>

WARNING:
The exhaust pipe is extremely hot. Be careful not to receive burns,
8) After pulling off the cotter pin and removing the castle nut, use a puller to remove the tie-rod end from the knuckle arm.



(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

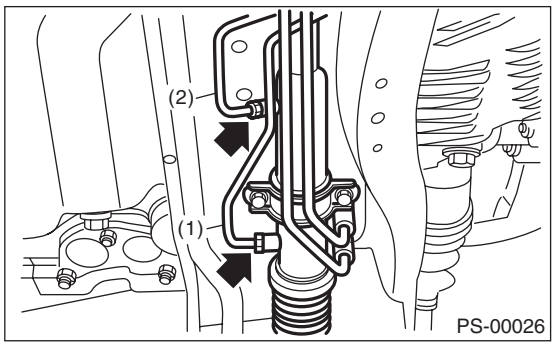
9) Remove the jack-up plate and front stabilizer.



(1) Jack-up plate

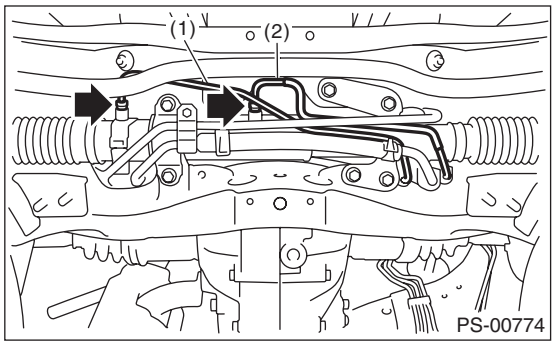
10) Remove the one pipe joint at the center of the gearbox, and connect the vinyl hose to the pipe and the joint. Discharge the fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipes.

- Non-turbo model



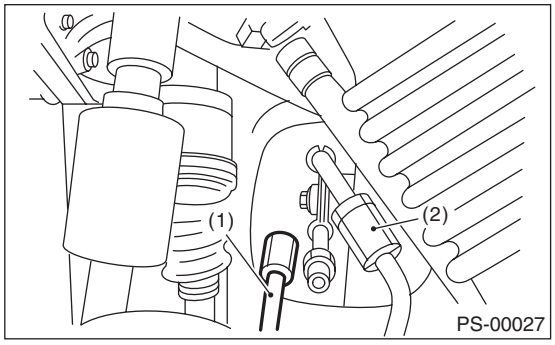
(1) Pipe A
(2) Pipe B

- Turbo model



(1) Pipe A
(2) Pipe B

11) Remove the universal joint. <Ref. to PS-19, REMOVAL, Universal Joint.>
12) Disconnect the lower pipe C from gearbox first, and upper pipe D second.



(1) Pipe C
(2) Pipe D

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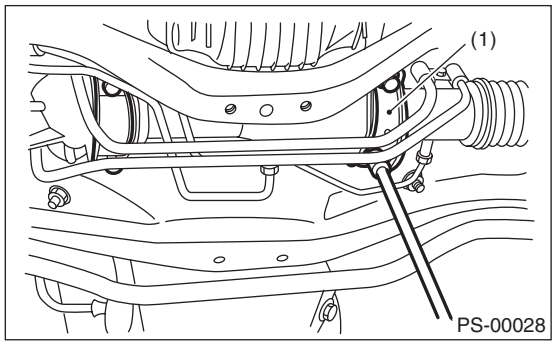
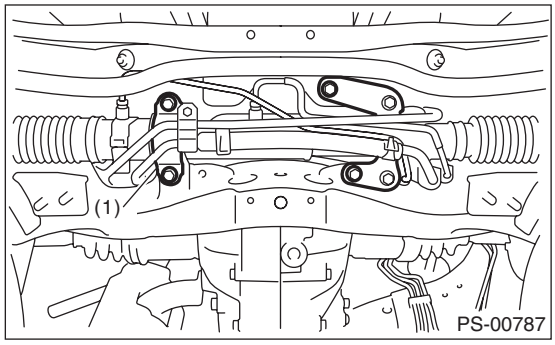
13) Remove the clamp bolts securing the gearbox to the crossmember, and remove the gearbox.

- Non-turbo model



(1) Clamp

- Turbo model



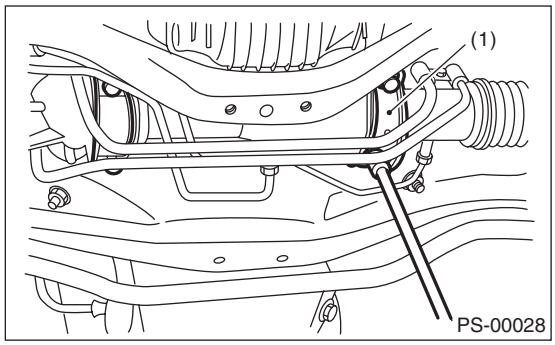
(1) Clamp

B: INSTALLATION

1) Insert the gearbox into crossmember, being careful not to damage gearbox boot.
2) Tighten the gearbox to the crossmember bracket via clamp with bolt, and tighten to the specified torque.

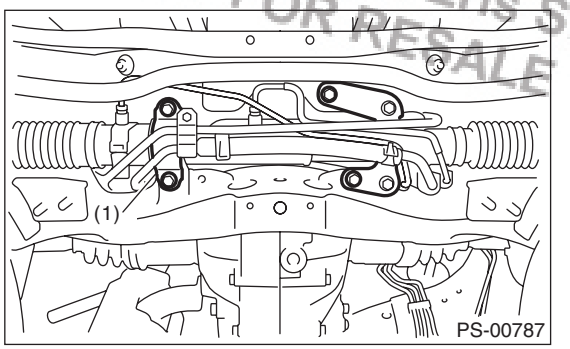
Tightening torque:
60 N·m (6.1 kgf-m, 44.3 ft-lb)

- ***Non-turbo model***



(1) Clamp

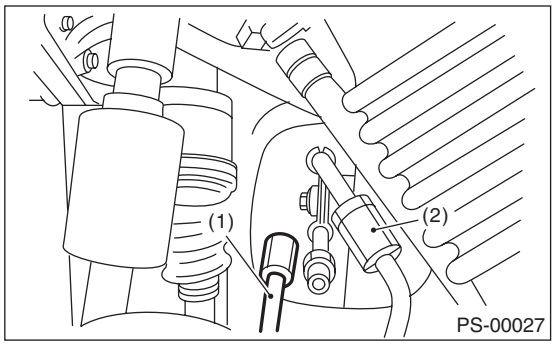
- ***Turbo model***



(1) Clamp

3) Connect the pipe D first to gearbox, then lower pipe C.

Tightening torque:
15 N·m (1.5 kgf -m, 10.8 ft-lb)



(1) Pipe C
(2) Pipe D

4) Install the universal joint. <Ref. to PS-19, INSTALLATION, Universal Joint.>
5) Connect the tie-rod end and knuckle arm, and tighten with castle nut.

Tightening torque (castle nut):
27 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:
When connecting, do not hit the cap at the bottom of tie-rod end with hammer.

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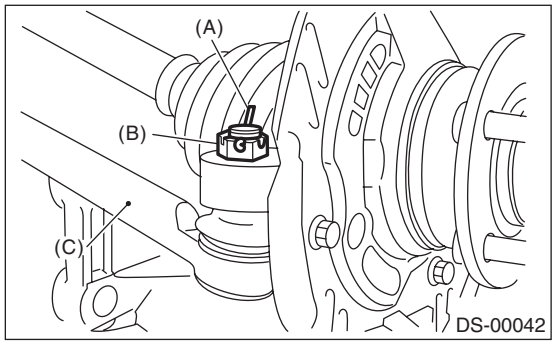
6) After tightening the castle nut to the specified tightening torque, tighten it further within 60° until the cotter pin hole is aligned with slot in the nut. Fit the cotter pin into the nut, and then bend the pin to lock.



(A) Cotter pin
(B) Castle nut
(C) Tie-rod end

7) Install the front stabilizer to vehicle. <Ref. to FS-21, INSTALLATION, Front Stabilizer.>
8) Install the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX(H4SO)-5, INSTALLATION, Front Exhaust Pipe.>
9) Install the sub frame. <Ref. to FS-23, INSTALLATION, Sub Frame.>
10) Install the under cover. <Ref. to EI-23, INSTALLATION, Front Under Cover.>
11) Align the center position of the roll connector. <Ref. to AB-19, ADJUSTMENT, Roll Connector.>
12) Install the steering wheel. <Ref. to PS-18, INSTALLATION, Steering Wheel.>
13) Install the front wheels.
14) Tighten the wheel nuts to the specified torque.

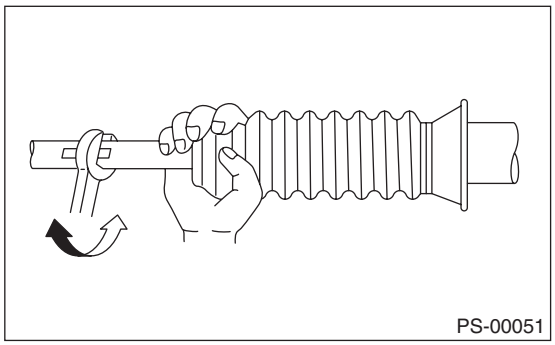
Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)

15) Connect the ground cable to the battery.
16) Pour fluid into the oil tank, and bleed air.
<Ref. to PS-66, Power Steering Fluid.>
17) Check for fluid leaks.
18) Install the jack-up plate.
19) Lower the vehicle.
20) Check the fluid level in oil tank.

21) After adjusting toe-in and steering angle, tighten the lock nut on tie-rod end.

Tightening torque:
83 N·m (8.5 kgf-m, 61.5 ft-lb)

NOTE:
When adjusting toe-in, hold the boot as shown to prevent it from being rotated or twisted. If it becomes twisted, straighten it.



C: DISASSEMBLY

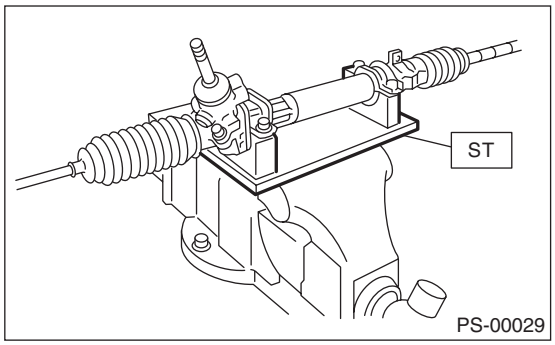
1. NON-TURBO MODEL

RACK HOUSING ASSEMBLY

1) Disconnect the four pipes from gearbox.

NOTE:
Remove the pipes E and F, which are fixed to the clamp plate, as a unit.
2) Secure the gearbox removed from vehicle in a vise using ST.
ST 926200000 STAND

CAUTION:
Secure the gearbox in a vise using ST as shown in the figure. Do not secure the gearbox without this ST.



3) Remove the tie-rod end and lock nut from gearbox.

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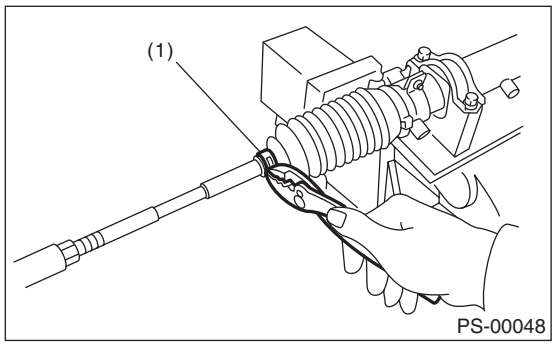
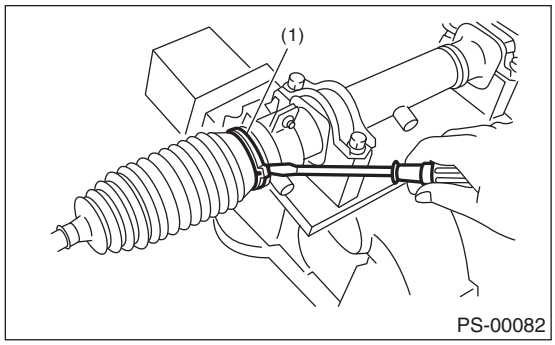
4) Remove the small clip from the boot using pliers, and then move the boot to tie-rod end side.



(1) Clip

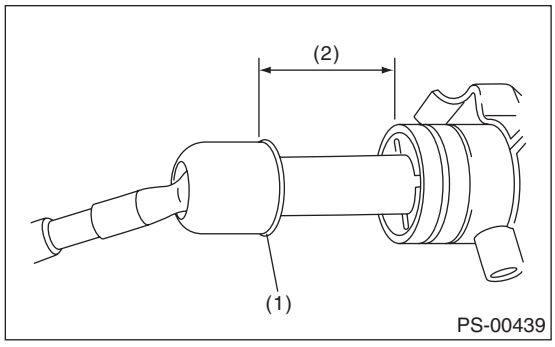
5) Using a flat tip screwdriver, remove the band from boot.



(1) Band

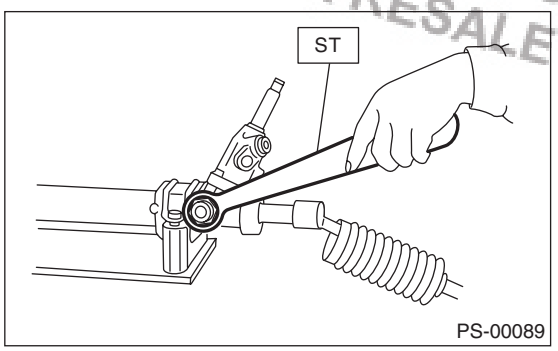
6) Extend the rack approx. 40 mm (1.57 in) out. Using a flat tip screwdriver, flatten the tab of the lock washer on both side of the tie-rod end.

CAUTION:
Be careful not to scratch the rack surface as oil leaks may result.

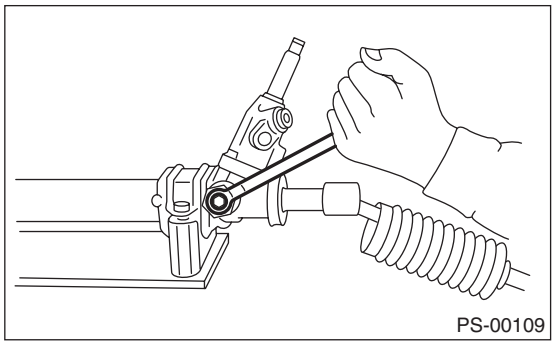


(1) Lock washer
(2) Approx. 40 mm (1.57 in)

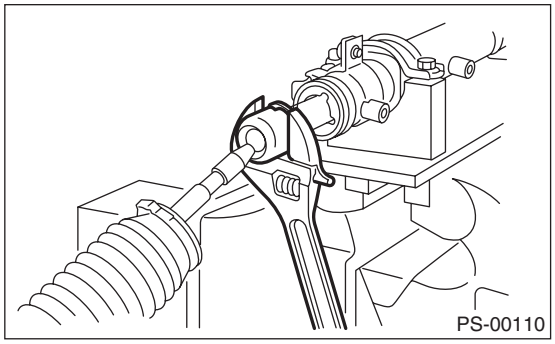
7) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



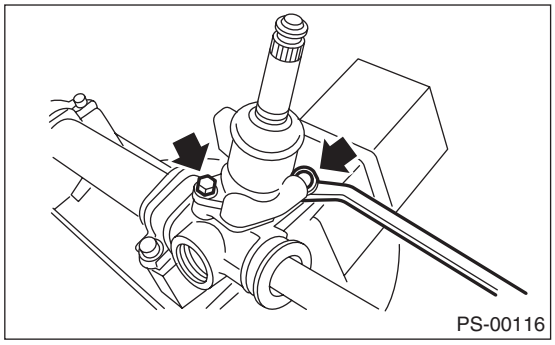
8) Tighten the adjusting screw until it can no longer be tightened.



9) Remove the tie-rod using a 32 mm wrench or adjustable wrench.



10) Loosen the adjusting screw, and remove the spring and sleeve.
11) Remove the two bolts securing valve assembly.



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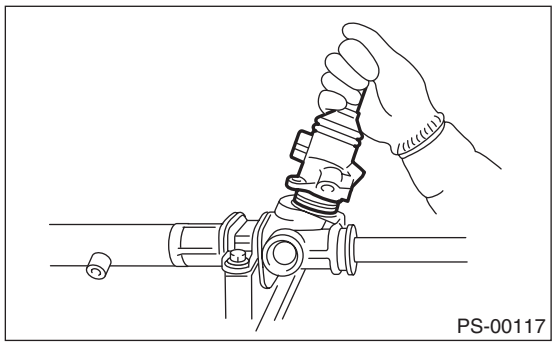
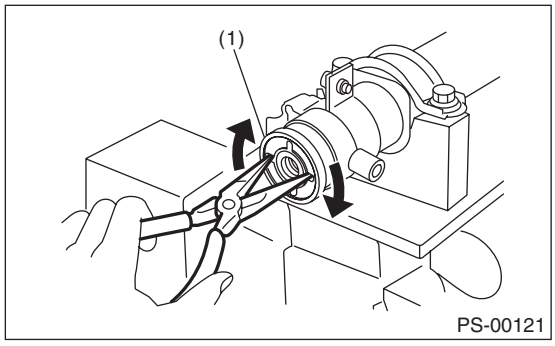
12) Carefully draw out the input shaft and remove the valve assembly.



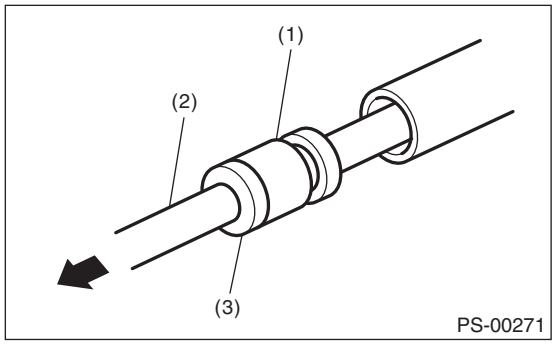
13) Using a sharp pointed pliers, rotate the rack stopper in direction of the arrow until end of the circlip comes out of stopper. Rotate the circlip in opposite direction and pull it out.



(1) Rack stopper

14) Pull the rack assembly from cylinder side, and draw out the rack bushing and rack stopper together with the rack assembly.

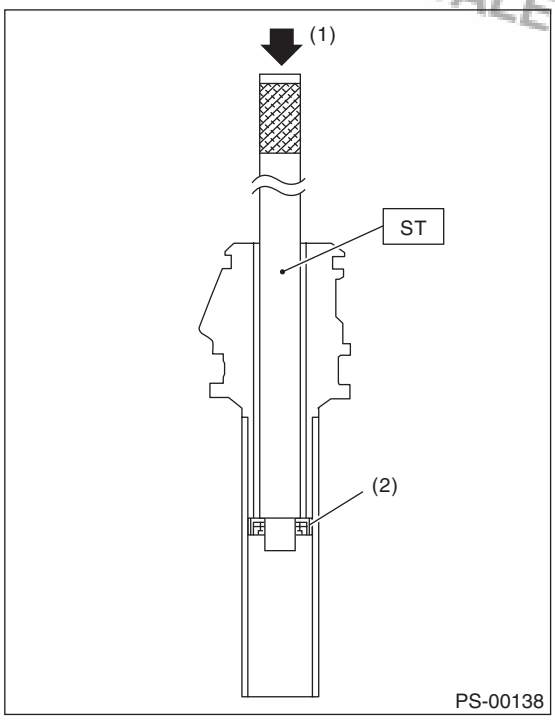
CAUTION:
Be careful not to contact the rack to inner wall of cylinder when drawing out. Any scratch on the cylinder inner wall will cause oil leakage.



(1) Rack bushing
(2) Rack ASSY
(3) Rack stopper

15) Remove the rack bushing and rack stopper from rack assembly.
16) Remove the oil seal from rack.

17) Insert the ST from pinion housing side and remove the oil seal using a press.
ST 34199AE050 OIL SEAL REMOVER



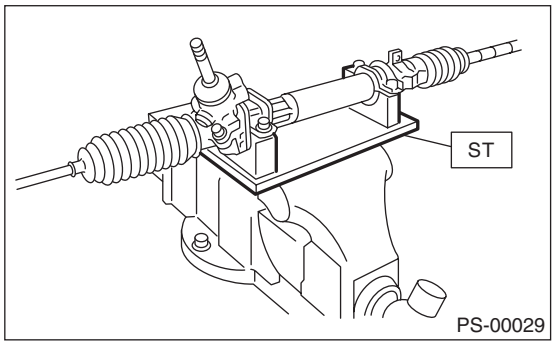
(1) Press
(2) Oil seal

Control valve assembly

1) Disconnect the four pipes from gearbox.

NOTE:
Remove the pipes E and F fixed at clamp plate as a single unit.
2) Secure the gearbox removed from vehicle in a vise using ST.
ST 926200000 STAND

CAUTION:
Secure the gearbox in a vise using ST as shown in the figure. Do not secure the gearbox without this ST.



