CHASSIS SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

FUJI HEAVY INDUSTRIES LTD.

G8050GE5

POWER ASSISTED SYSTEM (POWER STEERING)

PS

1. General Description S601001

A: SPECIFICATIONS S601001E49

Model				LHD	RHD
Steering wheel	Free play		mm (in)	17 (0.67)	
Turning angle	Inner tire & wheel			34.4°±1.5°	
	Outer tire & wheel			30.2°±1.5°	
Steering shaft	Clearance between steering wheel and column cover		mm (in)	3.0 (0.118)	
Steering gearbox (Power steering system)	Sliding resistance		N (kgf, lb)	304.0 (31.0, 68.4) or less	
	Rack shaft play in radial direction	Right-turn steering	mm (in)	0.15 (0.0059) or less	Horizontal movement: 0.6 (0.024) or less Vertical movement: 0.4 (0.016) or less
		Left-turn steering	mm (in)	Horizontal movement: 0.3 (0.012) or less Vertical movement: 0.15 (0.0059) or less	0.4 (0.016) or less
	Input shaft play	In radial direction	mm (in)	0.18 (0.0071) or less	
		In axial direction	mm (in)	0.1 (0.004) or less	
	Turning resistance		N (kgf, lb)	Within 30 mm (1.18 in) from rack center in straight ahead position: Less than 11.18 (1.14, 2.51) Maximum allowable value: 12.7 (1.3, 2.9)	
Oil pump [Non-turbo model (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	
		Resistance to rotation	N (kgf, lb)	9.22 (0.94, 2.07) or less	
	Regular pressure		kPa (kg/cm^2, psi)	981 (10, 142) or less	
	Relief pressure		kPa (kg/cm^2, psi)	7,355 (75, 1,067)	
Oil pump [Turbo model (Power steering system)]	Pulley shaft	Radial play	mm (in)	0.4 (0.016) or less	
		Axial play	mm (in)	0.6 (0.024) or less	
	Pulley	Ditch deflection	mm (in)	1.0 (0.039) or less	
		Resistance to rotation	N (kgf, lb)	9.22 (0.94, 2.07) or less	
	Regular pressure		kPa (kg/cm^2, psi)	981 (10, 142) or less	
	Relief pressure		kPa (kg/cm^2, psi)	9,807 (100, 1,422)	
Steering wheel effort (Power steering system)	At standstill with engine idling on a concrete road		N (kgf, lb)	29.4 (3.0, 6.6) or less	
	At standstill with engine stalled on a concrete road		N (kgf, lb)	294.2 (30, 66.2) or less	

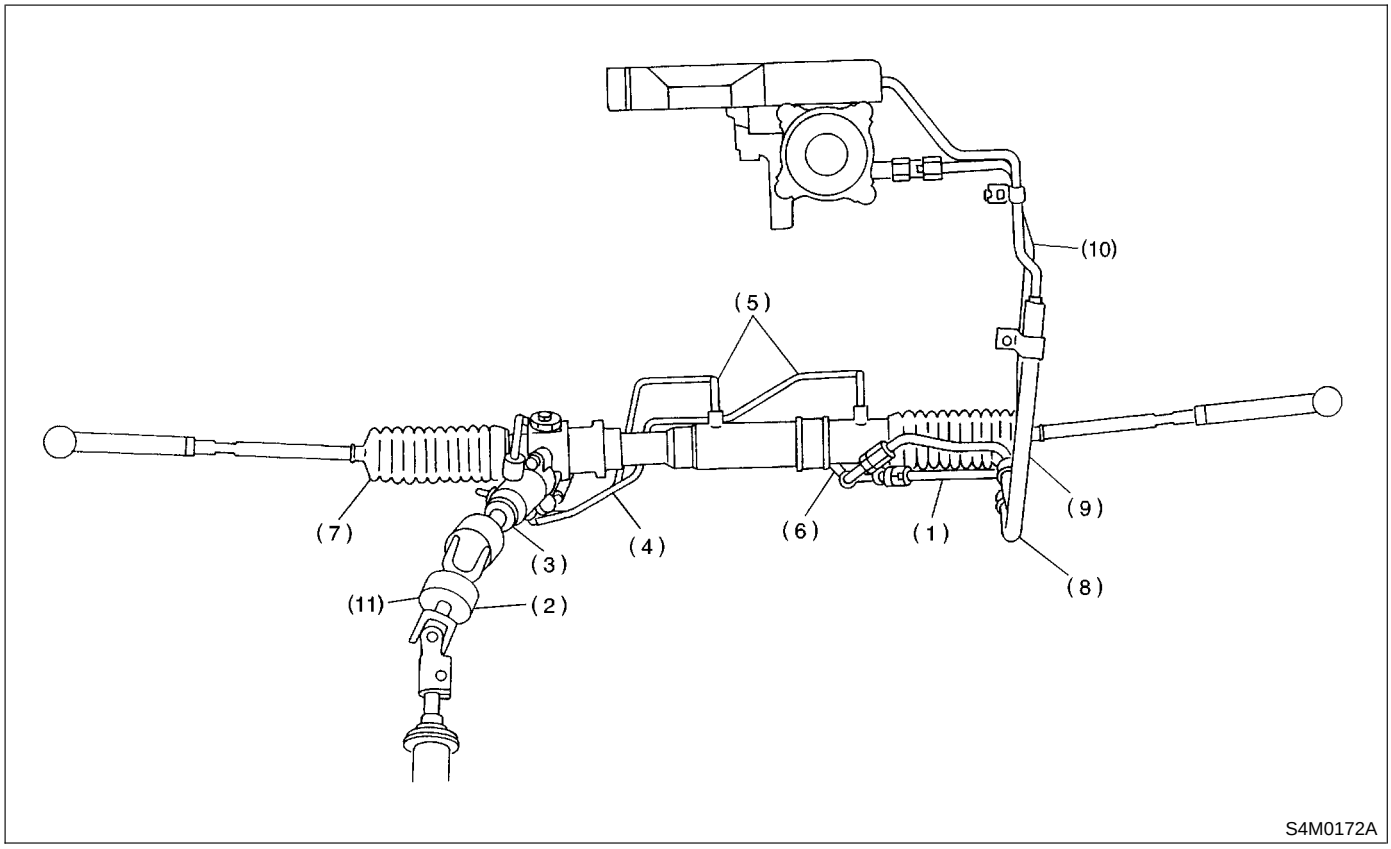
Recommended power steering fluid	Manufacturer
ATF DEXRON IIE or III	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

Model				Non-turbo	Turbo
Whole system	Minimum turning radius		m (ft)	5.4 (17.7)	
	Steering angle (Inside-Outside)			34.4°±1.5° — 30.2°±1.5°	
	Steering wheel diameter		mm (in)	With AIRBAG: 385 (15.16) Without AIRBAG: 385 (15.16)	
	Overall gear ratio (Turns, lock to lock)			LHD: 19.0 (3.4) RHD: 16.7 (3.0)	
Gearbox	Type			Rack and pinion, Integral	
	Backlash			0 (Automatically adjustable)	
	Valve (Power steering system)			Rotary valve	
Pump (Power steering system)	Type			Vane pump	
	Oil tank			Installed on pump	
	Output		cm^3 (cu in)/ rev.	7.2 — 0.6 (0.439 — 0.037)	9.6 — 0.65 (0.586— 0.040)
	Relief pressure		kPa (kg/cm^2, psi)	7,355 (75, 1,067)	7,846 (80, 1,138)
	Hydraulic fluid control			Drooping in response to increased engine revolutions	
	Hydraulic fluid		ℓ (US qt, Imp qt)	1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)	
	Range of revolution		rpm	500 — 7,500	500 — 8,000
	Revolving direction			Clockwise	
Working fluid (Power steering system)	Name			ATF DEXRON IIE or III	
	Capacity	Oil tank	ℓ (US qt, Imp qt)	0.3 (0.3, 0.3)	
		Total	ℓ (US qt, Imp qt)	0.7 (0.7, 0.6)	

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

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

- **Non-turbo model**



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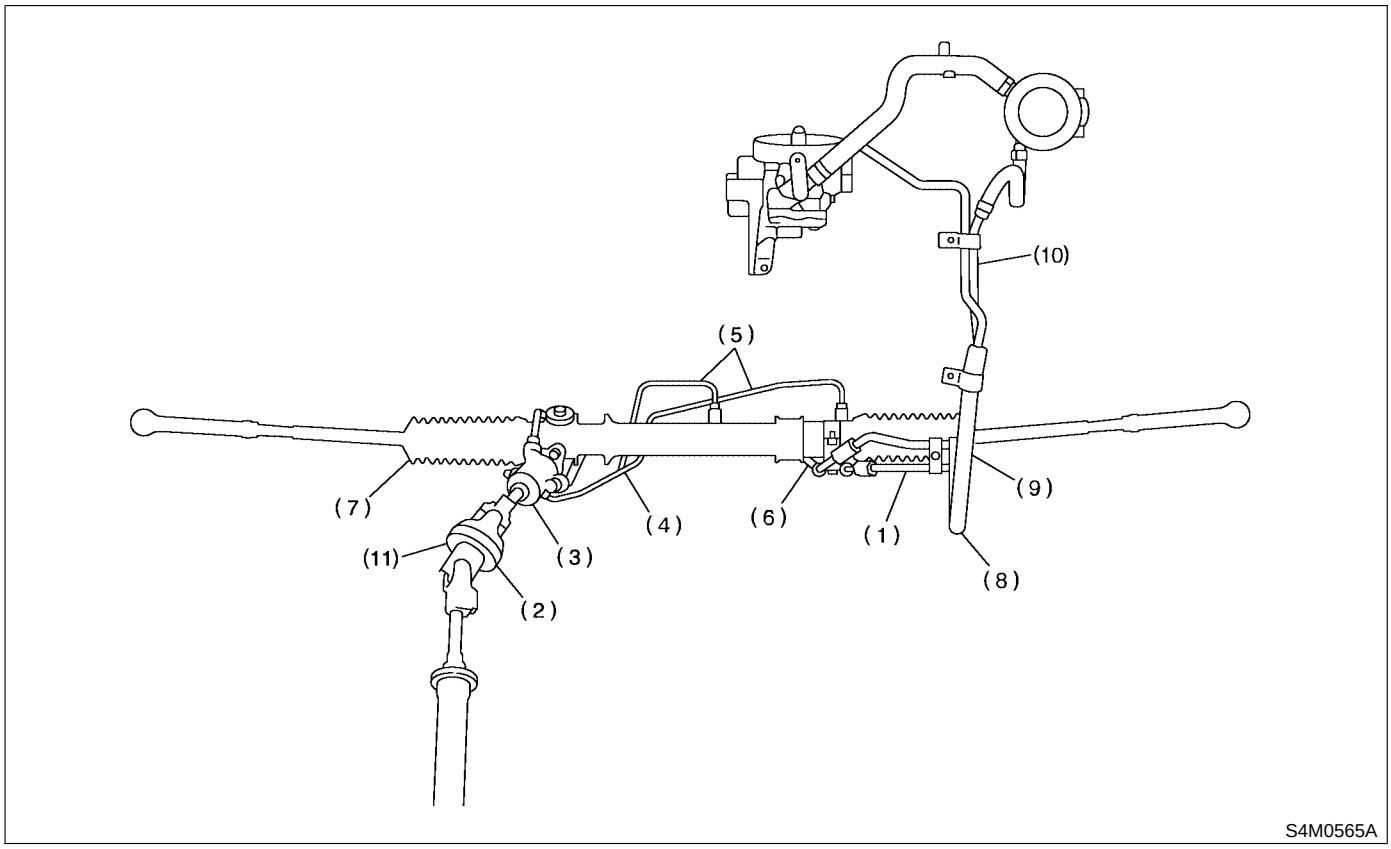
- **Turbo model**