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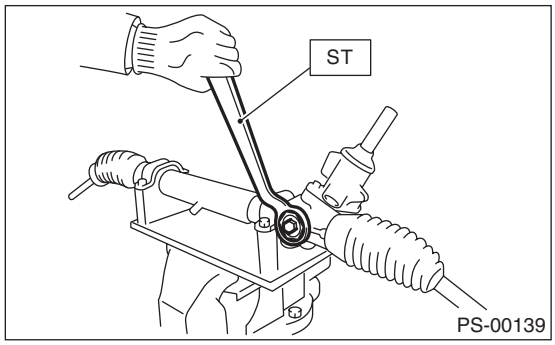
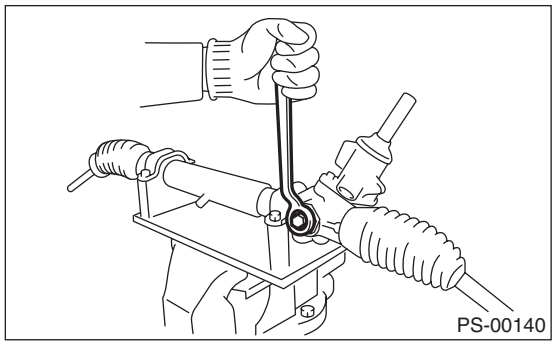
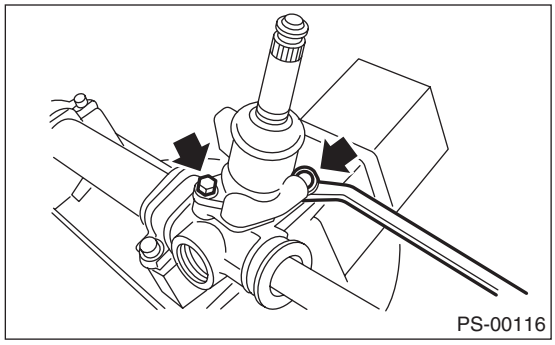
3) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



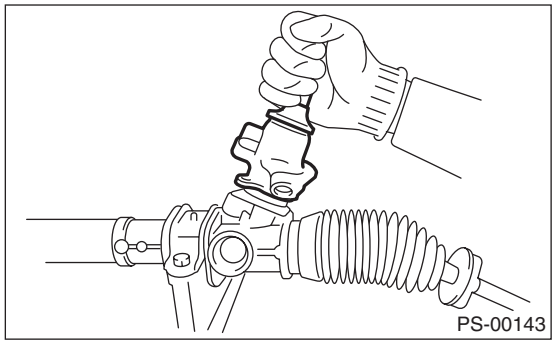
4) Tighten the adjusting screw until it can no longer be tightened.



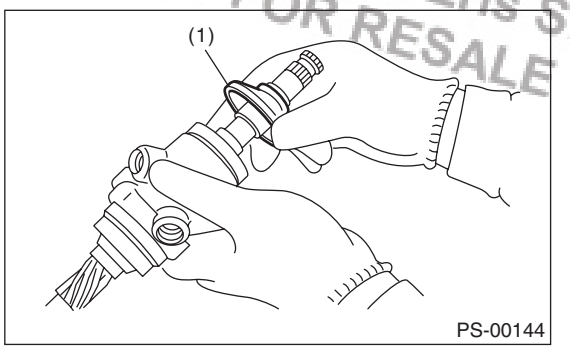
5) Loosen the adjusting screw, and remove the spring and sleeve.
6) Remove the two bolts securing valve assembly.



7) Carefully draw out the input shaft and remove the valve assembly.

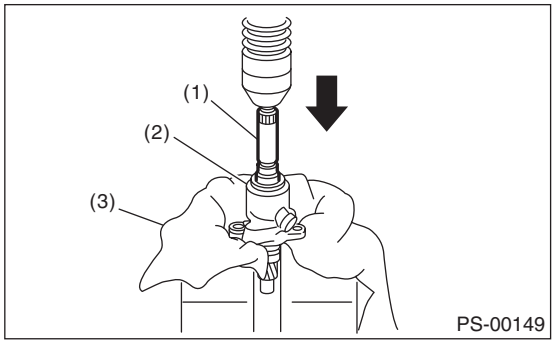


8) Slide the dust cover out.



(1) Dust cover

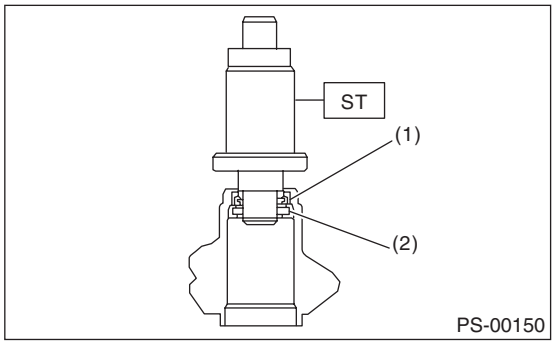
9) Using a press, remove the pinion & valve assembly from valve housing.



(1) Valve ASSY
(2) Valve housing
(3) Cloth

10) Using the ST and a press, remove the dust seal, oil seal and special bearing from the valve housing.
ST 34099FA120 INSTALLER & REMOVER SEAL

CAUTION:
• Do not apply a force to the end surface of valve housing.
• Do not reuse the oil seal after removal.



(1) Oil seal
(2) Special bearing

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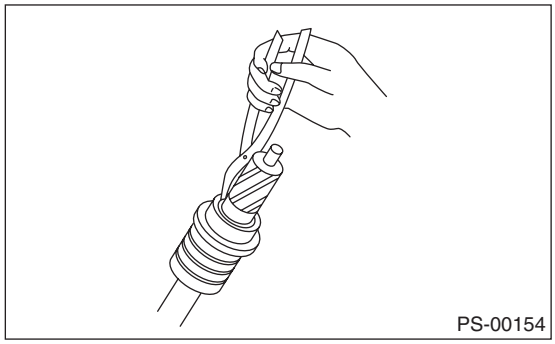
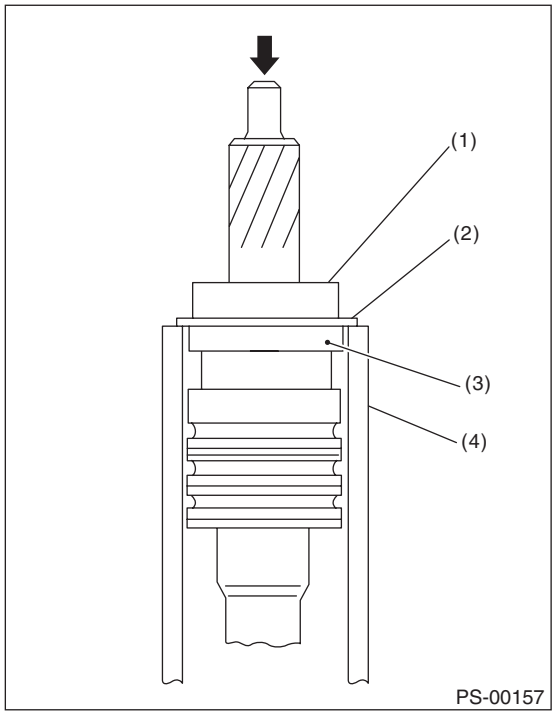
11) Remove the snap ring using snap ring pliers.

CAUTION:
Be careful not to scratch the pinion and valve assembly.



12) Press out the bearing together with the back up washer using pipe with a diameter of 38.5 — 39.5 mm (1.516 — 1.555 in) and press.

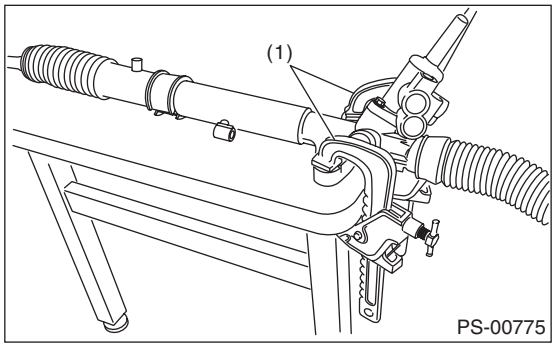


(1) Bearing
(2) Back-up washer
(3) Oil seal
(4) Pipe

13) Remove the oil seal.

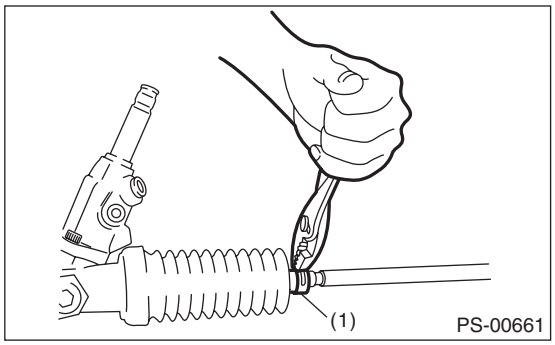
2. TURBO MODEL

1) Disconnect the pipes from the steering body and the control valve housing.
2) Secure the gearbox removed from the vehicle using C clamp.



(1) C clamp

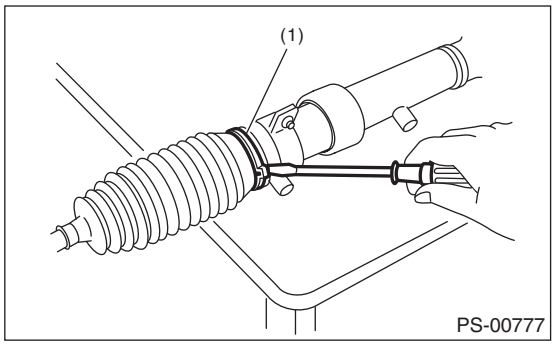
3) Remove the tie-rod end and lock nut from gearbox.
4) Remove the clip on outside of boot using pliers, and then slide the boot to tie-rod end side.



(1) Clip

5) Using a flat tip screwdriver, remove the band from boot.

NOTE:
Replace the boot if there is damage, cracks or deterioration.



(1) Band

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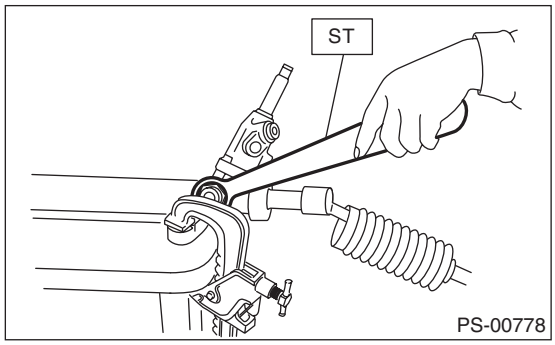
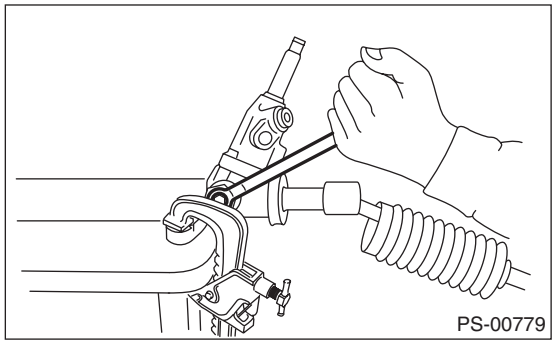
6) Using the ST, loosen the lock nut.
ST 926230000 SPANNER

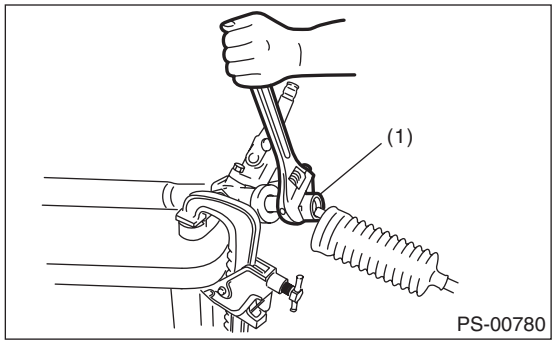


(1) Lock nut

7) Tighten the adjusting screw until it can no longer be tightened.



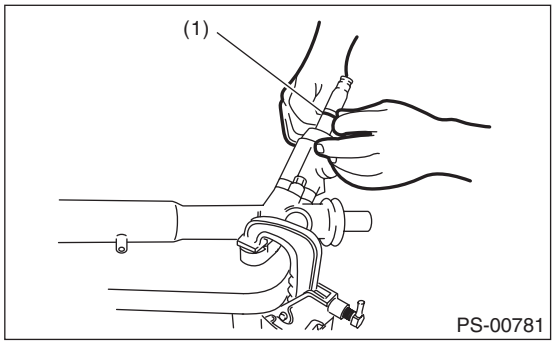
8) With the boot tightened, remove the tie-rod using a 32 mm spanner or adjustable wrench.



(1) Tie-rod

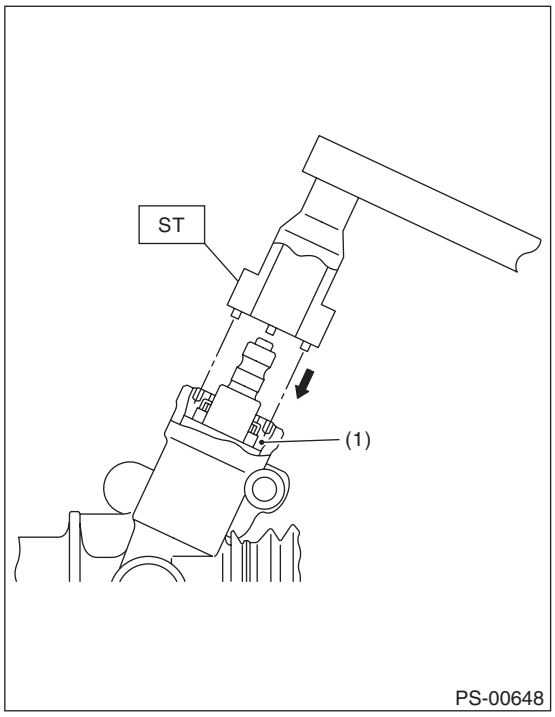
9) Loosen the adjusting screw, and remove the spring and sleeve.

10) Clean any dirt adhered to the input shaft. Remove the dust cover, paying attention not to scratch the housing or input shaft and not to allow foreign matter to enter gear box interior.



(1) Dust cover

11) Align the ST pin with plug hole to install. Rotate the ST counterclockwise to remove plug.
ST 34199AE090 PLUG WRENCH



(1) Plug

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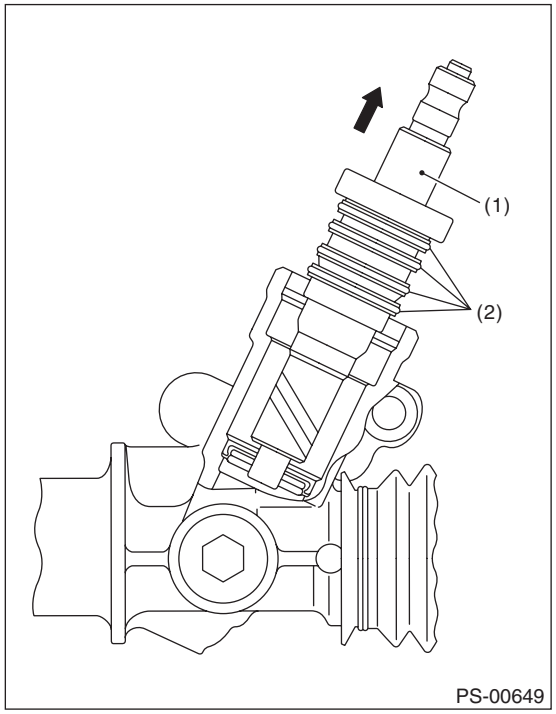
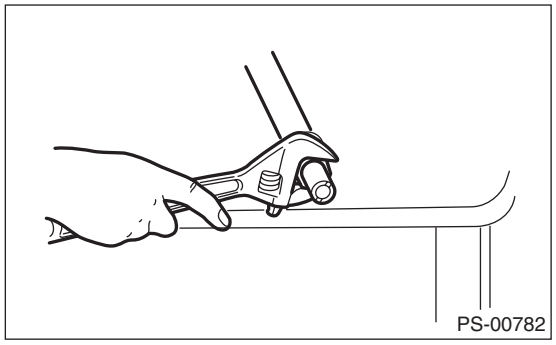
12) Remove the valve assembly paying attention not to scratch the seal ring or valve housing inner surfaces.



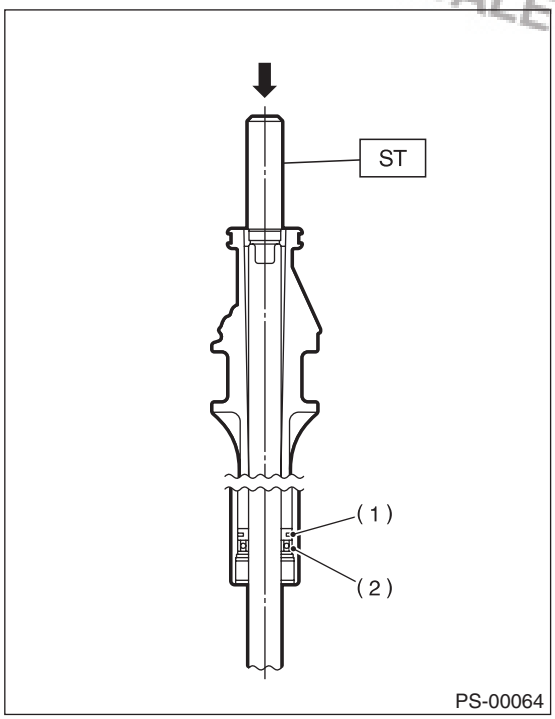
(1) Valve ASSY
(2) Seal ring

13) Remove the holder using a 36 mm spanner or adjustable wrench.



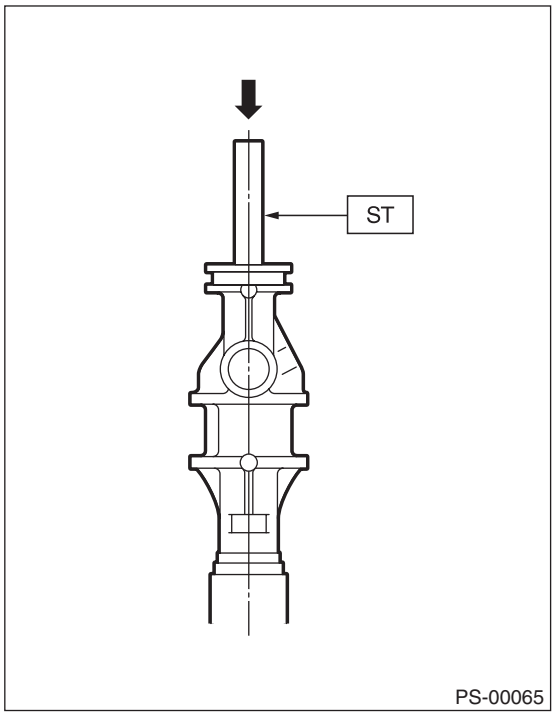
14) Attach the ST on the valve side of rack, and press out the outer side oil seal while taking care that the rack and the steering body inner surface do not come into contact with each other.
ST 34199FE000 INSTALLER & REMOVER

NOTE:
Block the pipe connection of steering body to prevent fluid from flowing out.



(1) Rack piston
(2) Outer side oil seal

15) Insert the ST from the valve side and press the back-up ring and oil seal out.
ST 34199FE010 REMOVER



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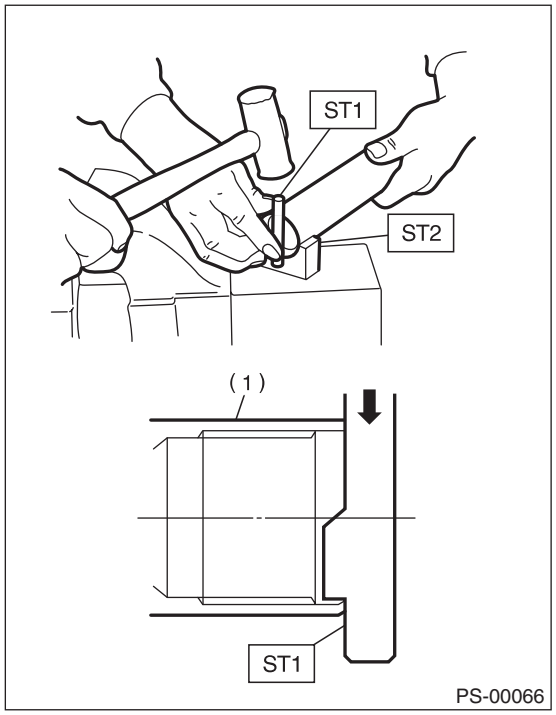
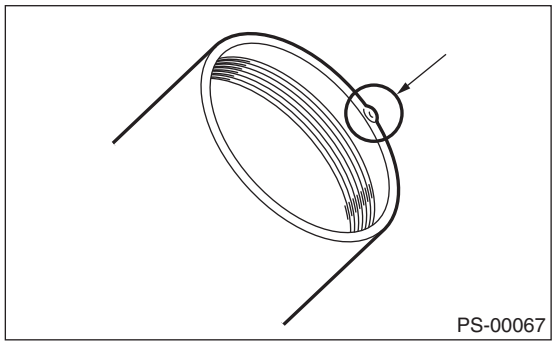
16) Using ST1 and ST2, repair the crimped portion of cylinder.
ST1 34099FA080 PUNCH
ST2 34199FE020 BASE



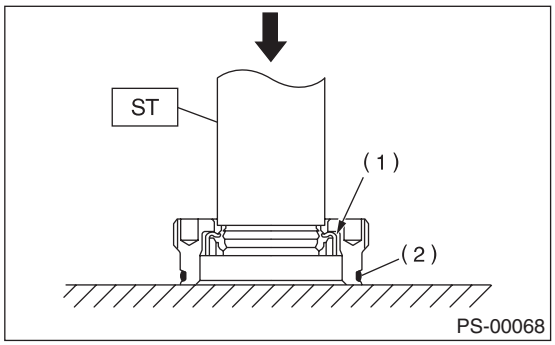
(1) Cylinder

17) If the cylinder edge is deformed in a convex shape, repair using an oil stone.



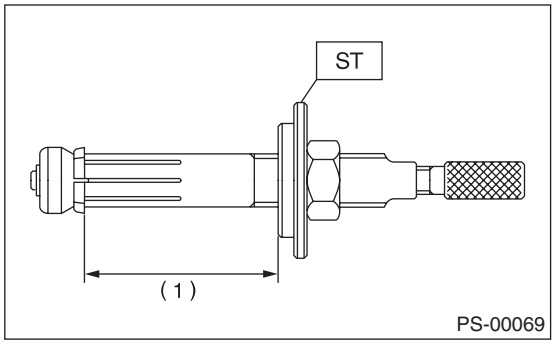
18) Remove the oil seal using ST and push out from the plug.
ST 34199AE100 OIL SEAL PLUG REMOVER

NOTE:
Do not apply force on the plug edge surface.



(1) Oil seal
(2) O-ring

19) Set the ST at a size shown in the figure.
ST 34199AE120 GEARBOX OIL SEAL REMOVER



(1) 70 mm (2.76 in)

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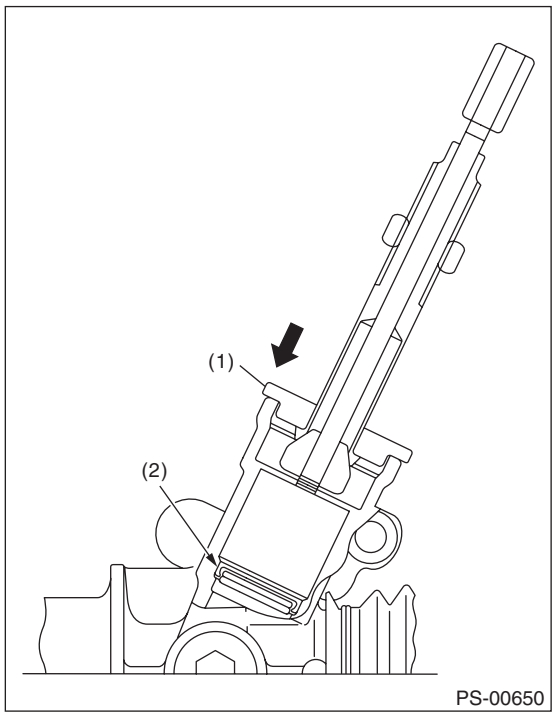
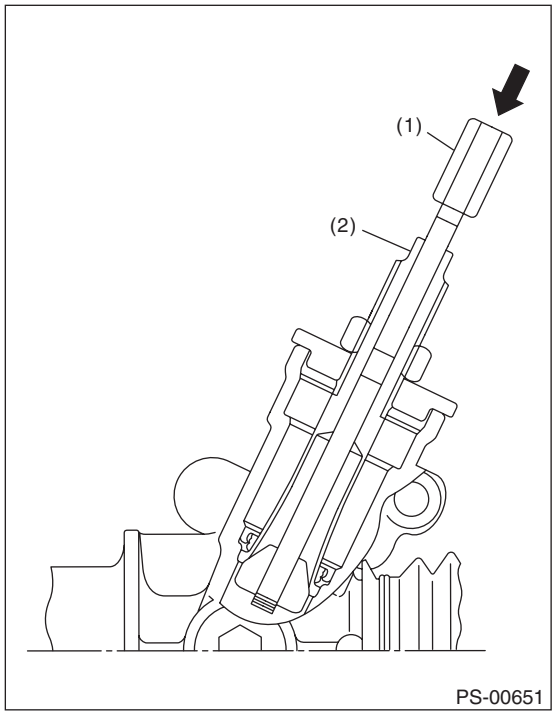
20) Set the stopper to gearbox, then insert the tip of the ST to the gearbox.



(1) Stopper
(2) Oil seal

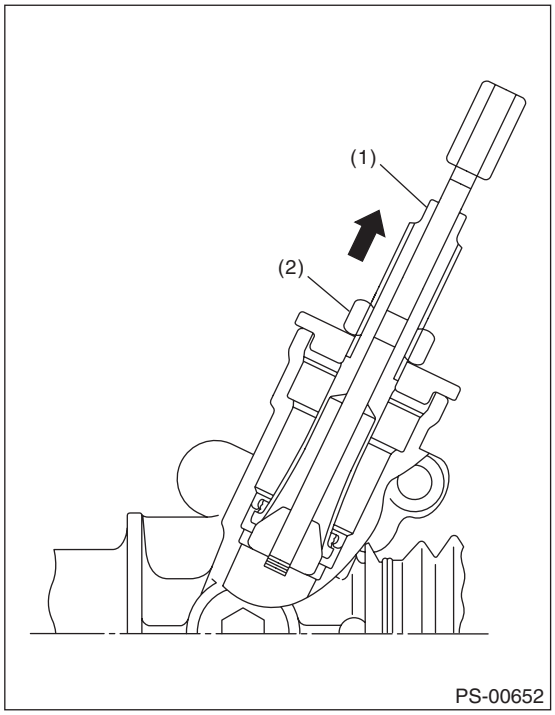
21) By fixing the 2-surface widths, press-in the rod while rotating it and catch the oil seal.



(1) Rod
(2) 2-surface widths

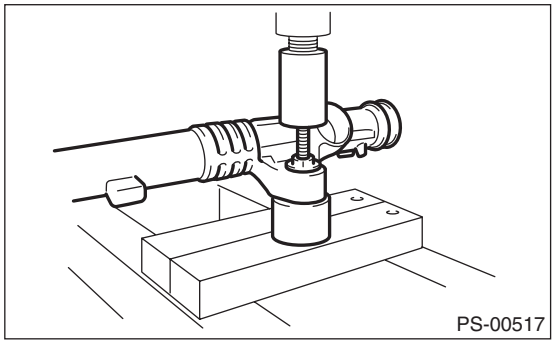
22) While fixing the 2-surface widths, pull out the oil seal by rotating nut.

CAUTION:
Take care not to scratch the gearbox inner surface.



(1) 2-surface widths
(2) Nut

23) Using a press, remove the bushing of gearbox installation portion.



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NOT FOR RESALE

D: ASSEMBLY

1. NON-TURBO MODEL

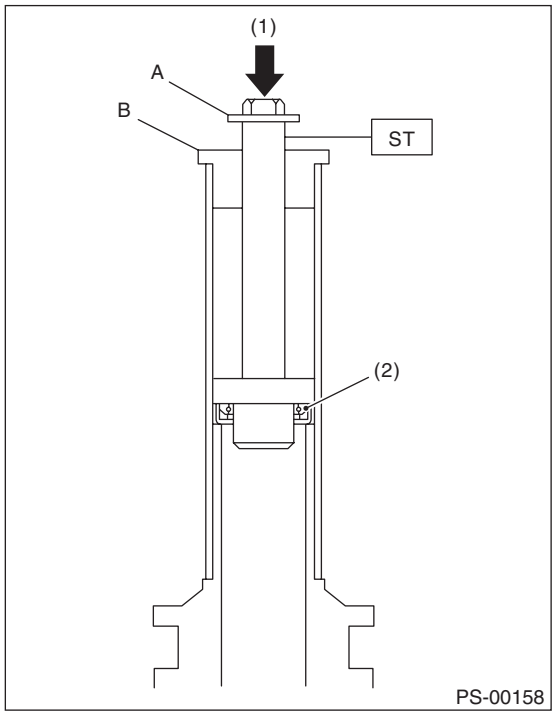
RACK HOUSING ASSEMBLY

CAUTION:
Use only the genuine grease for the gearbox.

Specified grease for gearbox
VALIANT GREASE M-2 (Part No. 003608001)

1) Apply power steering fluid to a new oil seal.
2) Verify the direction of oil seal in the figure. Push the oil seal using a press until portion A of ST contacts face of B.
ST 34099FA110 INSTALLER

CAUTION:
Be careful not to damage or scratch the cylinder inner wall.

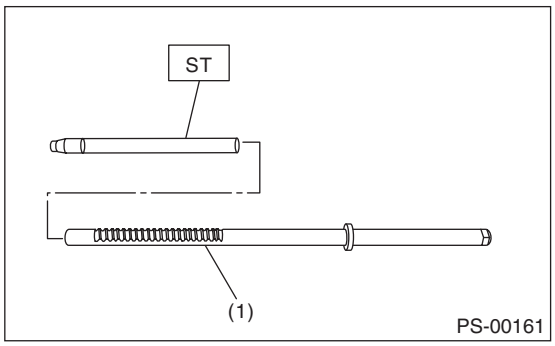


(1) Press
(2) Oil seal

3) Fix the rack housing in a vise using ST.
ST 926200000 STAND

NOTE:
• When fixing the rack housing in a vise, be sure to use this special tool. Do not fix the rack housing in a vise using pads such as aluminum plates, etc.
• When using the old rack housing, be sure to clean and remove rust before assembling. Check pinion housing bushing carefully.

4) Fit the ST over toothed portion of rack assembly, and check for binding or unsmooth insertion. If any deformation is noted on flats at the end of rack, shape by using file, and wash with cleaning fluid.
ST 926390001 COVER & REMOVER ASSY



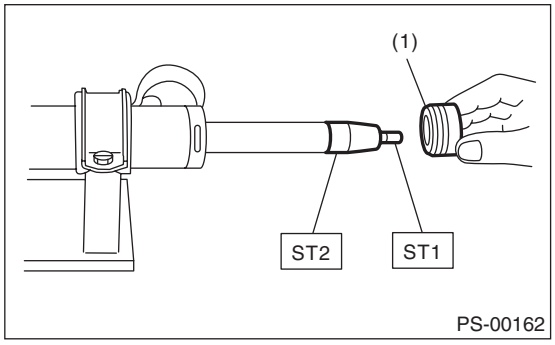
(1) Rack ASSY

5) Apply genuine grease to the teeth of thoroughly washed rack assembly, and then fit the ST over the toothed portion.

CAUTION:
• Be careful not to block the air passage with grease. Remove excessive grease.
• After fitting cover, check the air passage hole for clogging. If clogged, open by removing grease from the hole.

6) Apply a coat of specified power steering fluid to the surfaces of ST and the rack piston.
7) Insert the rack assembly into rack housing from cylinder side, and then remove the ST after it has passed completely through oil seal.
8) Fit the ST1 and ST2 over the end of rack, and then install a new rack bushing.
ST1 926400000 GUIDE
ST2 927660000 GUIDE

CAUTION:
• If burrs or nicks are found on this guide and rack shaft portion, remove by filing.
• Dip the rack bushing in specified power steering fluid before installing, and pay attention not to damage O-ring and oil seal.



(1) Rack bushing ASSY

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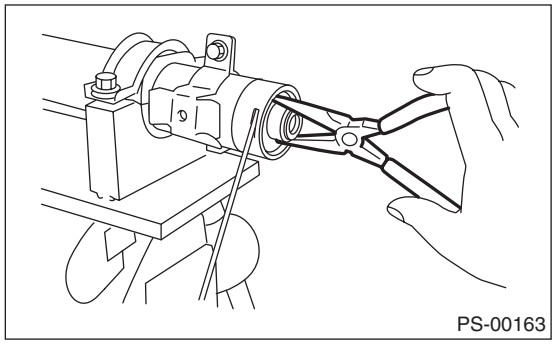
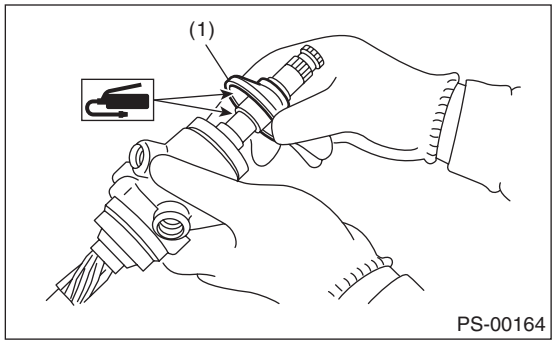
9) Insert the rack stopper into the cylinder tube until internal groove (on cylinder side) is aligned with external groove (on rack stopper). Turn the rack stopper with ST so that the rack stopper hole is seen through cylinder slits.
10) Insert the rack stopper into the rack housing, and then wrap a new circlip using a sharp pointed pliers to secure the rack stopper in position.

CAUTION:
Be careful not to scratch the rack while winding circlip.

NOTE:
Rotate the wrench another 90 — 180° after end of circlip has been wrapped in.


PS-00163

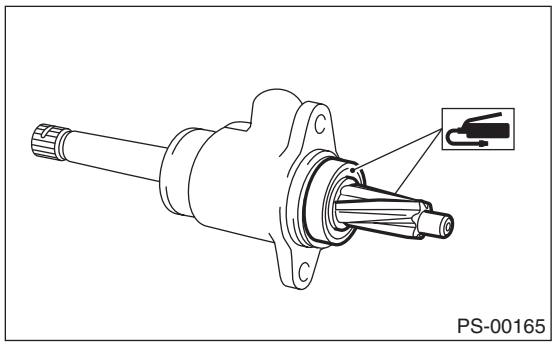
11) Apply genuine grease to the dust cover and install to valve assembly.



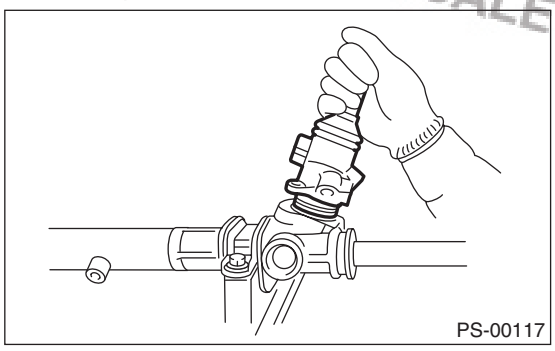
PS-00164

(1) Dust cover

12) Apply the genuine grease to the pinion gear and bearing of valve assembly.


PS-00165

13) Install a new gasket on valve assembly. Insert the valve assembly into place while facing the rack teeth toward pinion.

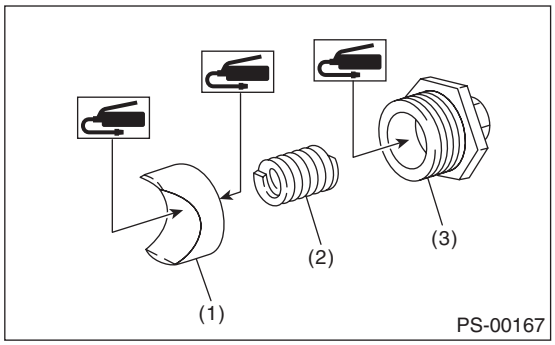

PS-00117

14) Tighten the bolts alternately to secure the valve assembly.

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

CAUTION:
Be sure to alternately tighten the bolts.
15) Temporarily install the tie-rod to rack end, and then operate the rack from lock to lock for two or three times to make it fit in. Remove any grease blocking the air vent hole.

CAUTION:
Operating the rack from lock to lock without installing tierods may damage the oil seal. Always install the LEFT AND RIGHT tierods.
16) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert the sleeve into steering body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw. Then install on the steering body.



PS-00167

(1) Sleeve
(2) Spring
(3) Adjusting screw

17) Tighten the adjusting screw to the specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

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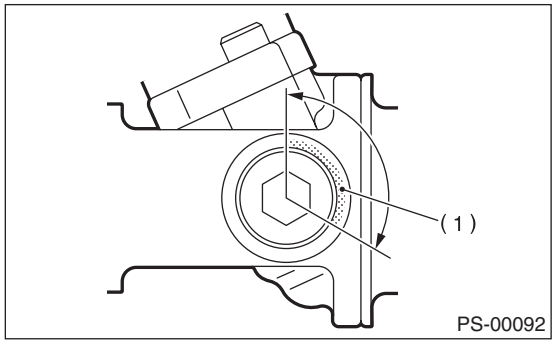
18) Tighten to the specified torque, then loosen it by 25°.
19) Remove the tie-rod.
20) Check that the play, or looseness, is at the standard value. <Ref. to PS-48, SERVICE LIMIT, INSPECTION, Steering Gearbox.>
21) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket:
THREE BOND 1141 (Part No. 004403006)



(1) Apply liquid gasket to at least 1/3 of entire perimeter.

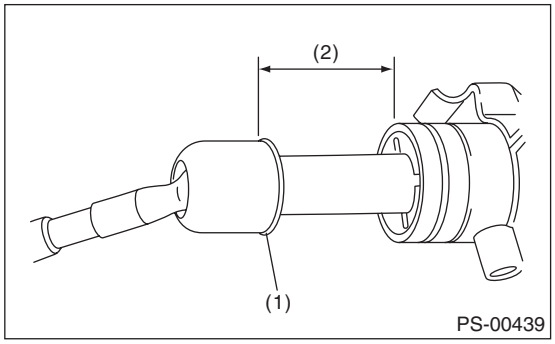
22) Tighten the adjusting screw to the specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
23) Tighten to the specified torque, then loosen it by 25°.
24) Install the lock nut. While holding the adjusting screw with a wrench, tighten the lock nut using ST.
ST 926230000 SPANNER

Tightening torque (lock nut):
40 N·m (4.1 kgf-m, 29.5 ft-lb)

NOTE:
Hold the adjusting screw with a wrench to prevent it from turning while tightening the lock nut.
25) Extend the rack approx. 40 mm (1.57 in) from steering body.
26) Install the tie-rod and new lock washer into rack.

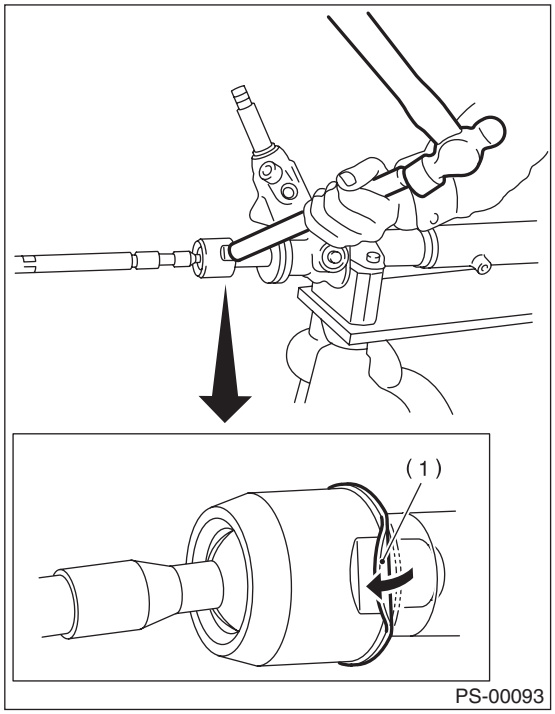
Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)



(1) Lock washer
(2) Approx. 40 mm (1.57 in)

27) Bend the lock washer and crimp it.

CAUTION:
Be careful not to scratch the rack when crimping lock washer.



(1) Lock washer

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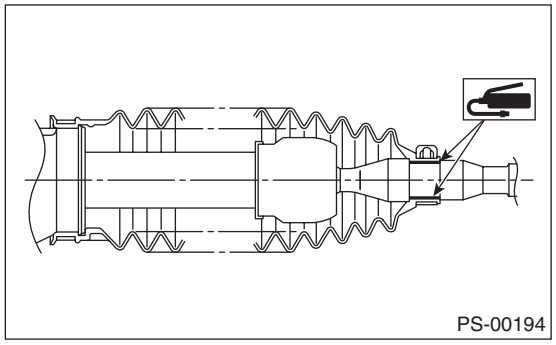
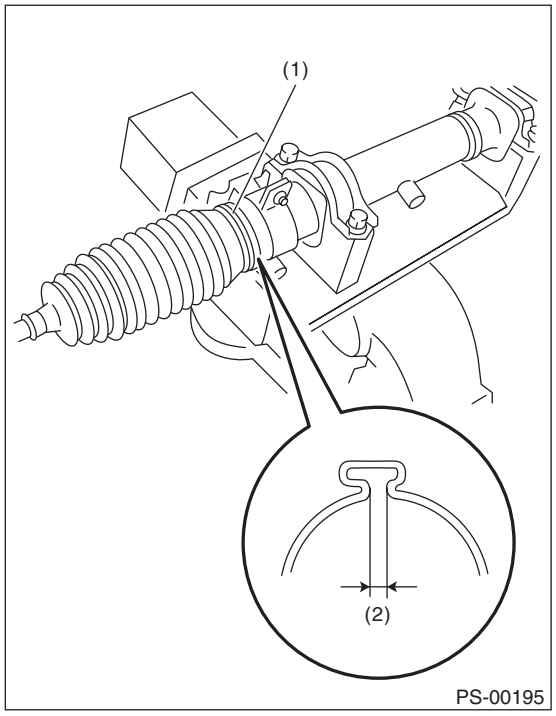
28) Apply a coat of grease to the tie-rod groove, and then install the boot to the housing.

NOTE:
Make sure that the boot is installed without unusual inflation or deflation.


PS-00194

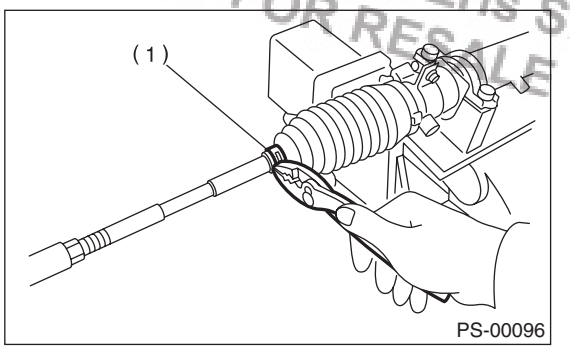
29) Install a new boot band. Using band clamp pliers, crimp it so that the clearance of crimping portion becomes 2 mm (0.079 in) or less.



PS-00195

(1) Boot band
(2) 2 mm (0.079 in) or less

30) Fix the boot end with small clip.

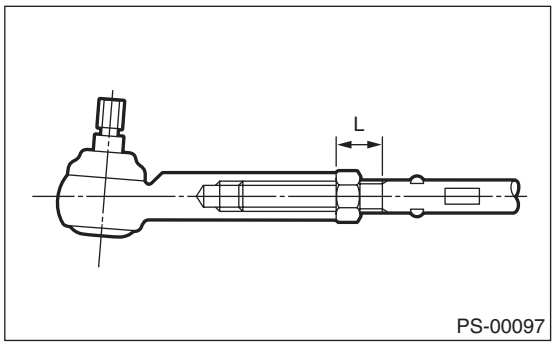


PS-00096

(1) Clip

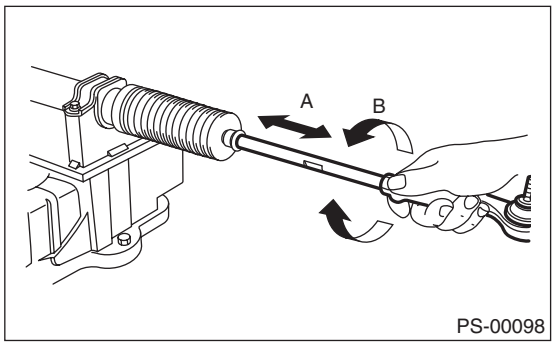
31) After installing, check that the boot end is installed to the groove of the tie-rod.
32) If the tie-rod end has been removed, screw in lock nut and tie-rod end to the screwed portion of tie-rod, and tighten the lock nut temporarily in a position as shown in the figure.

Installed tie-rod length L:
15 mm (0.59 in)



PS-00097

33) Inspect the gearbox as follows:
"A" Holding the tie-rod end, repeat movement from lock to lock two or three times as quickly as possible.
"B" Holding the tie-rod end, turn it slowly at a radius one or two times as large as possible.
Finally, make sure that the boot is installed in the specified position without inflating.