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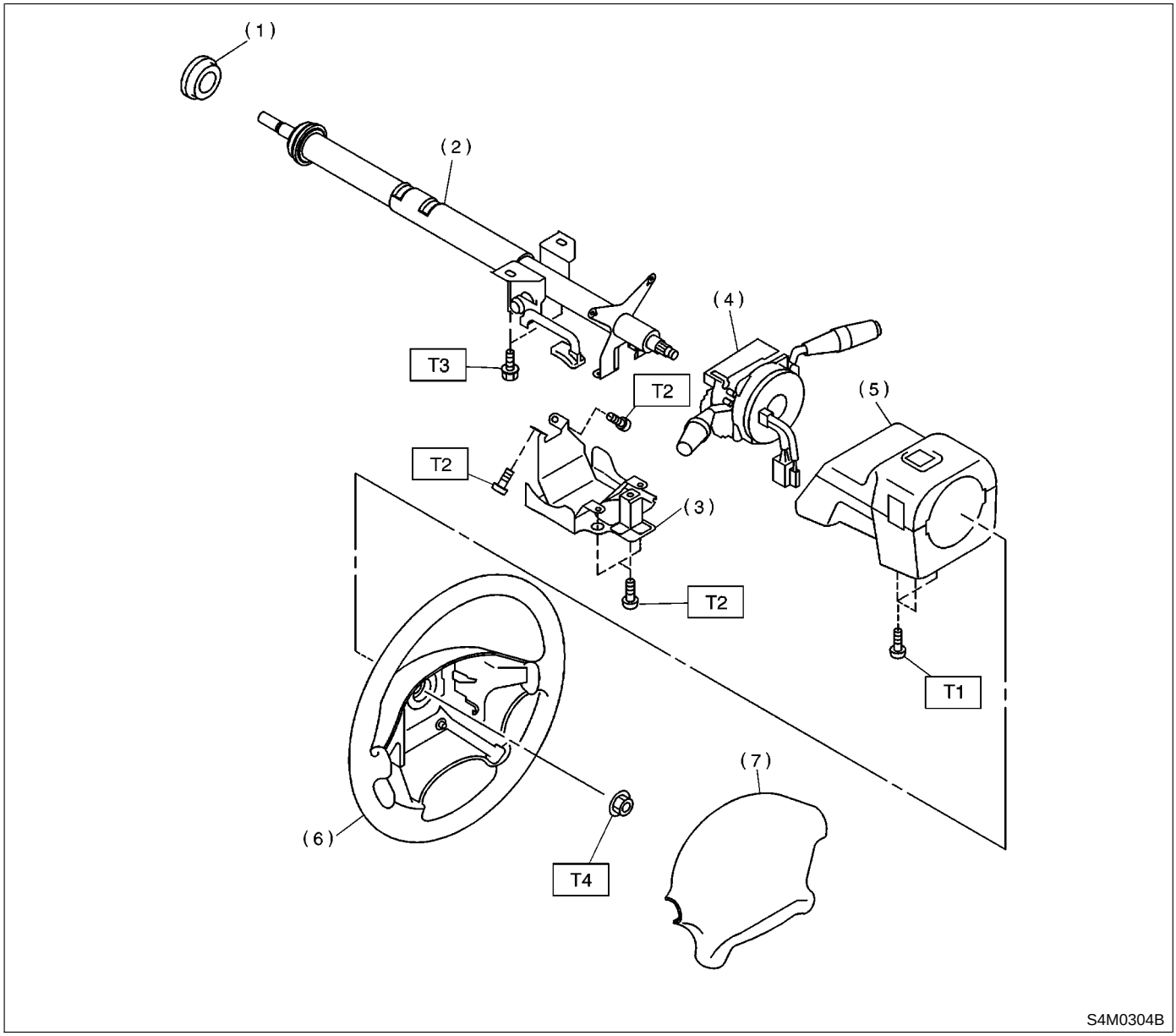
B: COMPONENT S601001A05