PS-00098

34) Remove the gearbox from ST.
ST 926200000 STAND

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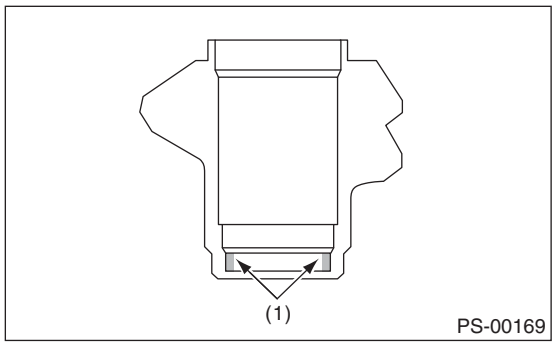
35) Install the four pipes on gearbox.
(1) Connect the pipes A and B to the four pipe joints of gearbox.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)
(2) Connect the pipes E and F to the gearbox.

Tightening torque:
Pipe E: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
Pipe F: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

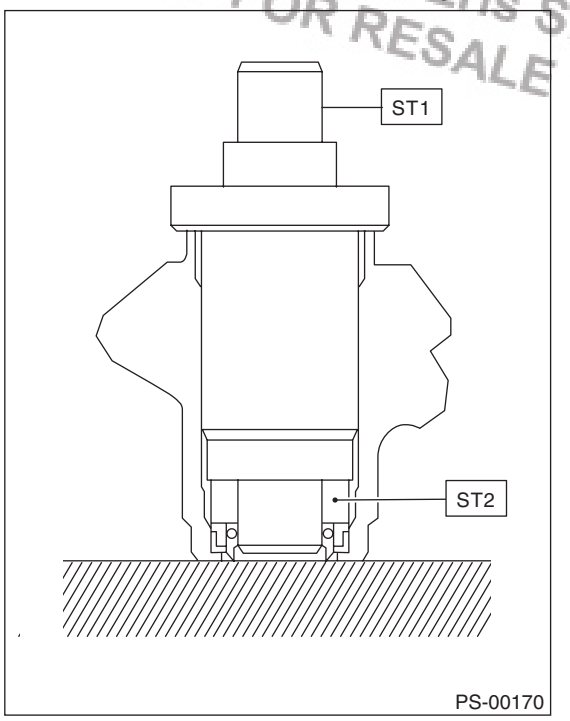
Control valve assembly

Specified steering grease:
VALIANT GREASE M-2 (Part No. 003608001)
1) Clean all parts and tools before reassembling.
2) Apply a coat of specified power steering fluid to the inner wall of valve housing.

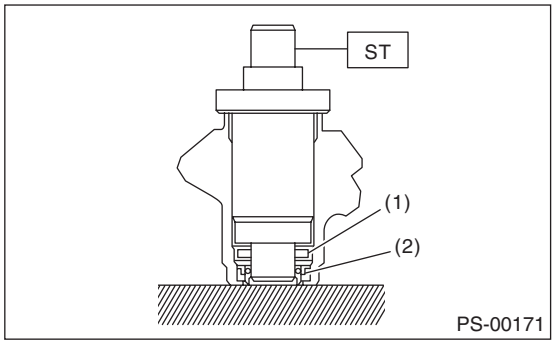


(1) Apply fluid.

3) Attach the ST2 to ST1.
ST1 34099FA120 INSTALLER & REMOVER SEAL
ST2 34099FA130 INSTALLER SEAL
4) To avoid scratching the oil seal, apply a coat of grease to the contact surface of installer and oil seal.
5) Verify the direction of oil seal. Install the oil seal to installer and position it to valve housing.
6) Press the oil seal into position using press.



7) Install the bearing to ST and position it to housing. Using the ST and a press, install the special bearing in valve housing.
ST 34099FA120 INSTALLER & REMOVER SEAL



(1) Special bearing
(2) Oil seal

8) Put vinyl tape around pinion shaft spline to protect oil seal from damage.
9) Attach the pinion and valve assembly into the valve housing.
10) Secure the valve assembly to ST1 and ST2.
ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
11) Apply a coat of specified power steering fluid to the oil seal and ST3.

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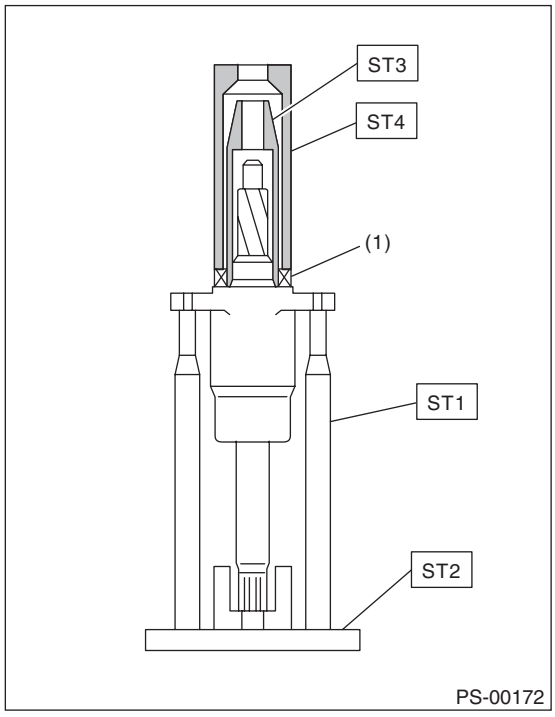
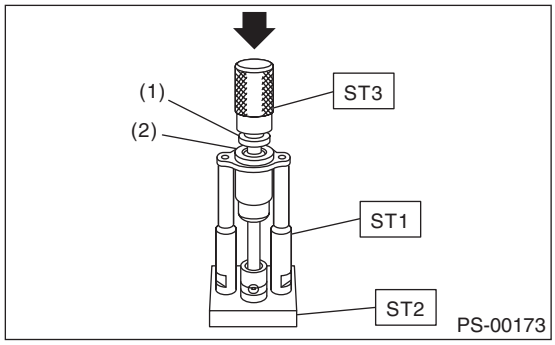
12) Attach the ST3 to the pinion, and then insert the oil seal.
Press the oil seal using a press until ST4 contacts face end of valve housing.
ST3 926360000 INSTALLER A
ST4 927620000 INSTALLER B



(1) Oil seal

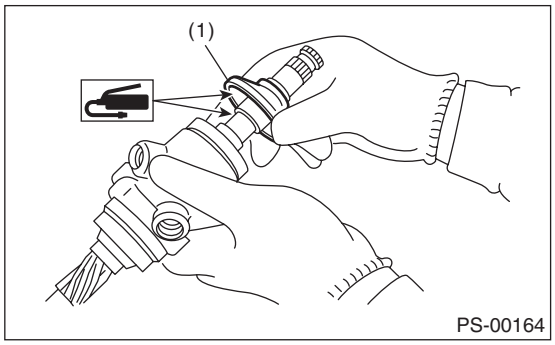
13) Remove the ST3 and install the back-up washer.
14) Install the ball bearing using ST3.
ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
ST3 927640000 INSTALLER B



(1) Ball bearing
(2) Back-up washer

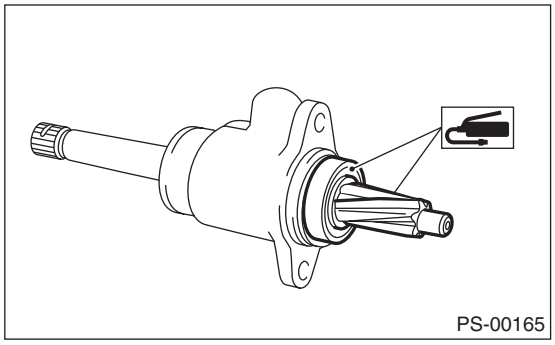
NOTE:
Be careful not to tilt the ball bearing during installation.

15) Install the snap ring using snap ring pliers.
NOTE:
Rotate the snap ring to check for proper installation.
16) Apply the specified grease to dust cover.
17) Install the dust cover on valve assembly.

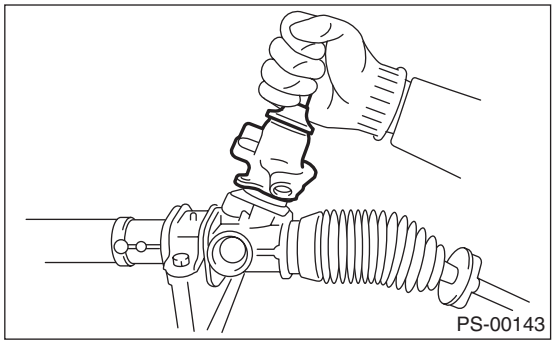


(1) Dust cover

18) Apply the genuine grease to the pinion gear and bearing of valve assembly.



19) Install a new gasket on valve assembly. Insert the valve assembly into place while facing the rack teeth toward pinion.



20) Tighten the bolts alternately to secure the valve assembly.

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

CAUTION:
Be sure to alternately tighten the bolts.

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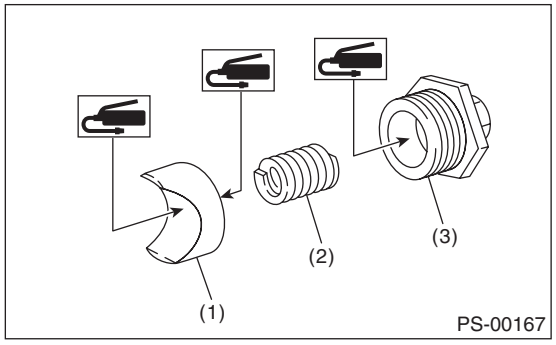
21) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert the sleeve into steering body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw. Then install on the steering body.



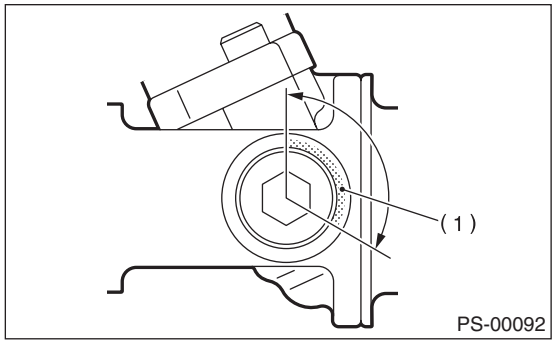
(1) Sleeve
(2) Spring
(3) Adjusting screw

22) Tighten the adjusting screw to the specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

23) Tighten to the specified torque, then loosen it by 25°.
24) Check that the play, or looseness, is within the standard value. <Ref. to PS-48, SERVICE LIMIT, INSPECTION, Steering Gearbox.>
25) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket
THREE BOND 1141 (Part No. 004403006)



(1) Apply liquid gasket to at least 1/3 of entire perimeter.

26) Tighten the adjusting screw.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

27) Tighten to the specified torque, then loosen it by 25°.
28) Install the lock nut. While holding the adjusting screw with a wrench, tighten the lock nut using ST.
ST 926230000 SPANNER

Tightening torque (lock nut):
40 N·m (4.1 kgf-m, 29.5 ft-lb)

NOTE:
Hold the adjusting screw with a wrench to prevent it from turning while tightening the lock nut.
29) Remove the gearbox from ST.
30) Install the four pipes on gearbox.
(1) Connect the pipes A and B to gearbox.

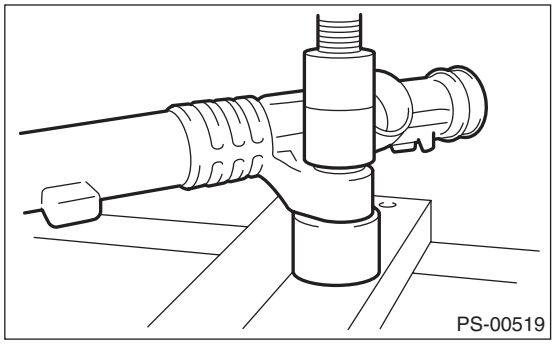
Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

(2) Connect the pipes E and F to the gearbox.

Tightening torque:
Pipe E: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
Pipe F: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

2. TURBO MODEL AND STI MODEL

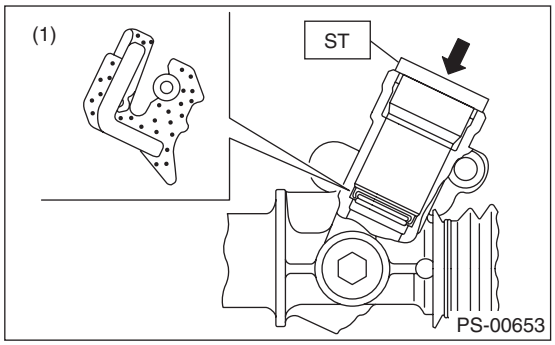
1) Using a press, install the bushing to gearbox installation portion.



2) Apply a coat of grease to the inside and outside of the new oil seal.

Steering grease:
VALIANT GREASE M-2 (Part No. 003608001)

3) Verify the direction of the oil seal and installation position. Using the ST and a press, press-fit the oil seal into the gearbox.
ST 34199AE130 GEARBOX OIL SEAL INSTALLER



(1) Oil seal

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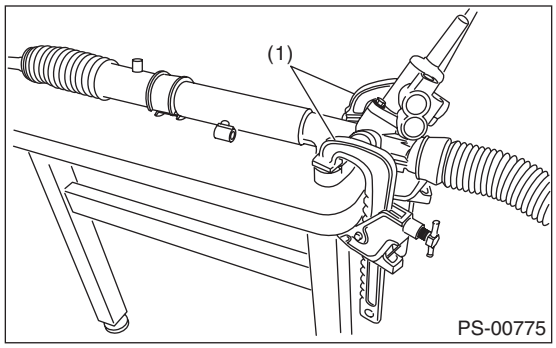
4) Install the steering body using the C clamp as shown in the figure. Apply a coat of grease to needle bearing.

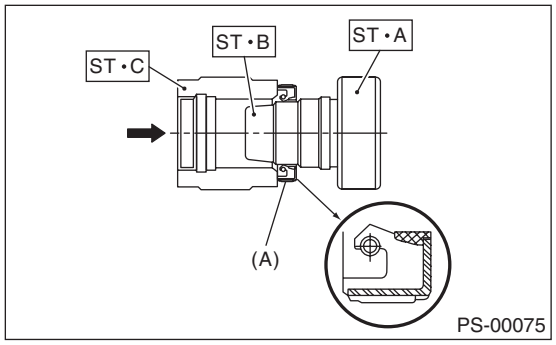
CAUTION:
Make sure the needle bearing is free from defects. If it is faulty, replace the steering body with a new part.



(1) C clamp

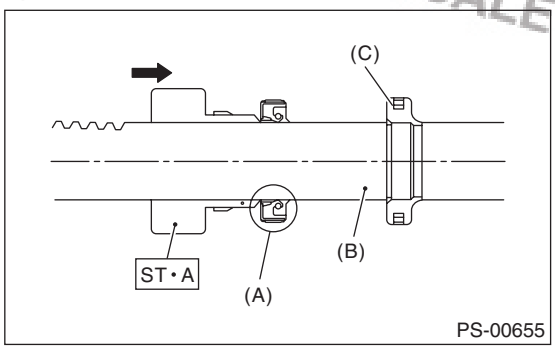
5) Using the ST B and ST C, attach the oil seal to ST A.
ST 34199FE040 INSTALLER A, B, C

NOTE:
Face the oil seal in the direction as shown in the figure.



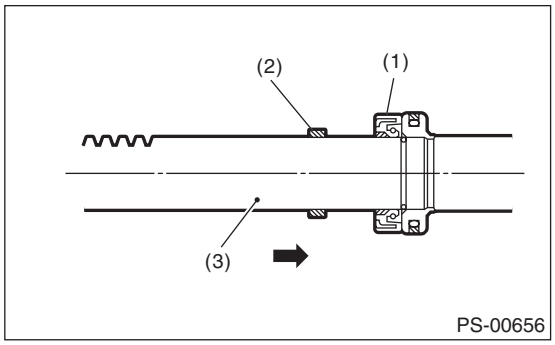
(A) Oil seal

6) Insert the ST A with oil seal assembled from the gear side of rack. Remove the oil seal from ST A near piston, and then remove the ST A from rack.



(A) Oil seal
(B) Rack
(C) Piston

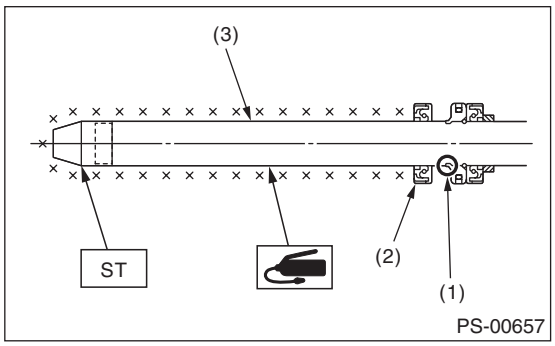
7) Install the back-up washer from the gear side of rack.



(1) Oil seal
(2) Back-up washer
(3) Rack

8) Equally apply a thin coat of grease to the rack, then install the oil seal.

CAUTION:
Be careful not to scratch the oil seal lips with the inner ring section of piston.



(1) Rack piston inner ring
(2) Outer side oil seal
(3) Rack

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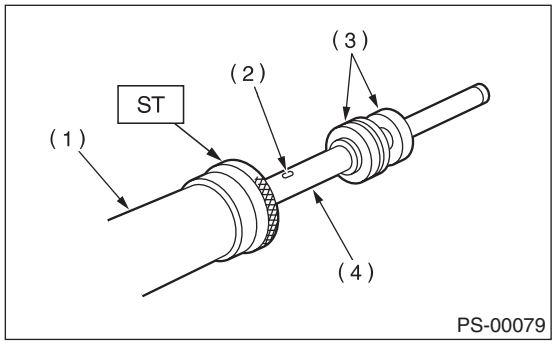
9) Apply a coat of grease to the grooves in rack, sliding surface of sleeve and sealing surface of piston. Attach the ST on the end of steering body cylinder. Then insert the rack into steering body from cylinder side.
ST 34199FE050 GUIDE

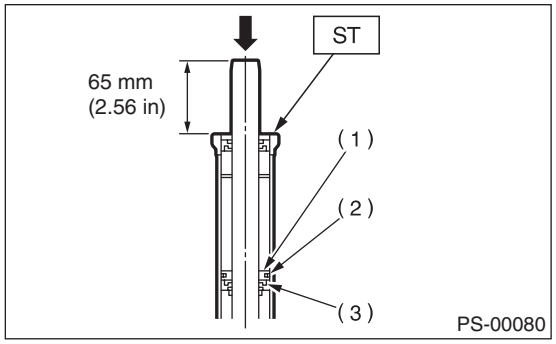
CAUTION:
Do not allow grease to block the air vent hole on rack.



(1) Cylinder side of steering body
(2) Air vent hole
(3) Oil seal
(4) Rack

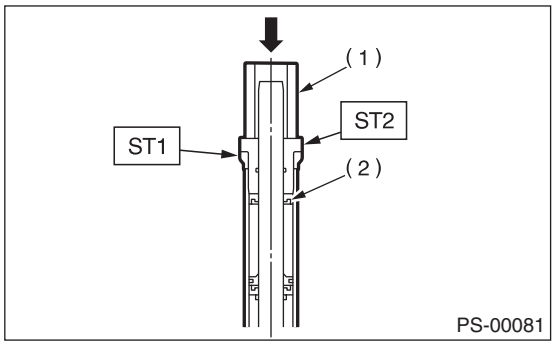
10) Slowly push the inner side oil seal using the press until the distance from the ST to the end of the rack is 65 mm (2.56 in).
ST 34199FE050 GUIDE

CAUTION:
Make sure that there are no scratches on the inner wall of the ST to avoid the possible damage to the oil seal.



(1) Rack piston
(2) Inner side oil seal
(3) Back-up ring

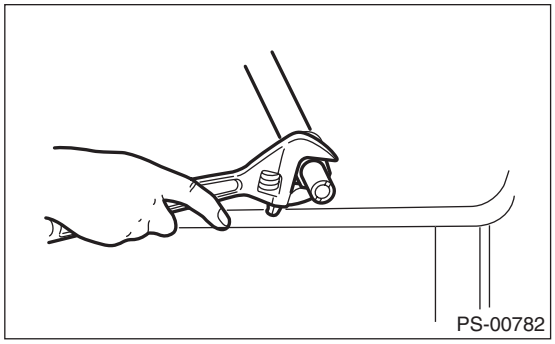
11) Make the ST2 and pipe pass through rack, and then press-in the ST1, ST 2 and the outer side oil seal using a press.
ST1 34199FE050 GUIDE
ST2 34199FE060 INSTALLER



(1) Pipe
(2) Outer side oil seal

12) Install a new holder to the cylinder side of steering body.

Tightening torque:
90 N·m (9.0 kgf-m, 65.1 ft-lb)



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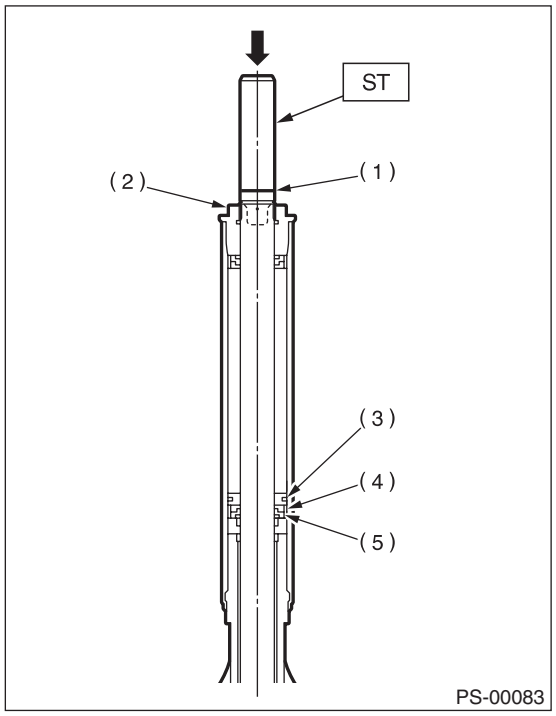
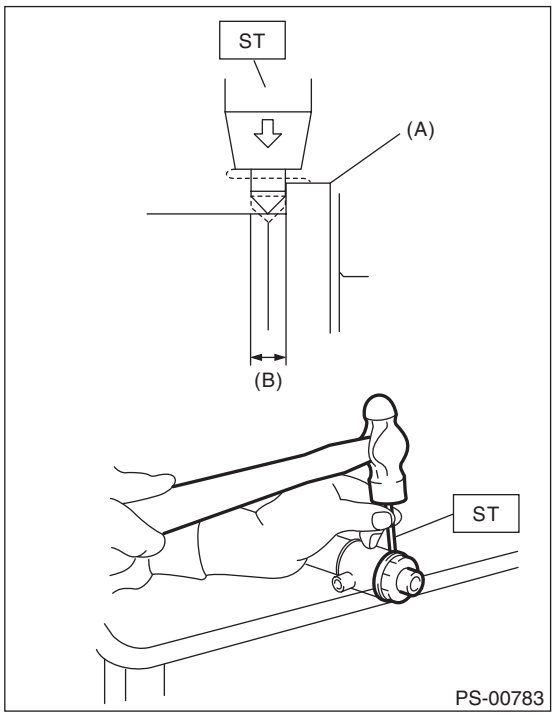
13) Attach the ST on rack cylinder. Using the press, press in the ST until the groove on the ST aligns with the edge of the holder.
ST 34199FE000 INSTALLER & REMOVER



(1) Groove
(2) Holder
(3) Rack piston
(4) Oil seal
(5) Back-up ring

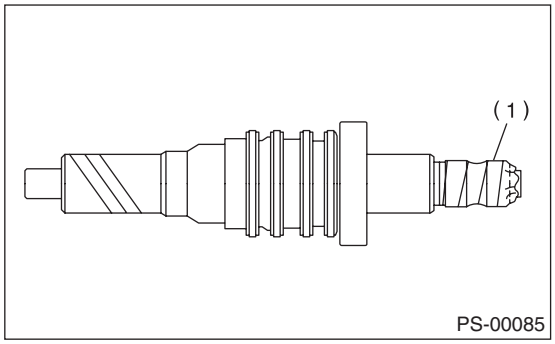
14) Using the ST, crimp the steering body at one point less than 3 mm (0.12 in) from holder.

CAUTION:
Be careful not to deform the holder.
ST 34099FA060 PUNCH HOLDER



(A) Holder
(B) 3 mm (0.1 in)

15) Roll a vinyl tape on the serration portion of valve assembly, and then apply grease on the tape surface.



(1) Vinyl tape

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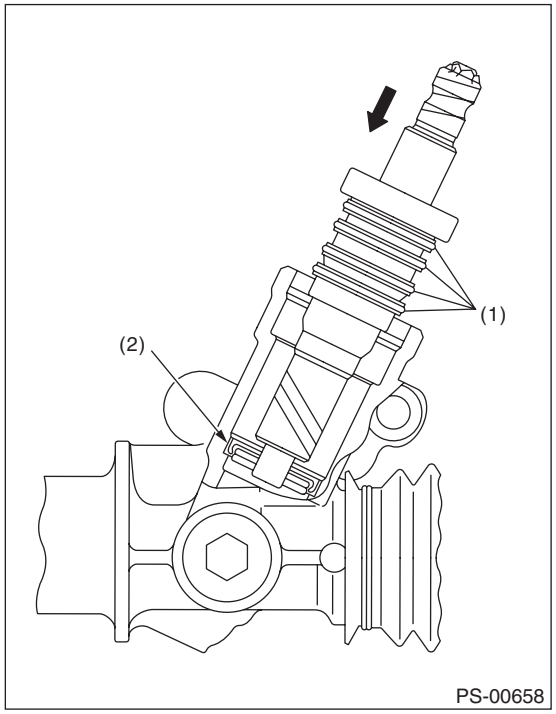
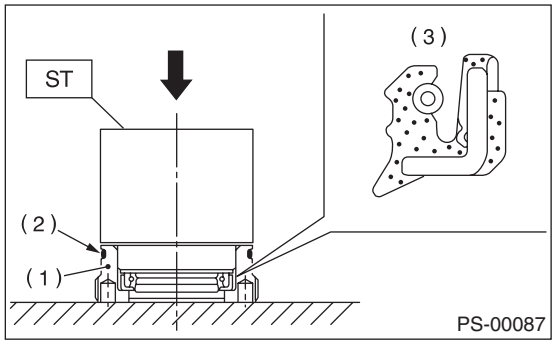
16) Apply a coat of grease on the gear teeth of the valve assembly, and then attach the valve assembly taking care not to scratch oil seal and seal ring.



(1) Seal ring
(2) Oil seal

17) Apply grease on the oil seal circumference, and then press it into the plug using ST and a press. Replace the O-rings of plug circumference with new O-rings.
ST 34199AE110 OIL SEAL PLUG INSTALLER

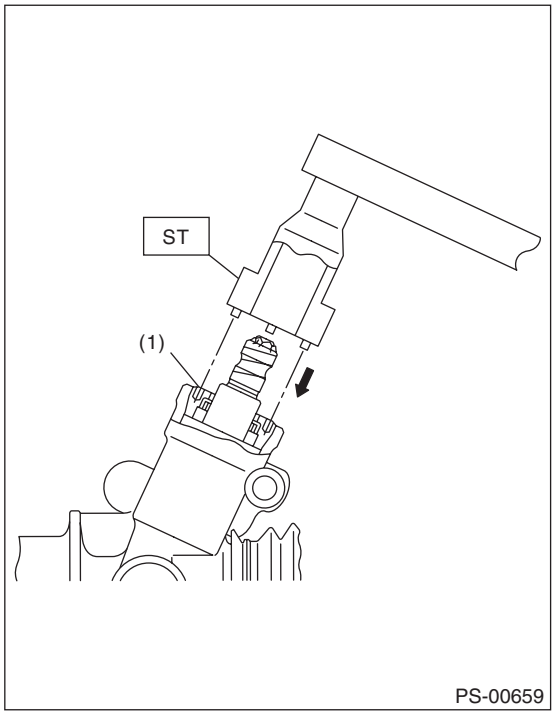
CAUTION:
Install the oil seal paying attention to correct direction.



(1) Plug
(2) O-ring
(3) Oil seal

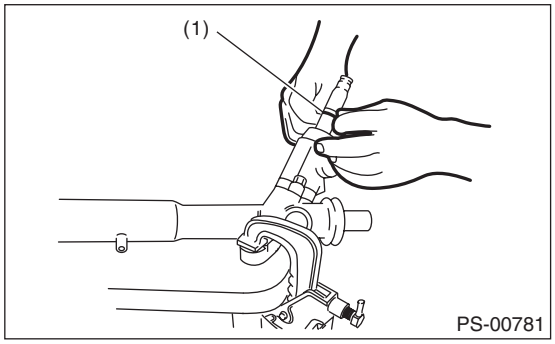
18) Attach the plug using ST.
ST 34199AE090 PLUG WRENCH

Tightening torque:
64 N·m (6.5 kgf-m, 47.0 ft-lb)



(1) Plug

19) Install the dust cover. Remove the vinyl tape.



(1) Dust cover

20) Temporarily install the tie-rod to rack end, and then operate the rack from lock to lock for two or three times to make it fit in. Remove any grease blocking the air vent hole.

CAUTION:
If operating the rack from lock to lock without installing tie-rods, it may damage the oil seal. Always install the tie-rods LH and RH.

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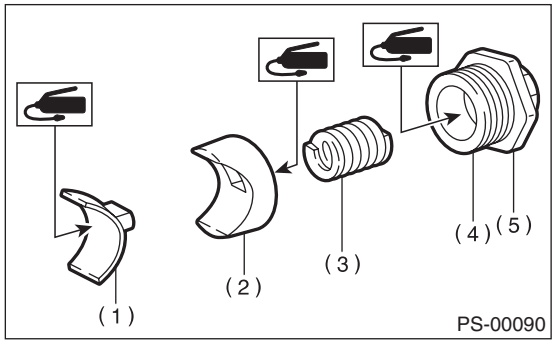
21) Apply a coat of grease to the sliding surface of seat pad, sleeve and seating surface of spring, and then insert sleeve into spring body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw. Then install on the steering body.



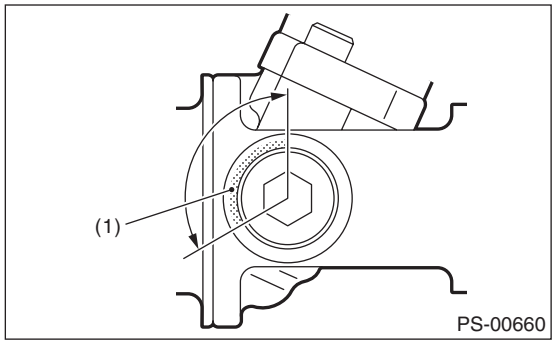
(1) Sheet pad
(2) Sleeve
(3) Spring
(4) Adjusting screw
(5) Lock nut

22) Tighten the adjusting screw to the specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

23) Tighten to the specified torque, then loosen it by 37°.
24) Remove the tie-rod.
25) Check that the play, or looseness, is within the standard value. <Ref. to PS-48, SERVICE LIMIT, INSPECTION, Steering Gearbox.>
26) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket
THREE BOND 1141 (Part No. 004403006)



(1) Apply liquid gasket to at least 1/3 of entire perimeter.

27) Tighten the adjusting screw.

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

28) Tighten to the specified torque, then loosen it.
29) Tighten the adjusting screw.

Tightening torque:
4.8 N·m (0.49 kgf-m, 3.5 ft-lb)

30) Tighten to the specified torque, then loosen it.
31) Tighten the adjusting screw.

Tightening torque:
4.8 N·m (0.49 kgf-m, 3.5 ft-lb)

32) Tighten to the specified torque, then loosen it by 37°.
33) Install the lock nut. While holding the adjusting screw with a wrench, tighten the lock nut using ST.
ST 926230000 SPANNER

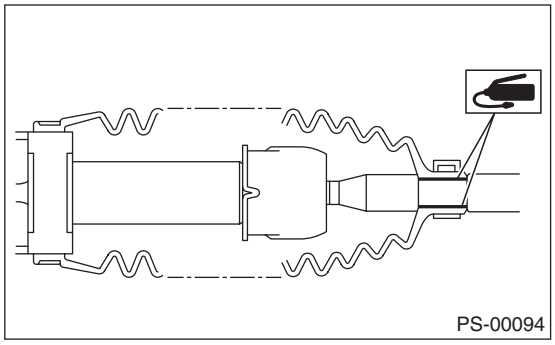
Tightening torque (lock nut):
40 N·m (4.1 kgf-m, 29.5 ft-lb)

NOTE:
Hold the adjusting screw with a wrench to prevent it from turning while tightening the lock nut.
34) Install the tie-rod into rack.

Tightening torque:
90 N·m (9.0 kgf-m, 65.1 ft-lb)

NOTE:
Check the mating face of rack and tie-rod for foreign matter such as dust etc.
35) Apply a coat of grease to the tie-rod groove, and then install the boot to the housing.

NOTE:
Make sure that the boot is installed without unusual inflation or deflation.



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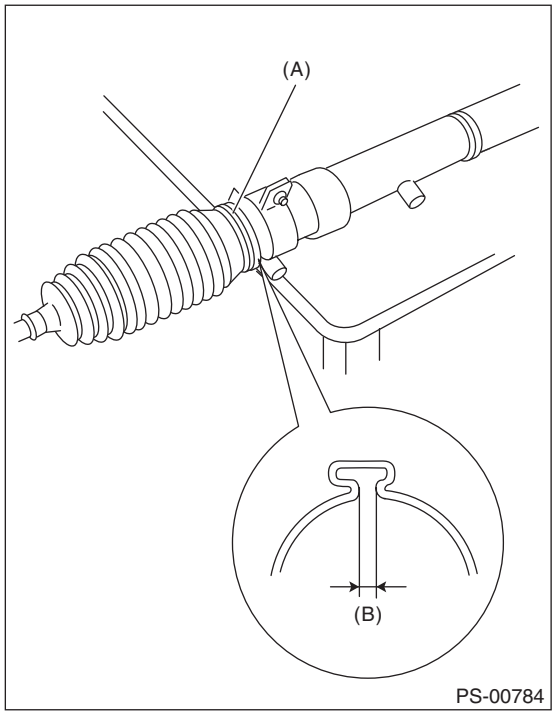
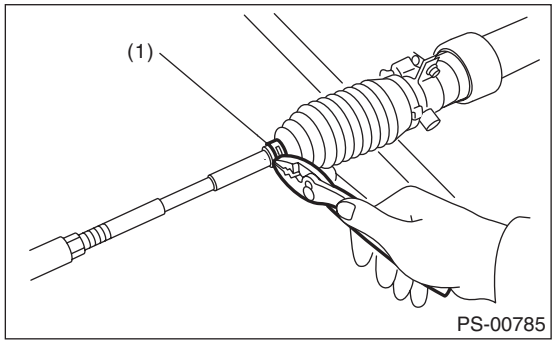
36) Crimp the boot so that the clearance of the boot band crimp portion becomes 2 mm (0.08 in) or less.

NOTE:
Use a new band.



(A) Boot band
(B) 2 mm (0.08 in) or less

37) Fix the boot end with small clip.

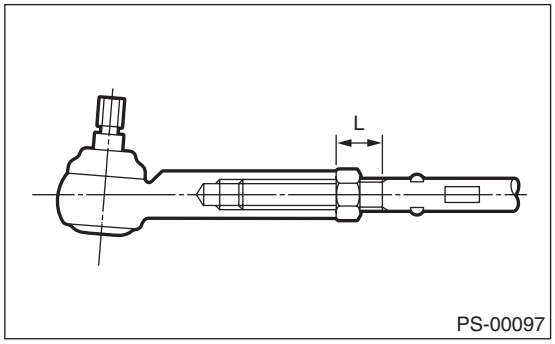


(1) Clip

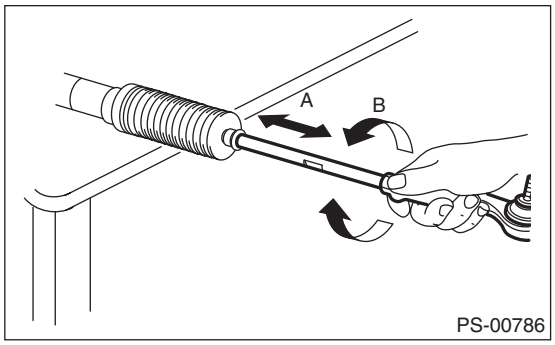
38) After installing, check that the boot end is installed to the groove of the tie-rod.

39) If the tie-rod end has been removed, screw in lock nut and tie-rod end to the screwed portion of tie-rod, and tighten the lock nut temporarily in a position as shown in the figure.

Installed tie-rod length L:
Sedan:
25 mm (0.98 in)
Wagon:
15 mm (0.59 in)



40) Inspect the gearbox as follows:
"A" Holding the tie-rod end, repeat movement from lock to lock two or three times as quickly as possible.
"B" Holding the tie-rod end, turn it slowly at a radius one or two times as large as possible.
Finally, make sure that the boot is installed in the specified position without inflating.



41) Remove the gearbox from ST.
ST 926200000 STAND
42) Install the four pipes on gearbox.
(1) Connect the pipes A and B to gearbox.

Tightening torque:
Housing side:
20 N·m (2.0 kgf-m, 14.5 ft-lb)
Cylinder side:
24 N·m (2.4 kgf-m, 17.4 ft-lb)
(2) Connect the pipes G and H to the gearbox.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

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E: INSPECTION

1. BASIC INSPECTION

1) Clean all the disassembled parts, and check for wear, damage or any other faults, then repair or replace as necessary.
2) When disassembling, check the inside of gearbox for water. If any water is found, carefully check the boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bent input shaft (2) Damage on serration	If the bend or damage is excessive, replace the entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, the lip is worn out or damage is found, replace it with a new part.
3	Rack & pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the turning torque of the gearbox and sliding resistance of rack, check if the rack & pinion engage uniformly and smoothly with each other. (Refer to “Service limit”.) (2) Pull out the entire rack to allow viewing of the teeth, and check for damage. Even if abnormality is found in either (1) or (2), replace the entire gearbox.
4	Gearbox unit	(1) Bending of the rack shaft (2) Bending of the cylinder portion (3) Crack or damage on cast iron portion	Replace the gearbox with a new part.
		(4) Wear or damage on rack bushing	If the free play of rack shaft in radial direction is out of the specified range, replace the gearbox with new part. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If the free play of input shaft in radial and axial direction is out of the specified range, replace the gearbox with a new part. (Refer to “Service limit”.)
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration of dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipe	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

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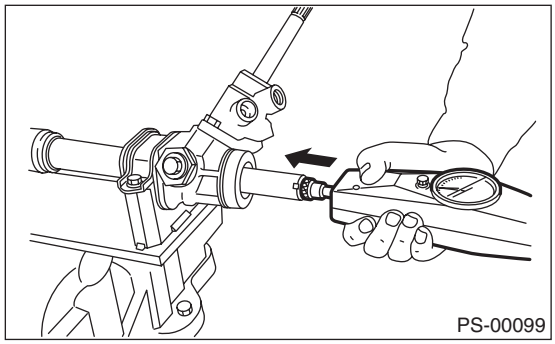
2. SERVICE LIMIT

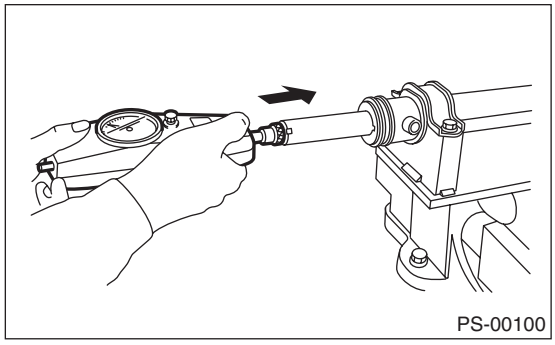
Make a measurements as follows. If it exceeds the specified service limits, adjust or replace.

NOTE:
When making a measurement, vise the gearbox using ST. Never vise the gearbox by inserting aluminum plates etc. between vise and gearbox.
ST 926200000 STAND

Sliding resistance of rack shaft

Service limit
400 N (41 kgf, 90 lbf) or less


PS-00099

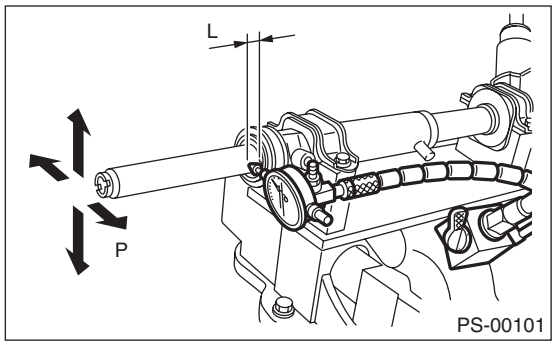

PS-00100

3. RACK SHAFT PLAY IN THE RADIAL DIRECTION

Right-turn steering:

Service limit
0.19 mm (0.0075 in) or less

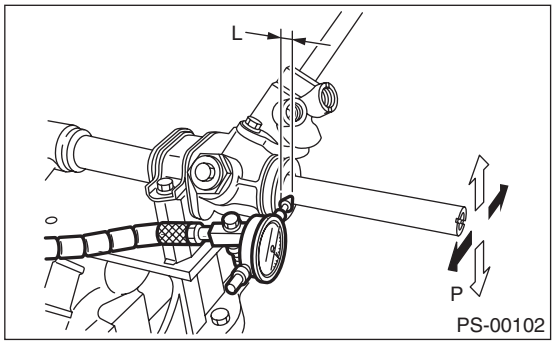
On condition
L: 5 mm (0.20 in)
P: 122.6 N (12.5 kgf, 27.6 lbf)



PS-00101

Left-turn steering:

Service limit
Direction ⇦ ⇨
0.3 mm (0.012 in) or less
Direction ⬅ ➡
0.15 mm (0.0059 in) or less
L: 5 mm (0.20 in)
P: 98 N (10 kgf, 22 lbf)



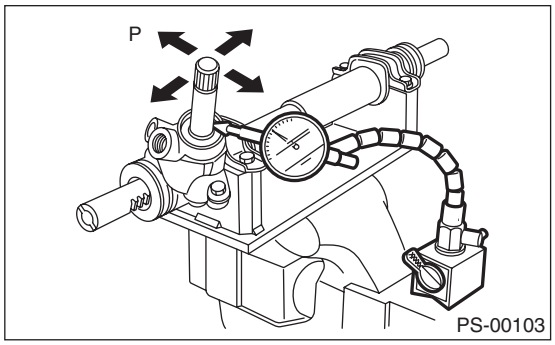
PS-00102

4. INPUT SHAFT PLAY

In radial direction:

Service limit
0.18 mm (0.0071 in) or less

On condition
P: 98 N (10 kgf, 22 lbf)

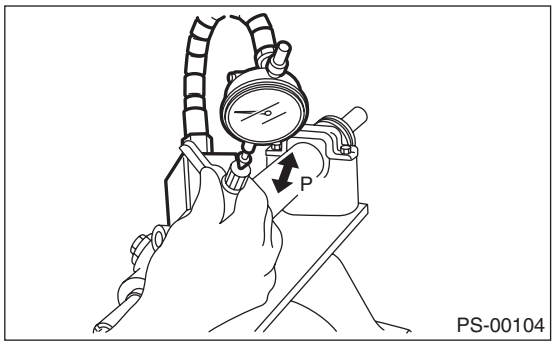


PS-00103

In axial direction:

Service limit
0.5 mm (0.020 in) or less

On condition
P: 20 — 49 N (2 — 5 kgf, 4 — 11 lbf)