1. STEERING WHEEL AND COLUMN S601001A0501

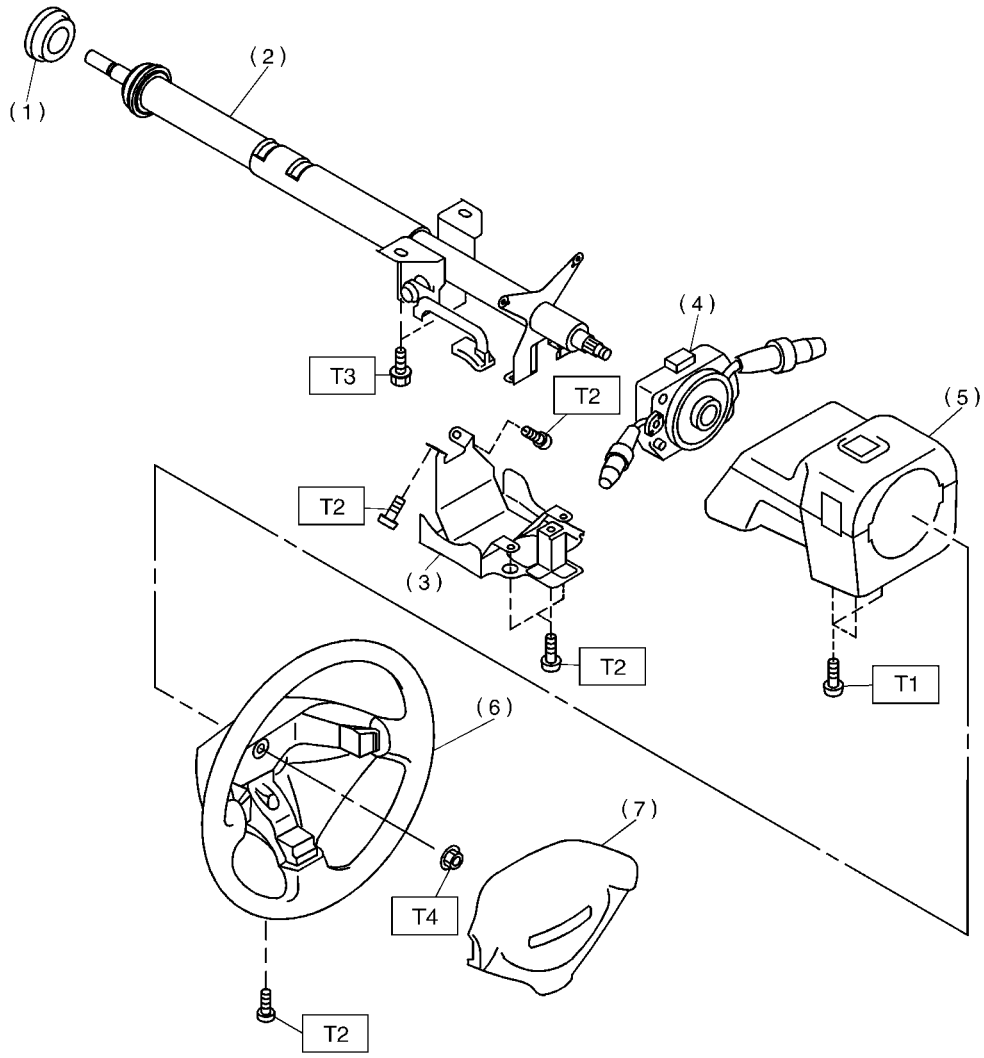
- **With Airbag Model**



(1) Bushing
(2) Steering shaft
(3) Knee protector
(4) Steering roll connector
(5) Column cover
(6) Steering wheel
(7) Airbag module

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.2 (0.12, 0.9)
T2: 3.4 (0.35, 2.5)
T3: 25 (2.5, 18.1)
T4: 44 (4.5, 32.5)