PS-00104

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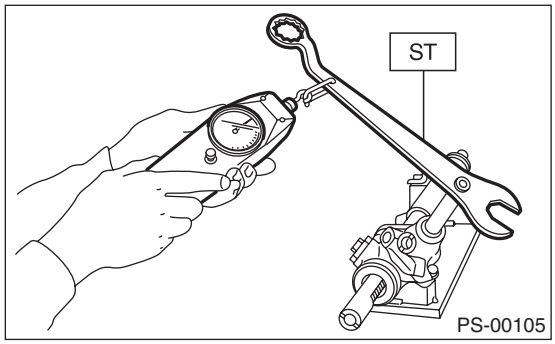
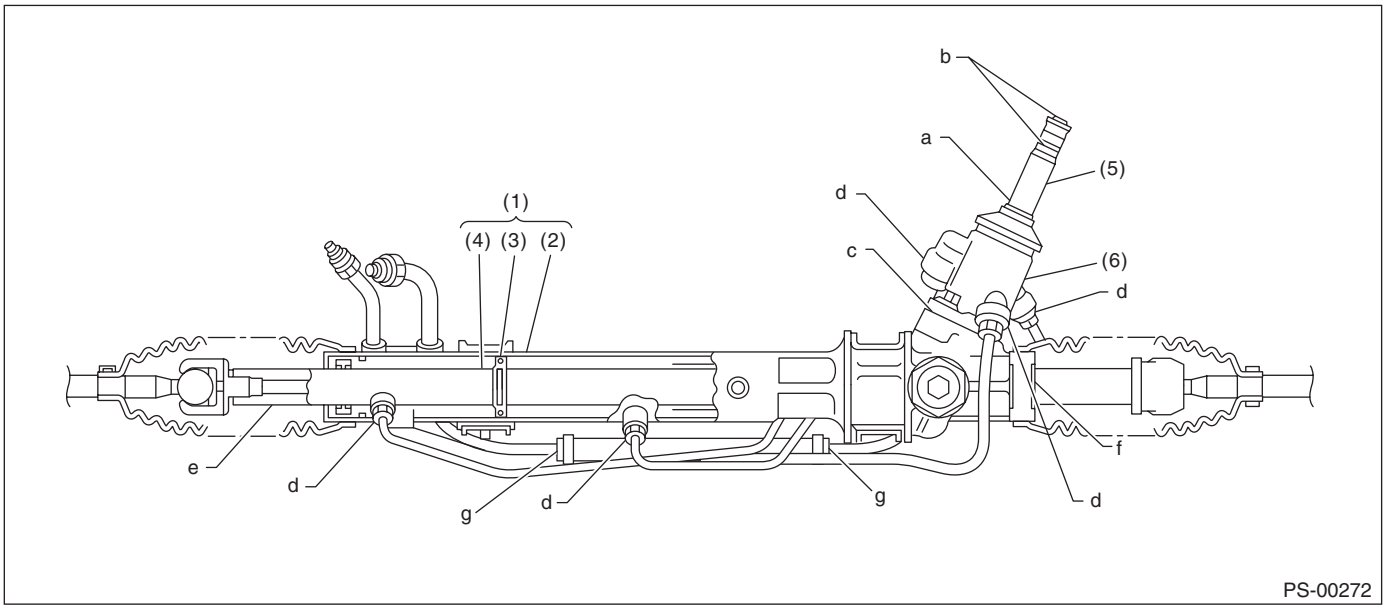
5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure the gearbox turning resistance.
ST 34099PA100 SPANNER

Service limit
Maximum allowable resistance
10.5 N (1.1 kgf, 2.4 lbf) or less
Difference between right and left turning resistance: 20% or less



6. OIL LEAKAGE



(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack axle
(5) Input shaft
(6) Valve housing

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1) Lift up the vehicle.
2) If a fluid leak is found, clean the fluid completely from the suspect area, and turn the steering wheel 30 to 40 times to the left and right from lock to lock, with the engine running, and check again for leaks immediately, and also after a few hours have passed.
3) Cause and solution for oil leakage from “a”
The oil seal is damaged. Replace the valve assembly with a new part.
4) Cause and solution for oil leakage from “b”
The torsion bar O-ring is damaged. Replace the valve assembly with a new part.
5) Cause and solution for oil leakage from “c”
The oil seal is damaged. Replace the valve assembly or oil seal with a new part.
6) Cause and solution for oil leakage from “d”.
The pipe is damaged. Replace the faulty pipe or O-ring.
7) Cause and solution for oil leakage from “g”.
The hose is damaged. Replace the hose with a new part.
8) If leak is other than a, b, c, d or g, or if oil is leaking from gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove fluid from surrounding portions. Then, turn the steering wheel from lock to lock 30 to 40 times with the engine running, then re-inspect the leaking area immediately after and several hours after this operation.
(1) Leakage from “e”
The cylinder seal is damaged. Replace the rack bushing with a new part.
(2) Leakage from “f”
There are two possible causes. Perform the following step first. Remove the pipe assembly B from the valve housing, and close the circuit using ST.

ST 926420000 PLUG

Turn the steering wheel from lock to lock 30 to 40 times with the engine running, then re-inspect the leaking area immediately after and several hours after this operation.
- If leakage from “f” is noted again:

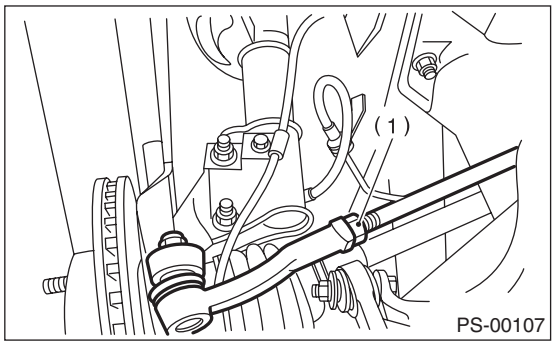
The oil seal of pinion and valve assembly is damaged. Replace the pinion & valve assembly with a new part. Or replace the oil seal and the parts that are damaged during disassembly with new parts.
- If oil stops leaking from “f”:

The oil seal of rack housing is damaged. Replace the oil seal and parts that are damaged during disassembly with new parts.

F: ADJUSTMENT

1) Adjust the front toe.
<Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

Standard of front toe:
IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)



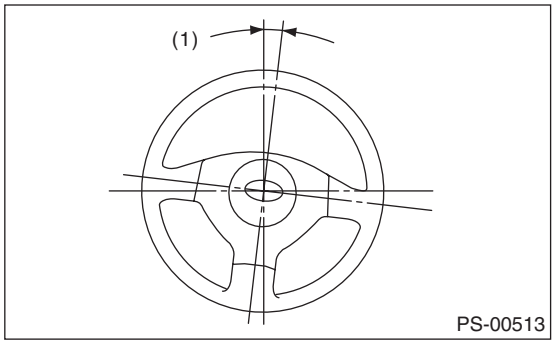
(1) Lock nut

2) Adjust the steering angle of the wheels.

Standard of steering angle:

Model	2.5i, OUTBACK, WRX	STI
Inner wheel	34.5°±1.5°	32.9°±1.5°
Outer wheel	30.3°±1.5°	28.5°±1.5°

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, or error is more than 5° on the periphery of the steering wheel, correctly re-install the steering wheel.



(1) 5° or less

4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in the opposite direction from each other by the same angle.

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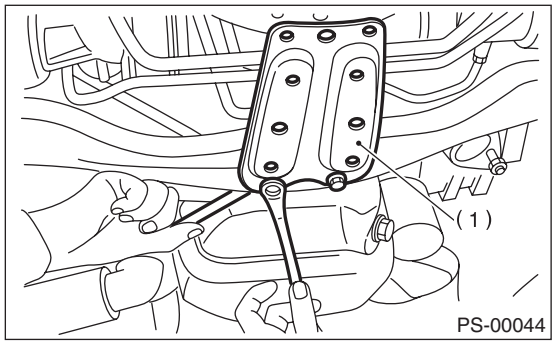
6. Pipe Assembly

A: REMOVAL

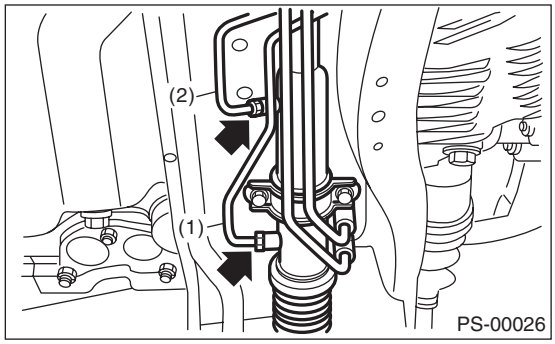
1) Disconnect the ground cable from the battery.
2) Lift up the vehicle and remove the jack-up plate.



(1) Jack-up plate

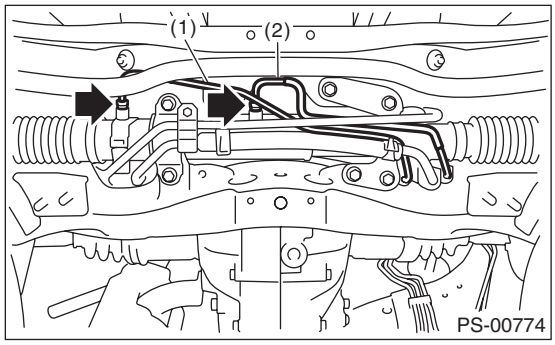
3) Remove the one pipe joint at the center of the gearbox, and connect the vinyl hose to the pipe and the joint. Discharge the fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipes.

- Non-turbo model



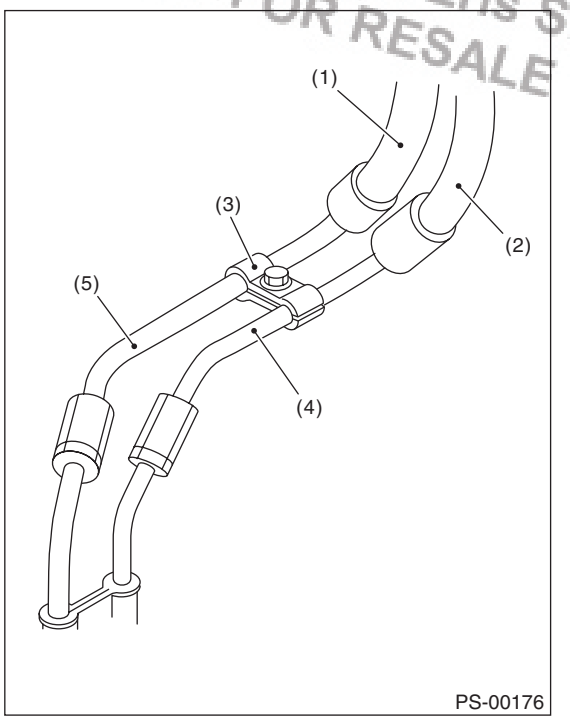
(1) Pipe A
(2) Pipe B

- Turbo model



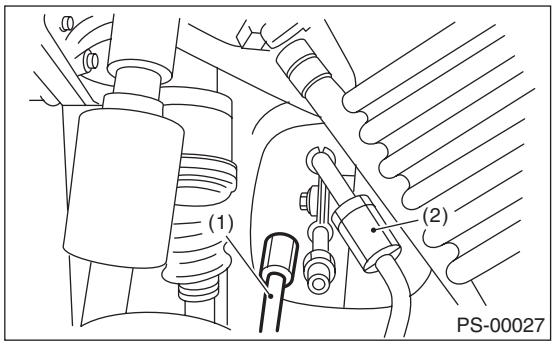
(1) Pipe A
(2) Pipe B

4) Remove the clamp E from pipe C and D.



(1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Pipe C
(5) Pipe D

5) Disconnect the pipe C and D from the gearbox.



(1) Pipe C
(2) Pipe D

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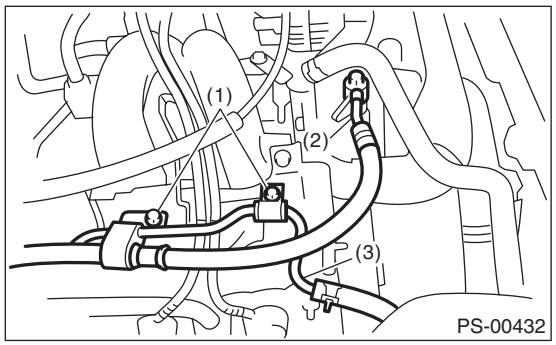
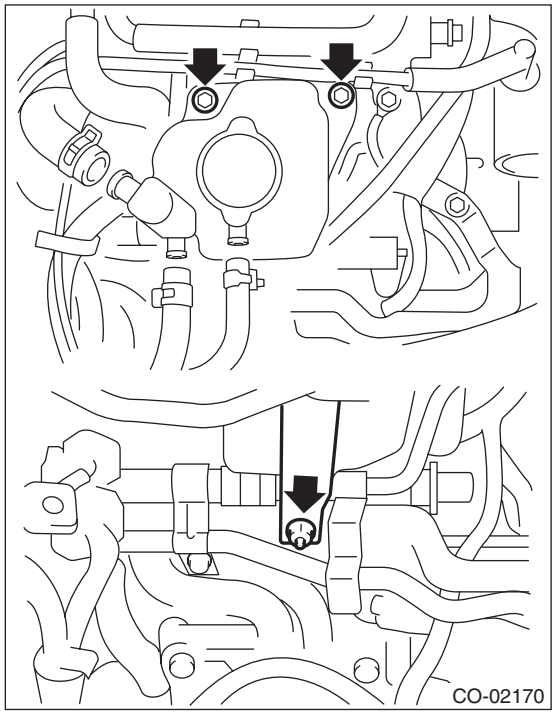
6) Non-turbo model
(1) Remove the air intake duct. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
(2) Remove the bolt A.
(3) Disconnect the pipe C from oil pump. Disconnect the pipe D from the return hose.

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



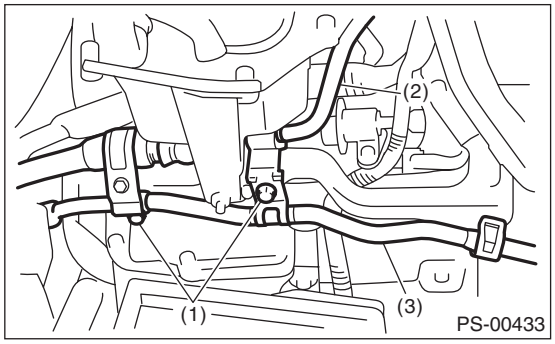
(1) Bolt A
(2) Pipe C
(3) Pipe D

7) Turbo model
(1) Remove the air cleaner.
<Ref. to IN(H4DOTC)-10, REMOVAL, Air Cleaner Case.>
(2) Remove the coolant filler tank.



(3) Remove the two bolts (bolt A) holding the pipe C and D in place.
(4) Disconnect the pipe C from oil pump. Disconnect the pipe D from the return hose.

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



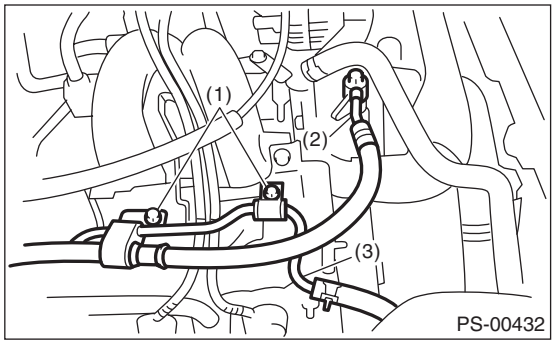
(1) Bolt A
(2) Pipe C
(3) Pipe D

B: INSTALLATION

1) Temporarily tighten the two bolts (bolts A) fixing pipe C and D in place.

NOTE:
Visually check that the hose between tank and pipe D is not bent or twisted.

• Non-turbo model



(1) Bolt A
(2) Pipe C
(3) Pipe D

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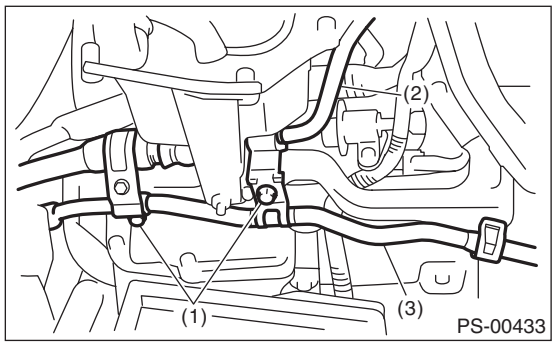
- Turbo model



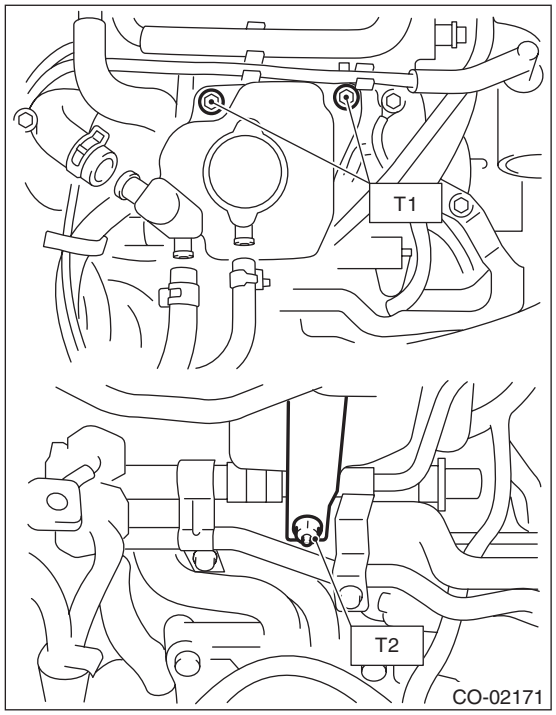
(1) Bolt A
(2) Pipe C
(3) Pipe D

(1) Connect pipe D to the oil tank.
(2) Install the pipe C to the oil pump using a new gasket.

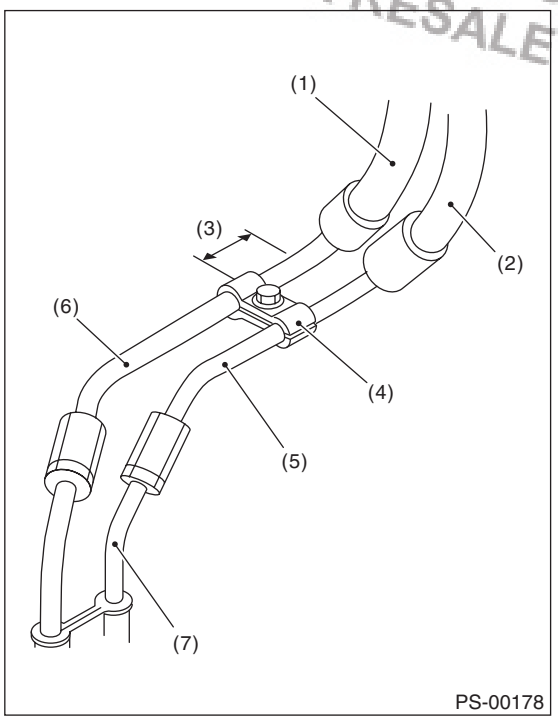
Tightening torque:
40 N·m (4.1 kgf-m, 29.5 ft-lb)
(3) Tighten the two bolts (bolts A) fixing pipe C and D in place.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)
2) Install the coolant filler tank. (Turbo model)

Tightening torque:
T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)
T2: 13 N·m (1.3 kgf-m, 9.4 ft-lb)



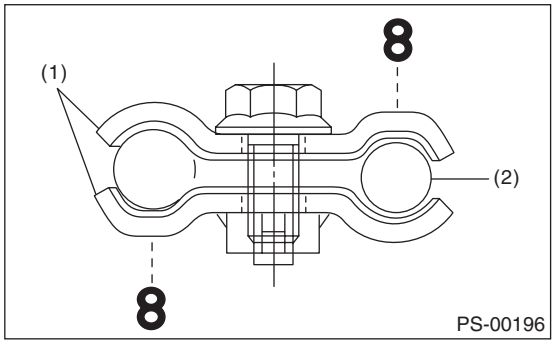
3) Temporarily connect the pipes C and D to the gearbox.



(1) Return hose
(2) Pressure hose
(3) Approx. 30 mm (1.18 in)
(4) Clamp E
(5) Pipe C
(6) Pipe D
(7) Pipe (gearbox side)

4) Temporarily tighten clamp E on pipes C and D.

NOTE:
Make sure that the character 8 on each clamp is positioned on the opposite side, as shown in the figure.



(1) Clamp E
(2) Pipe C

5) Tighten clamp E.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

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6) Tighten the joint nut.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

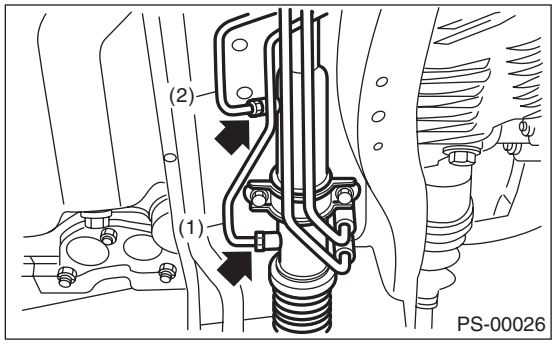
7) Connect pipes A and B to the four pipe joints of the gearbox. Connect the upper pipe B first, and lower pipe A.

Tightening torque:

Non-turbo model:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

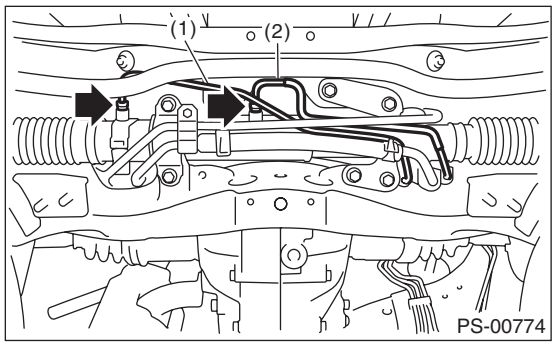
Turbo model and STI model:
Housing side:
20 N·m (2.0 kgf-m, 14.5 ft-lb)
Cylinder side:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

- Non-turbo model



(1) Pipe A
(2) Pipe B

- Turbo model



(1) Pipe A
(2) Pipe B

8) Install the jack-up plate.
9) Install the air intake duct. <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.>
10) Install the air intake duct, the air cleaner upper cover and the air intake boot. <Ref. to IN(H4DOTC)-10, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.>
11) Connect the ground cable to the battery.
12) Fill with the specified fluid.

CAUTION:
Never start the engine before feeding the fluid otherwise the vane pump might be seized.

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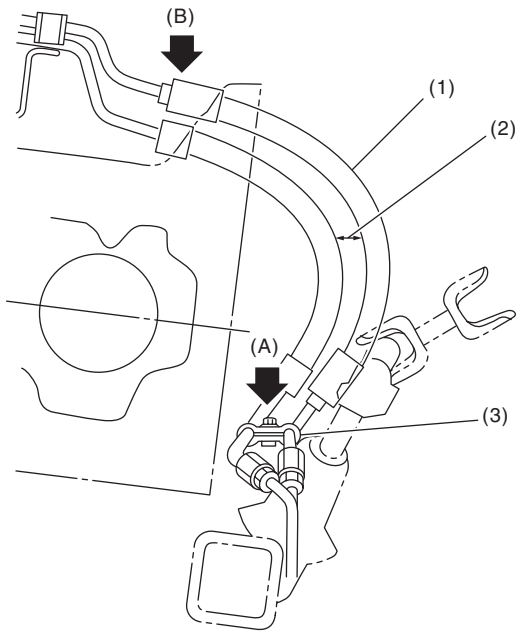
13) Finally, check clearance between pipes or hoses as shown in the figure.
If the cruise control actuator and power steering hose clearance is less than 10 mm (0.39 in), move section (A) held in place by the clamp, or bend (B) to adjust.



PS-00179

(1) High-pressure hose
(2) No interference is allowed between hoses.
(3) Crossmember to pipe clearance: 3 — 8 mm (0.12 — 0.31 in)

C: INSPECTION

Check all disassembled parts for wear, damage or other problems. Repair or replace the defective parts as necessary.

Part	Inspection	Corrective action
Pipe	• O-ring fitting surface damage • Nut damage • Pipe damage	Replace with a new part.
Clamp	• Loose clamps	Replace with a new part.
Hose	• Flare surface damage • Flare nut damage • Outer surface cracks • Outer surface wear • Clip damage • End coupling or adapter deformation	Replace with a new part.

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CAUTION:
Although the surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. Wipe off hoses immediately if any of these come into contact with the hoses.
Since resistances for heat and low temperature brittleness gradually declines according to long periods of exposure to hot or cold conditions, and their service lives are shortening accordingly. It is necessary to perform careful inspection frequently when the vehicle is used in hot weather areas, cold weather areas and in frequent driving conditions where a lot of steering work is required.
Continuous discharge of the relief valve for 5 seconds or more will reduce the service lives of hoses, oil pump, fluid, etc., due to over heating.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct customers.
	Malfunction of the relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Disconnection of the return hose	Improper connection	Repair.
	Loosening of the clip	Retighten.
	Poor cold characteristic of fluid	Replace fluid.
Fluid slightly leaking out of hose	Wrong piping layout and tension	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the parts if defective.
	Improper stop position of pitching stopper	Replace the parts if defective.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customers.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, brake fluid, engine oil, or electrolyte coming into contact with the hose surface	Replace. Be careful during service work.
	Too many uses in extremely cold weather	Replace. Instruct customers.

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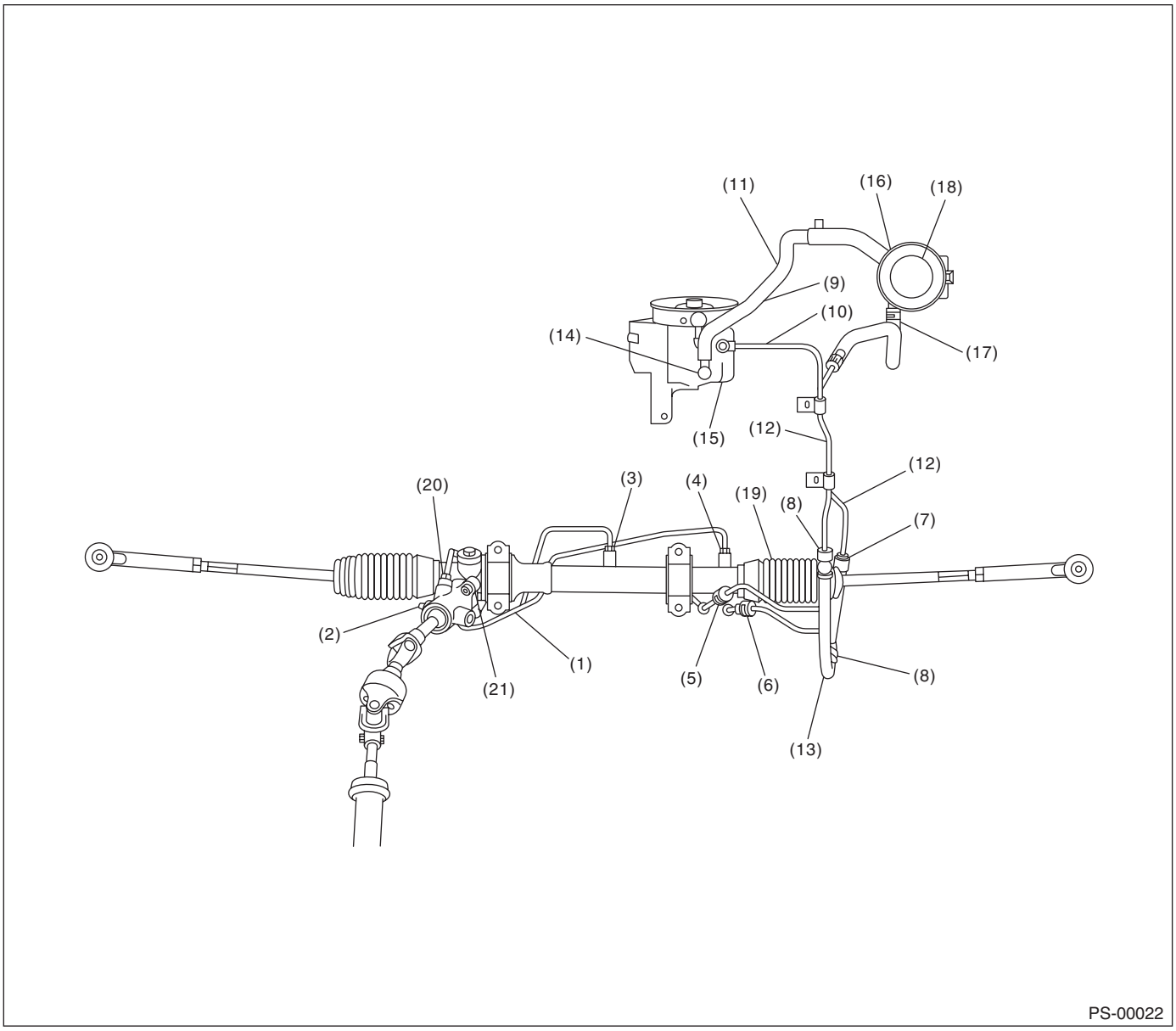
NOTE:
There are conditions in which a fluid leak is diagnosed, but is not actually leaking. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.



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Fluid leaking area	Possible cause	Corrective action
Leakage from pipe and hose connections numbered with (1) through (10) in the figure	Insufficient tightening of flare nuts, dirt accumulation, damage to flare or flare nut or eye bolt	Loosen and retighten. Replace if ineffective.
	Improper installation of hose or clamp	Retighten or replace the clamp.
	Damaged O-ring or gasket	Replace the O-ring, gasket pipe or hose with new part, if still no improvement, replace the gearbox as well.
Leakage from hose (11), (12) and (13) in the figure	Crack or damage in hose	Replace with a new part.
	Crack or damage in hose hardware	Replace with a new part.
Leakage from surrounding of cast iron portion of oil pump, (14) and (15) in the figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.
Leakage from oil tank, (16) and (17) in the figure	Crack in oil tank	Replace the oil tank.
Leakage from filler neck of (18)	Damaged cap gasket	Replace the cap.
	Crack in root of filler neck	Replace the oil tank.
	Fluid level too high	Adjust the fluid level.
Leakage from power cylinder of gearbox area (19) in the figure	Damaged oil seal	Replace the oil seal.
Leakage from (20), (21) in the figure and control valve of gearbox	Damaged gasket or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

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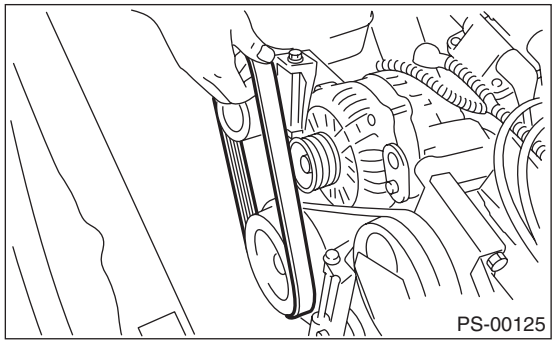
7. Oil Pump

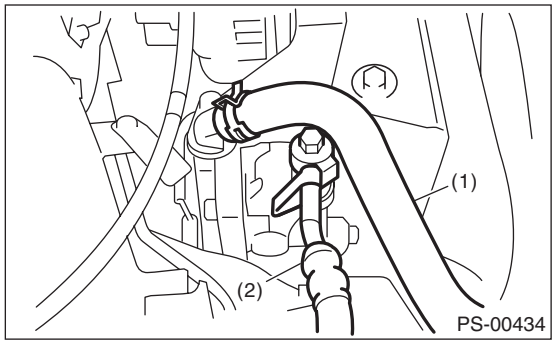
A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Remove the pulley belt cover.
3) Loosen the belt tension securing bolt and generator securing bolt, then remove the power steering pump V-belt.



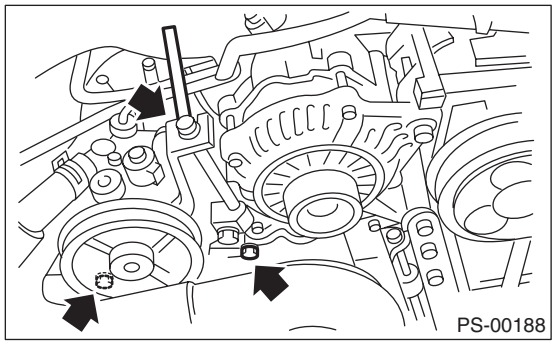
4) Disconnect the connector from power steering pump switch.
5) Disconnect pipe C and suction hose from oil pump.

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



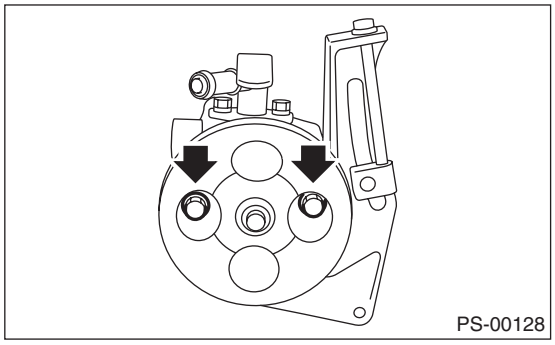
(1) Suction hose
(2) Pipe C

6) Remove the installation bolt of the power steering pump bracket.

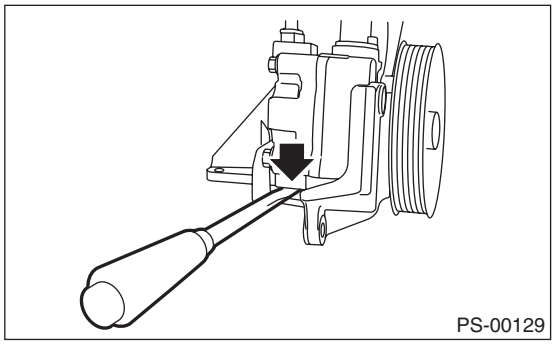


7) Place the oil pump bracket in a vise, and remove the two bolts from the front side of the oil pump.

CAUTION:
When securing the oil pump bracket in a vice, hold the oil pump bracket with the least possible force between two pieces of wood.



8) Remove the bolt from the rear side of oil pump.
9) Disassemble the oil pump and bracket by inserting a flat tip screwdriver as shown in the figure.



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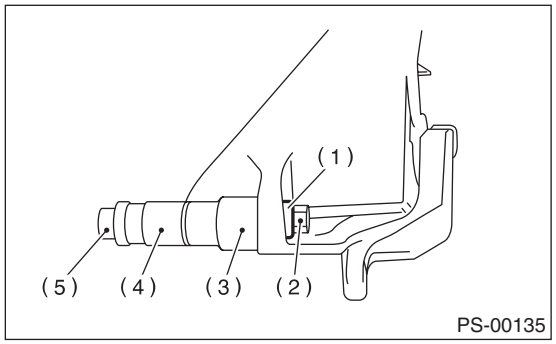
B: INSTALLATION

1) Install the oil pump to 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 the oil pump mounting surface.

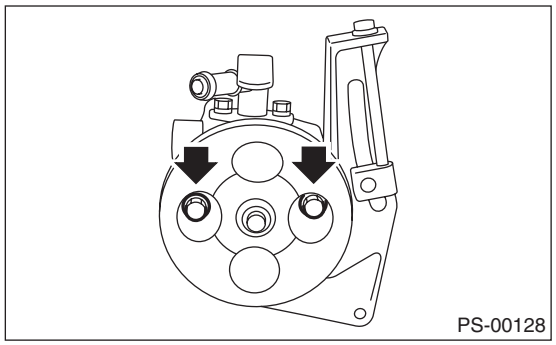
CAUTION:
When securing the oil pump bracket in a vice, hold the oil pump bracket with the least possible force between two pieces of wood.



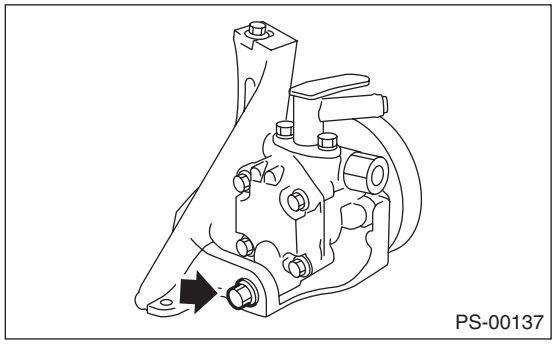
(1) Bushing
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

(2) Tighten the bolts which hold the oil pump to the bracket.

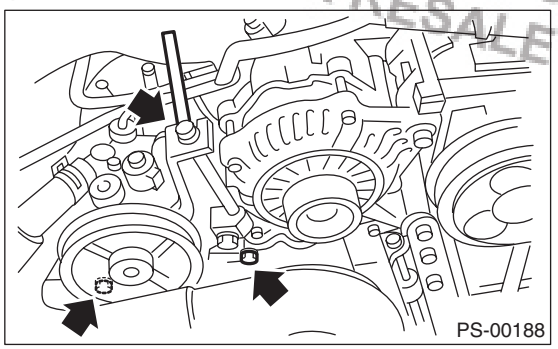
Tightening torque:
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)



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



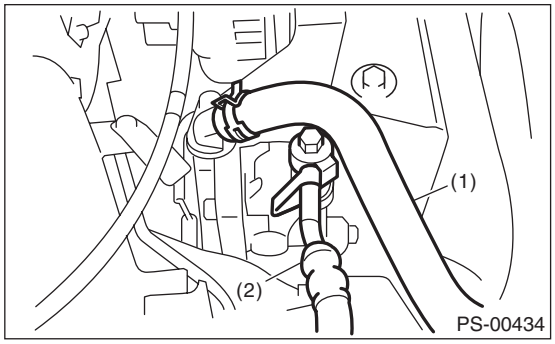
2) Attach the installation bolts of the power steering pump bracket.



3) Connect the pipe C and the suction hose.

Tightening torque:
Eyebolt
40 N·m (4.1 kgf-m, 29.5 ft-lb)

CAUTION:
Be careful when installing; If the hose is twisted it may come into contact with other parts.



(1) Suction hose
(2) Pipe C

4) Connect the connector to the power steering pump switch.
5) Install the V-belts to the oil pump.
6) Check the tension of the V-belt.
<Ref. to ME(H4SO)-40, INSPECTION, V-belt.>
7) Tighten the belt tension bolt.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
8) Install the pulley belt cover.
9) Connect the ground cable to the battery.
10) Fill with the specified power steering fluid.
<Ref. to PS-66, Power Steering Fluid.>

CAUTION:
Never start the engine before feeding the fluid otherwise the vane pump might be seized.

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C: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and replace faulty parts.

No.	Part	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace the oil pump with a new part.
		(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 part.
2	Pulley	(1) Damage	Replace with a new part.
		(2) Bend	Measure the V groove deflection. If it exceeds the service limit, replace the pulley with a new part.
3	Oil pump (Interior)	(1) Faulty or seized of vane pump	Check the rotating resistance of pulley. If it exceeds the service limit, replace the oil pump with new part.
		(2) Bend in the shaft or damage to bearing	If the a string is wrapped on the pulley and rotated, and the oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump, replace the oil pump with a new part.
4	O-ring	Cracking or deterioration	Replace with a new part.
5	Bracket	Crack	Replace with a new part.

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2. SERVICE LIMIT

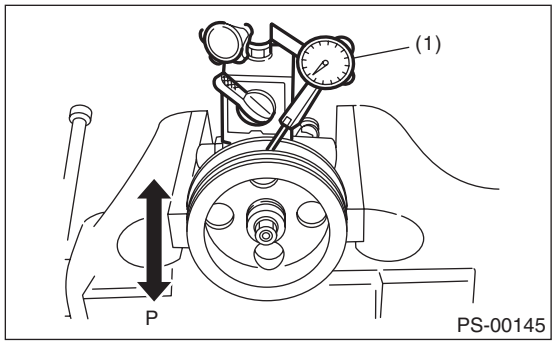
Make a measurements as follows. If it exceeds the service limit, replace with a new part.

CAUTION:
• When securing the oil pump on a vise, hold the oil pump with the least possible force between two pieces of wood.
• Do not set the 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 the pulley shaft

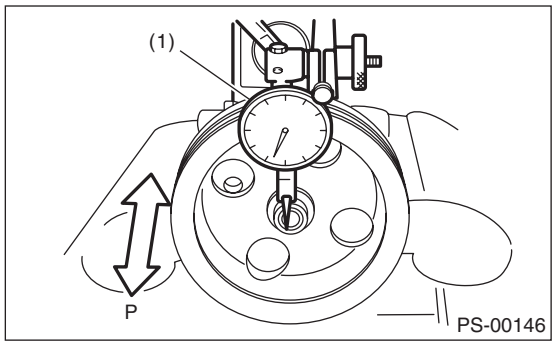
Condition:
P: When applying the force of 9.8 N (1.0 kgf, 2.2 lb)

Service limit:
Play in the radial direction (Direction ⬅ ➡)
0.4 mm (0.016 in) or less



(1) Dial gauge

Axial play (Direction ⇦ ⇨)
0.9 mm (0.035 in) or less

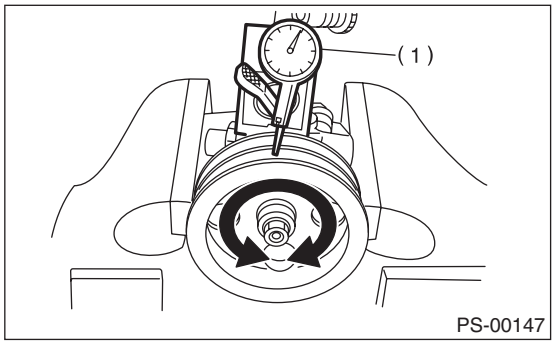


(1) Dial gauge

2) Deflection of the pulley groove

Service limit:
1.0 mm (0.039 in) or less

NOTE:
Read the value for one surface of V groove, and then set a dial on the other face and read the value.

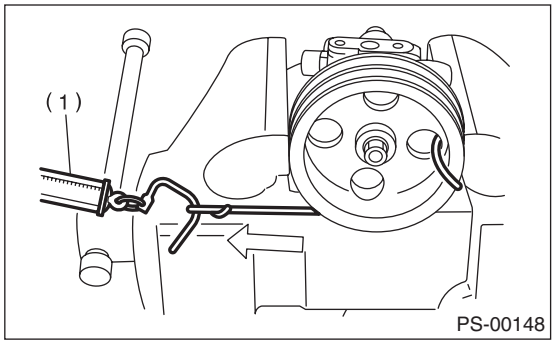


(1) Dial gauge

3) Rotating resistance of pulley

Service limit:
Maximum load: 9.22 N (0.94 kgf, 2.07 lbf) or less

NOTE:
• A rather higher value may be indicated when pulley starts turning.
• Measure the load during rotation to make a judgment.



(1) Spring scale

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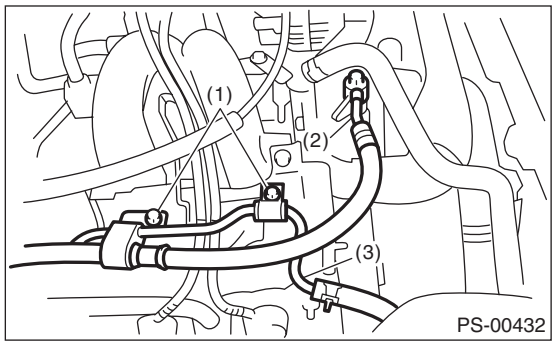
3. HYDRAULIC PRESSURE

NOTE:
• Be sure to complete all items aforementioned in "INSPECTION," prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-67, INSPECTION, General Diagnostic Table.>
• Do not leave the valve of pressure gauge closed or hold the steering wheel at lock for 5 seconds or more in any case, this can damage the oil pump.
• Before attaching a pressure gauge, place cloth at locations where fluid is expected to spill. Wipe off any spilt fluid completely after the measurement.

1) Regular pressure measurement
(1) Connect the ST1, ST2 and ST3.

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

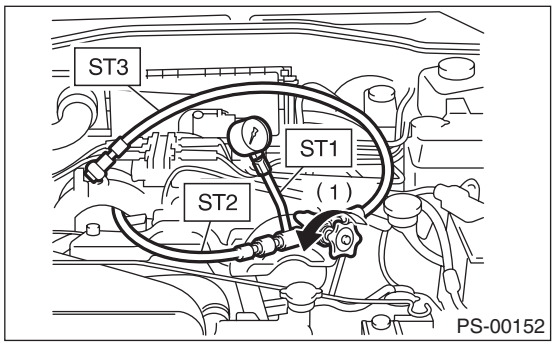
(2) Remove the air intake duct.
(3) Disconnect the pipe C from pump.
(4) Using the gasket (Part No. 34621AC022) and bolt (Part No. 34620AC010), attach the ST2 to pump instead of pipe C.



(1) Bolt A
(2) Pipe C
(3) Pipe D

(5) Attach the ST3 to the end of pipe C which is removed from pump.
(6) Replenish power steering fluid up to the specified level.
(7) Open the valve, and start the engine.
(8) Measure the regular pressure.