● Without Airbag Model



S4M0311A

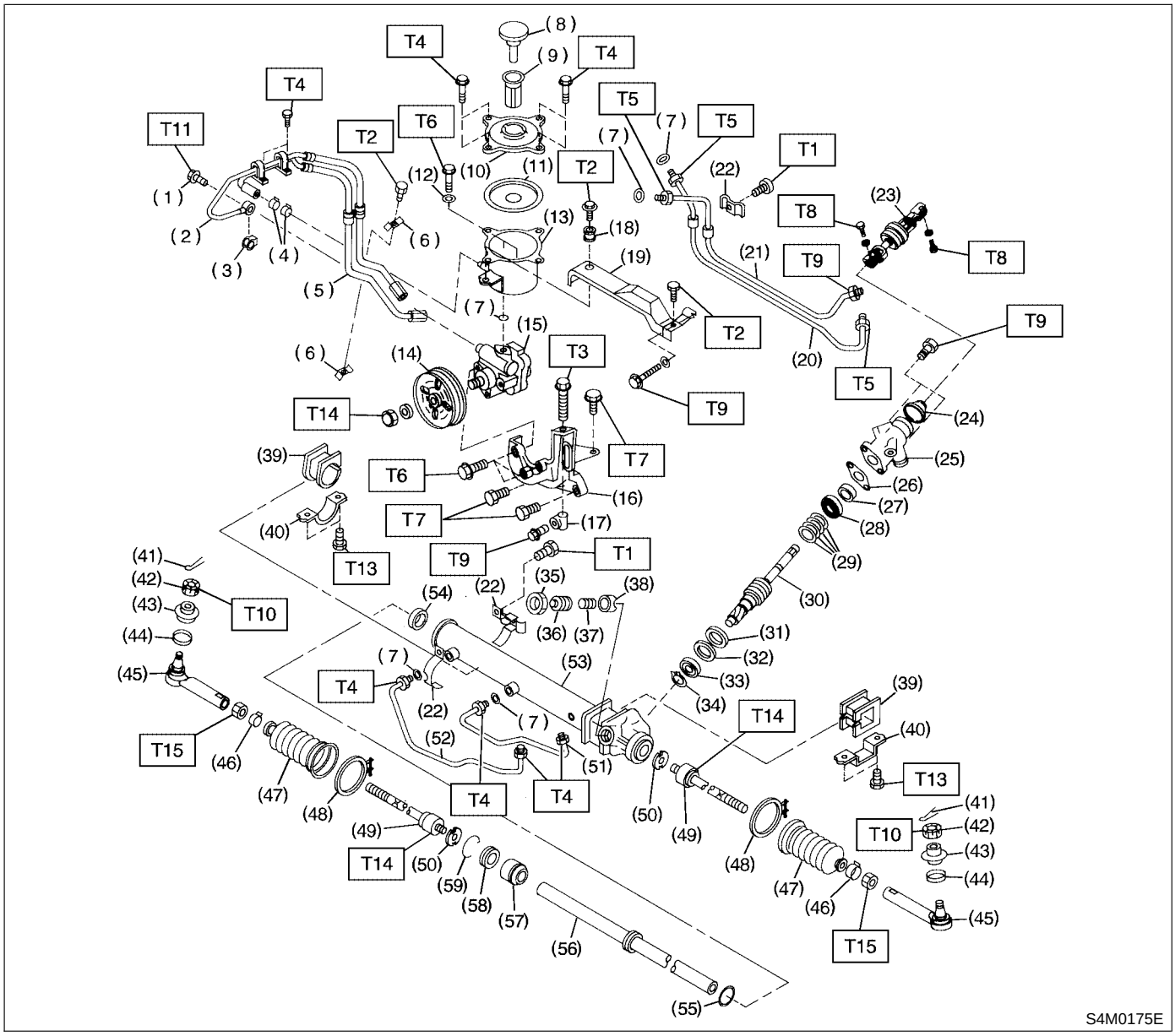
(1) Bushing
(2) Steering shaft
(3) Knee protector
(4) Combination switch
(5) Column cover
(6) Steering wheel
(7) Pad ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.2 (0.12, 0.9)
T2: 3.4 (0.35, 2.5)
T3: 25 (2.5, 18.1)
T4: 44 (4.5, 32.5)

MEMO:

2. POWER ASSISTED SYSTEM FOR NON-TURBO MODEL S601001A0504

- **LHD Model**

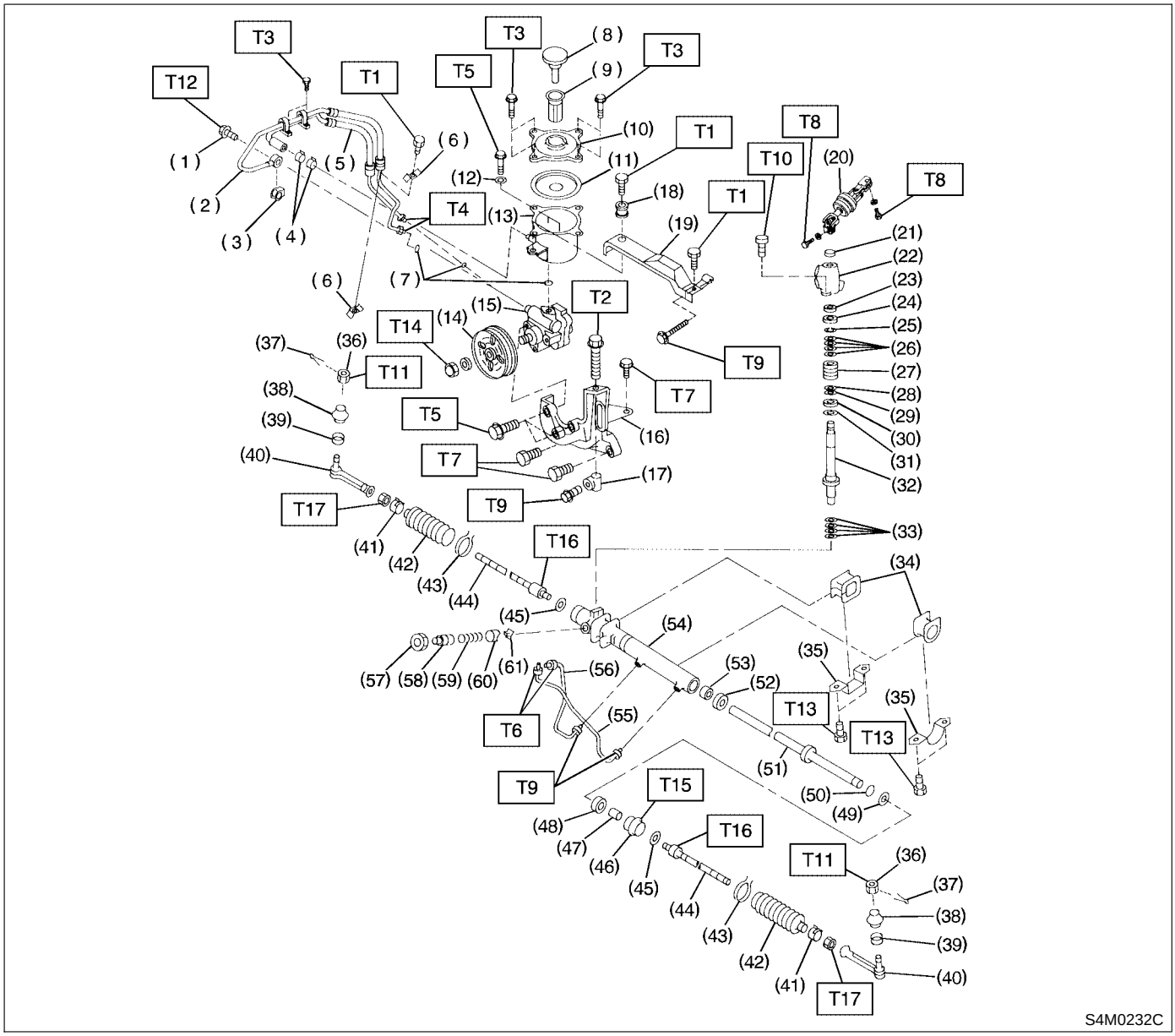


S4M0175E

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

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: 18 (1.8, 13.0)
T7: 22 (2.2, 15.9)
T8: 24 (2.4, 17.4)
T9: 25 (2.5, 18.1)
T10: 27.0 (2.75, 19.9)
T11: 39 (4.0, 28.9)
T12: 52 (5.3, 38)
T13: 59 (6.0, 43)
T14: 78 (8.0, 58)
T15: 83 (8.5, 61.5)

- **RHD Model**



S4M0232C

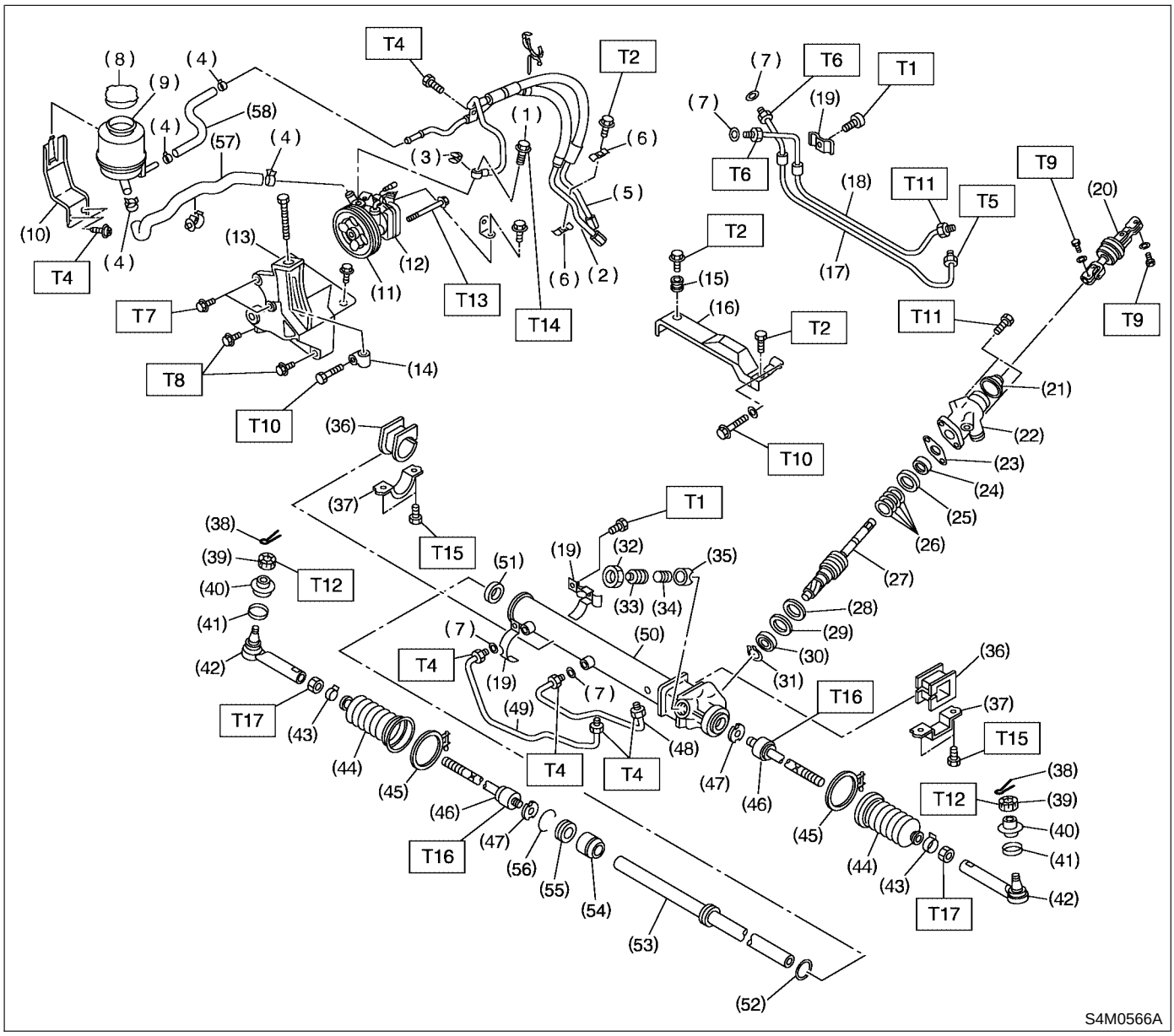
(1) Eye bolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Strainer
(10) Upper shell
(11) Buffle
(12) Seal washer
(13) Lower shell
(14) Pulley
(15) Oil pump
(16) Bracket
(17) Belt tension nut
(18) Bushing
(19) Belt cover
(20) Universal joint
(21) Dust cover
(22) Valve housing
(23) Oil seal
(24) Ball bearing
(25) Retaining ring
(26) Seal ring
(27) Valve sleeve
(28) Seal ring
(29) O-ring
(30) Oil seal
(31) Spacer
(32) Pinion
(33) Shim
(34) Adapter
(35) Clamp
(36) Castle nut
(37) Cotter pin
(38) Dust seal
(39) Clip
(40) Tie-rod end
(41) Clip
(42) Boot
(43) Wire
(44) Tie-rod
(45) Lock washer
(46) Holder
(47) Bushing
(48) Oil seal
(49) Oil seal
(50) O-ring
(51) Rack
(52) Oil seal
(53) Back-up washer
(54) Steering body
(55) Pipe A
(56) Pipe B
(57) Lock nut
(58) Adjusting screw
(59) Spring
(60) Sleeve
(61) Seat pad

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: 18 (1.8, 13.0)
T6: 20 (2.0, 14.5)
T7: 22 (2.2, 15.9)
T8: 24 (2.4, 17.4)
T9: 24.5 (2.50, 18.1)
T10: 25 (2.5, 18.1)
T11: 27.0 (2.75, 19.9)
T12: 39 (4.0, 28.9)
T13: 59 (6.0, 43)
T14: 52 (5.3, 38)
T15: 64 (6.5, 47)
T16: 78 (8.0, 58)
T17: 83 (8.5, 61.5)