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



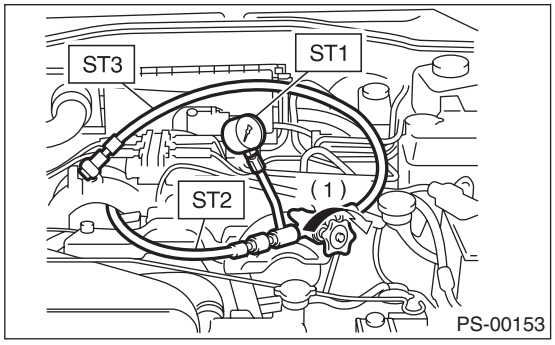
(1) Valve

Service limit:
981 kPa (10 kgf/cm^2, 142 psi) or less

(9) If it is not within the specification, replace the problem part for the following problems. (Pipe or hose clogged, leaks from fluid line, and mixture of foreign matter in fluid line)

2) Measure the relief pressure.
(1) Using the 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



(1) Valve

Service limit:
Non-turbo model:
6,700 — 7,400 kPa
(68 — 75 kgf/cm^2, 972 — 1,073 psi)
Turbo model and STI model:
7,350 — 8,036 kPa
(75 — 82 kgf/cm^2, 1,067 — 1,165 psi)

(4) If it is not within the specification, replace the oil pump.

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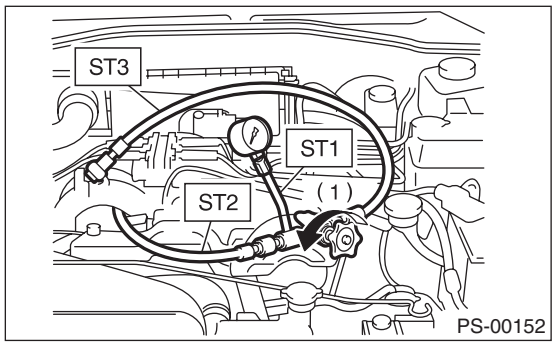
3) Measure the working pressure.
(1) Using the ST, measure the working pressure.
(2) Open the valve.
(3) Measure the working pressure of control valve by turning steering wheel from stop to stop.

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



(1) Valve

Service limit:
Non-turbo model:
6,700 — 7,400 kPa
(68 — 75 kgf/cm^2, 972 — 1,073 psi)
Turbo model and STI model:
7,350 — 8,036 kPa
(75 — 82 kgf/cm^2, 1,067 — 1,165 psi)

(4) If it is out of specification, measure the steering effort. <Ref. to PS-70, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specification, replace the control valve itself or control valve and pinion as a single unit, using new parts.

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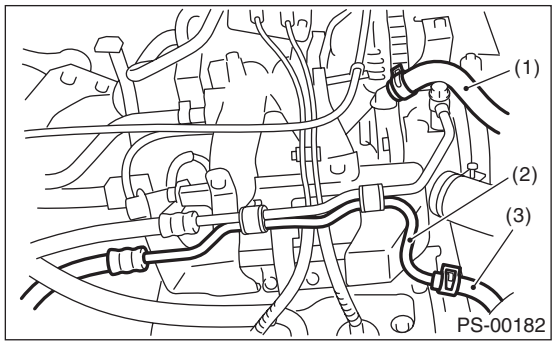
8. Reservoir Tank

A: REMOVAL

1) Remove the air intake duct. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
2) Drain fluid from the reservoir tank.
3) Disconnect the pipe D from the return hose and suction hose from the oil pump.

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

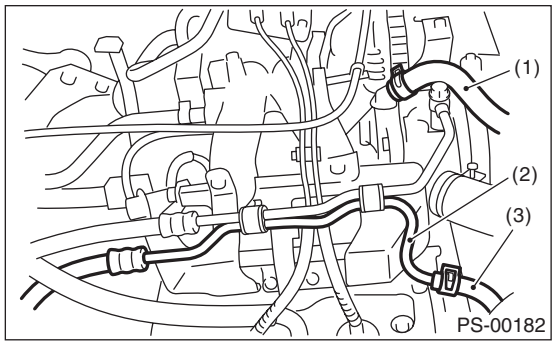


(1) Suction hose
(2) Pipe D
(3) Return hose

4) Remove the reservoir tank from the bracket by pulling it upwards.

B: INSTALLATION

1) Install the reservoir tank to the bracket.
2) Connect the pipes D to the return hose and suction hose to the oil pump.



(1) Suction hose
(2) Pipe D
(3) Return hose

3) Replenish power steering fluid up to the specified level. <Ref. to PS-66, Power Steering Fluid.>

C: INSPECTION

Check the reservoir tank for cracks, breakage or damage. If a failure is found, replace the reservoir tank.

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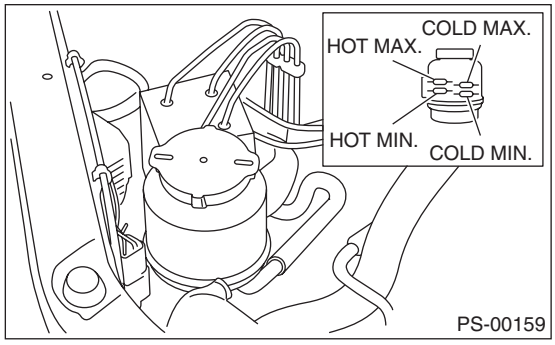
9. Power Steering Fluid

A: SPECIFICATION

Recommended power steering fluid
SUBARU ATF or ATF DEXRON III

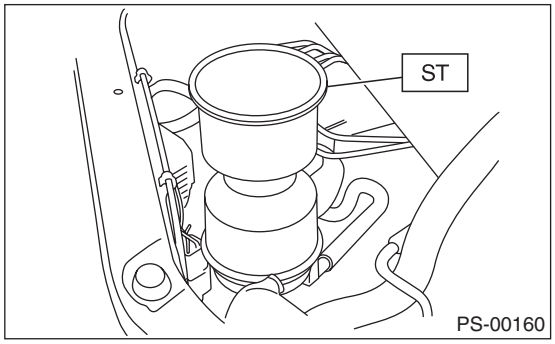
B: INSPECTION

1) Check the power steering fluid for deterioration or contamination. If the fluid is highly deteriorated or contaminated, drain it and refill with new fluid.
2) Check the joints and units for fluid leakage. If any oil leaks are found, repair or replace the applicable part.
3) Inspect the fluid level of reservoir tank with vehicle on level surface and engine stopped.
If the level is at “MIN.” point or below, add fluid to keep the level in the specified range of the indicator. If fluid level is at “MAX.” point or above, drain fluid by using a syringe or the like.
(1) If the power steering fluid temperature is 20°C (68°F), read the fluid level on the “COLD” side.
(2) If the power steering fluid temperature is 80°C (176°F), read the fluid level on the “HOT” side.



C: REPLACEMENT

1) Lift up the vehicle.
2) Remove the jack-up plate.
3) Remove the pipe joint in the center of gearbox, and connect the vinyl hose to the pipe and joint. Drain fluid out while turning the steering wheel.
4) Set ST on the top of reservoir tank and fill it about half way with the specified fluid.
ST 34199AE040 OIL CHARGE GUIDE



5) Maintaining the fluid level of Step 4), continue to turn the steering wheel slowly from lock to lock until the bubbles stop appearing on oil surface.
6) If the steering wheel is turned in a low fluid level condition, air will be sucked into the pipe. If air has entered, leave it for about half an hour and then repeat step 5) again.
7) Start the engine and let it idle.
8) Continue to turn the steering wheel slowly from lock to lock again until the bubbles stop appearing on oil surface, while keeping the fluid at the level in Step 4).
Normally bubbles will stop appearing after turning the steering wheel from lock to lock three times.
9) In case bubbles do not stop appearing in the tank, leave it for about half an hour and then repeat step 4) again.
10) Lower the vehicle, and then idle the engine.
11) Continue to turn the steering wheel from lock to lock until the bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).
12) In case the following happens, leave it about half an hour and then do step 8) to 11) again.
(1) The fluid level changes 3 mm (0.12 in) or more.
(2) Bubbles remain on the upper surface of the fluid.
(3) Screeching noise is generated from oil pump.
13) Check for fluid leakage after turning steering wheel from lock to lock with the engine running.

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10.General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
• Steering effort is heavy in all ranges. • Steering effort is heavy at stand still. • Steering wheel vibrates when turning.	1. Pulley belt • Unequal length of pulley belts • Contact with oil or grease • Looseness or damage of the pulley belt • Poor uniformity of the pulley belt cross section • Pulley belt touches to pulley bottom • Poor revolution of pulleys (except oil pump pulley) • Poor revolution of oil pump pulley	Adjust or replace.
	2. Tire and wheel • Improper tires out of specifications • Improper wheels out of specification • Tires not properly inflated*1	Replace or reinflate.
	3. Fluid • Low fluid level • Air entry in fluid • Dust entry in fluid • Fluid deterioration • Inadequate warm-up of fluid *2	Refill, bleed air, replace or instruct customer.
	4. Idle speed • Lower idle speed • Excessive drop of idle speed at start or when turning the steering wheel *3	Adjust or instruct customer.
	5. Measure the hydraulic pressure. <Ref. to PS-61, INSPECTION, Oil Pump.>	Replace the problem parts.
	6. Measure the steering wheel effort. <Ref. to PS-67, INSPECTION, General Diagnostic Table.>	Adjust or replace.
• Vehicle leads to one side or the other. • Returning force of steering wheel to center is poor. • Steering wheel vibrates when turning.	1. Fluid line • Folded hose • Flattened pipe	Repair or replace.
	2. Tire and wheel • Flat tire • Mixed use of different tires • Mixed use of different wheels • Abnormal wear of tire • Unequal tread remaining • Unequal pressure of tire	Adjust, fix or replace.
	3. Front alignment • Improper or unequal caster • Improper or unequal toe-in • Loose suspension connections	Adjust or retighten.
	4. Others • Damaged joint assembly • Unbalanced height • Unbalanced weight	Replace, adjust or instruct customer.
	5. Measure the steering wheel effort. <Ref. to PS-67, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If the tires or wheels are wider than standard, the load to power steering system is increased. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before reaching maximum turning angle. In this case, steering effort may be heavy. When the measured hydraulic pressure is normal, there is no abnormal thing.
*2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn the steering wheel from stop to stop several times to warm-up fluid. If steering effort reduces normally, function is normal.
*3 In cold weather or with insufficient warm-up of the engine, steering effort may be heavy due to excessive drop of idling when turning the steering wheel. In this case, start the vehicle with increasing engine speed than usual. If steering effort reduces normally, function is normal.

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1. NOISE AND VIBRATION

CAUTION:
Do not keep the relief valve operating for 5 seconds or more at a time or the inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:
• A screeching noise may be heard immediately after the engine start in extremely cold conditions. In this case, if the noise goes off during warm-up there is no abnormal function in the system. This is due to the fluid characteristics in extremely cold condition.
• The oil pump normally makes a small whining noise due to its mechanism. Even if a noise is heard when steering wheel is turned at stand still, there is no abnormal function in the system provided that the noise eliminates when the vehicle is driving.
• When turning the steering wheel with the brake applied when the vehicle is parked, a screeching noise may be generated by the brake disc and pads. This is not a fault in the steering system.
• There may be a small vibration around the steering devices when turning the steering wheel at standstill, even though the component parts are operating properly.
Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of steering wheel, fluid temperature and braking condition.
These conditions do not indicate a problem in the system.
Confirm vibration for an AT model, by applying the parking brake on a concrete surface, shifting into the “D” range, and turning the steering wheel repeatedly from slow to rapid, step by step.

Trouble	Possible cause	Corrective action
Hiss noise (continuous) when engine is running.	The relief valve emits an operating sound when steering wheel is completely turned in either direction. (Do not keep this condition for 5 seconds or more.)	Normal
	Relief valve emits an operating sound when steering wheel is not turned. This means that the relief valve is defective.	Replace the oil pump.
Rattling noise (intermittent) when engine is running.	Interference with adjacent parts	Check the clearance. Correct if necessary. <Ref. to PS-55, INSPECTION, Pipe Assembly.>
	Loosened installation of oil pump, oil tank, pump bracket, gearbox or crossmember	Retighten.
	Loose oil pump pulley or other pulley(s)	Retighten.
	Looseness of linkage, play of steering, improper tightening (looseness) of suspension joint or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace faulty parts in the gearbox or oil pump.
Knocking When turning steering wheel in both directions with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for adjusting backlash	Adjust and retighten.
	Insufficient tightening or play in the tie-rod or tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Air in vane pump	Inspect and retighten the fluid line connection. Refill the fluid and vent air.
	Vane pump seizing	Replace the oil pump.
	Oil pump pulley bearing seized	Replace the oil pump.
	Folded hose, flattened pipe	Replace.
Squeal, squeak (intermittent or continuous) While engine is running.	Improper adjustment of pulley belt Damaged or over tensioned pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Runout or dirty V-groove surface of oil pump pulley	Clean or replace.

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Trouble	Possible cause	Corrective action
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix the faulty part causing aeration. Replace the fluid and vent air.
	Damaged pipe of gearbox	Replace the pipe.
	Faulty inside of hose or pipe Flattened hose or pipe	Repair or replace.
	Abnormal inside of oil tank	Replace.
	Removed oil tank cap	Install cap.
Whistle (continuous) While engine is running.	Faulty pipe of gearbox or faulty hose	Replace the faulty parts of the gearbox or the hose.
Whine or growl (intermittent or continuous) While engine is running with/ without steering turned.	Looseness of oil pump, oil pump bracket attachment	Retighten.
	Fault inside of oil pump or hose	Replace the oil pump or hose, if the noise can be heard when vehicle is running as well as being stopped.
	Torque converter growl, air conditioner compression growl	Remove the power steering pulley belt and check.
Creaking noise (intermittent) While engine is running with the steering turned.	Fault inside of gearbox	Replace the faulty parts of gearbox.
	Faulty steering shaft bearing	Apply grease or replace.
	Occurs when turning the steering wheel with brakes (service or parking) applied.	If the noise goes off when brake is released, it is normal.
Vibration While engine is running with/ without steering turned.	Engine speed is too low.	Adjust, and notify customer.
	Air in vane pump	Repair faulty part Vent air.
	Damaged valve in oil pump or gearbox	Replace the faulty parts in gearbox and oil pump.
	Excessive play in steering, looseness of suspension parts	Retighten.

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2. MEASUREMENT OF STEERING EFFORT

	Step	Check	Yes	No
1	**CHECK STEERING EFFORT.** 1) Stop the vehicle on paved road. 2) Start the engine. 3) Idle the engine. 4) Install a spring scale on the steering wheel. 5) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts. NOTE: When turning the steering more quickly than necessary from a direction to the other direction at an engine speed of 2,000 rpm or faster, steering effort may be heavy. This is caused by flow characteristic of the fluid in the oil pump and is not a defect.	Is the steering effort less than 31.4 N (3.2 kgf, 7.1 lbf)?	Go to step **2**.	Adjust the backlash.
2	**CHECK STEERING EFFORT.** 1) Stop the engine. 2) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts.	Is the steering effort less than 294.2 N (30 kgf, 66.2 lbf)?	Go to step **3**.	Perform the adjustment.
3	**CHECK STEERING WHEEL EFFORT.** 1) Remove the universal joint. 2) Measure the steering wheel effort.	Is the steering effort less than 2.26 N (0.23 kgf, 0.51 lbf)?	Go to step **4**.	Check, adjust and replace if necessary.
4	**CHECK STEERING WHEEL EFFORT.** Measure the steering wheel effort.	Is the difference of steering effort between right and left less than 20%?	Go to step **5**.	Check, adjust and replace if necessary.
5	**CHECK UNIVERSAL JOINT.** Measure the swing torque of the joint (yoke of steering column side). <Ref. to PS-20, INSPECTION, Universal Joint.>	Is the swing torque of the universal joint less than 7.3 N (0.74 kgf, 1.64 lbf)?	Go to step **6**.	Replace with a new part.
6	**CHECK UNIVERSAL JOINT.** Measure the swing torque of the joint (yoke of gearbox side). <Ref. to PS-20, INSPECTION, Universal Joint.>	Is the swing torque of the universal joint less than 3.8 N (0.39 kgf, 0.86 lbf)?	Go to step **7**.	Replace with a new part.
7	**CHECK FRONT WHEEL.** Check the front wheels.	Does the front wheels have unsteady revolution or rattling, or does the brakes drag?	Inspect, readjust and replace if necessary.	Go to step **8**.
8	**CHECK TIE-ROD ENDS.** Remove the tie-rod ends.	Is there any unsteady revolution or rattling of suspension tie-rod ends?	Inspect and replace if necessary.	Go to step **9**.
9	**BALL JOINT CHECK.** Remove the ball joint.	Is there any unsteady revolution or rattling of suspension ball joints?	Inspect and replace if necessary.	Go to step **10**.
10	**CHECK GEARBOX.** Measure the rotating of gearbox. <Ref. to PS-49, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>	Is the rotating resistance of steering gearbox less than 10.5 N (1.1 kgf, 2.4 lbf)? Is the difference between right and left sides less than 20%?	Go to step **11**.	Readjust the backlash, and if ineffective, replace the faulty parts.
11	**CHECK GEARBOX.** Measure the sliding of the gearbox. <Ref. to PS-48, SERVICE LIMIT, INSPECTION, Steering Gearbox.>	Is the sliding resistance of steering gearbox less than 400 N (41 kgf, 90 lbf)? Is the sliding resistance difference between right and left less than 20%?	Steering effort is normal.	Readjust the backlash, and if ineffective, replace the faulty parts.

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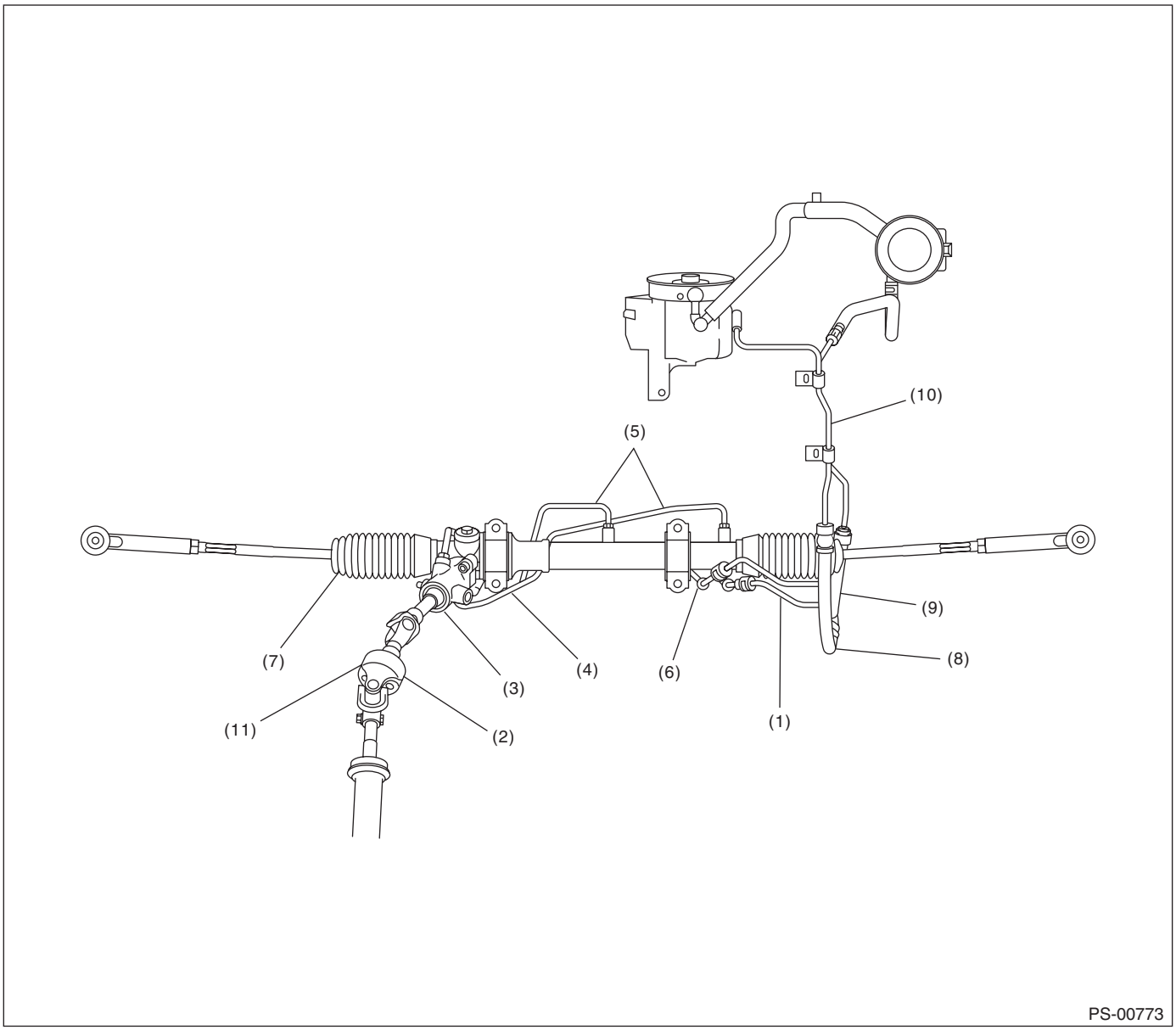
3. INSPECTION OF CLEARANCE

This table lists various clearances that must be correctly adjusted to ensure the normal vehicle driving without interfering noise, or any other faults.

Location	Maximum allowance
(1) Crossmember to Pipe	5 mm (0.20 in)
(2) DOJ to Shaft or joint	14 mm (0.55 in)
(3) DOJ to Valve housing	11 mm (0.43 in)
(4) Pipe to Pipe	2 mm (0.08 in)
(5) Stabilizer to Pipe	5 mm (0.20 in)
(6) Exhaust pipe to Pipe	11 mm (0.43 in)
(7) Exhaust pipe to Gear box bolt	15 mm (0.59 in)
(8) Side frame to Hose A and B	10 mm (0.39 in)
(9) Cruise control pump to Hoses A and B	15 mm (0.59 in)
(10) Pipe portion of hose A to Pipe portion of hose B	1.5 mm (0.059 in)
(11) AT cooling hose to Joint	20 mm (0.79 in)



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