3. POWER ASSISTED SYSTEM FOR TURBO MODEL S601001A0505

- **LHD Model**

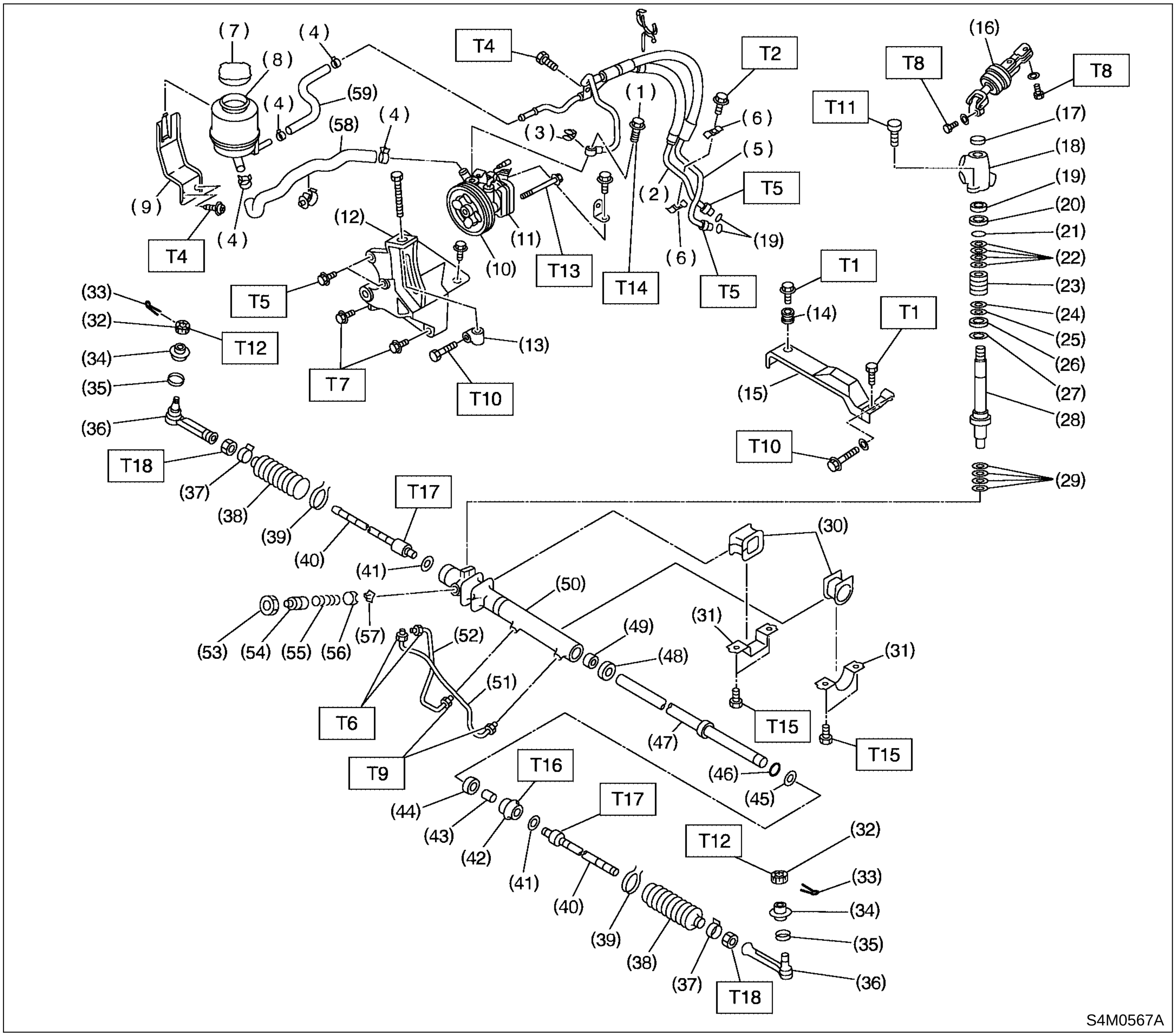


(1) Eye bolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Reservoir tank
(10) Reservoir tank bracket
(11) Pulley
(12) Oil pump
(13) Bracket
(14) Belt tension nut
(15) Bushing
(16) Belt cover
(17) Pipe E
(18) Pipe F
(19) Clamp plate
(20) Universal joint
(21) Dust cover
(22) Valve housing
(23) Gasket
(24) Oil seal
(25) Special 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 seal
(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) Circlip
(57) Suction hose
(58) Tank 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 (1.5, 10.8)
T7: 15.7 (1.6, 11.6)
T8: 22 (2.2, 15.9)
T9: 24 (2.4, 17.4)
T10: 25 (2.5, 18.1)
T11: 25 (2.5, 18.1)
T12: 27 (2.75, 19.9)
T13: 37.3 (3.8, 27.5)
T14: 39 (4.0, 28.9)
T15: 59 (6.0, 43)
T16: 78 (8.0, 58)
T17: 83 (8.5, 61.5)
T18: 25 (2.5, 18.1)

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

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: 24 (2.4, 17.4)
T10: 24.5 (2.50, 18.1)
T11: 25 (2.5, 18.1)
T12: 27.0 (2.75, 19.9)
T13: 37.3 (3.8, 27.5)
T14: 39 (4.0, 28.9)
T15: 59 (6.0, 43)
T16: 64 (6.5, 47)
T17: 78 (8.0, 58)
T18: 83 (8.5, 61.5)

C: CAUTION S601001A03

- This section includes Airbag related repair works. For those corresponding to the repair procedures, read carefully CAUTION items in AB section before working and be sure to follow the instructions.
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- 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 SUBARU genuine steering fluid, grease etc. or the equivalent. Do not mix steering fluid, grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply steering fluid onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of steering fluid to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL S601001A17

1. SPECIAL TOOLS S601001A1701

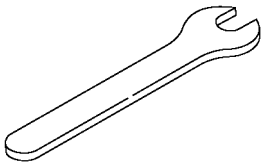
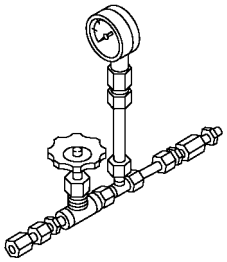
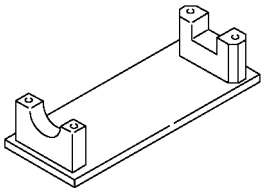
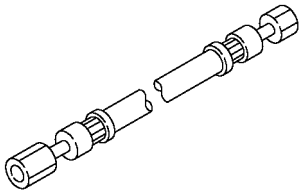
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2411	925700000	WRENCH	• Used for removing and installing tie-rod. • Apply this tool to rack.
 B4M2412	925711000	PRESSURE GAUGE	Used for measuring oil pump pressure.
 B4M2413	926200000	STAND	Used when inspecting characteristic of gearbox assembly and disassembling it.
 B4M2414	34099AC010	ADAPTER HOSE A	Used with PRESSURE GAUGE (925711000).

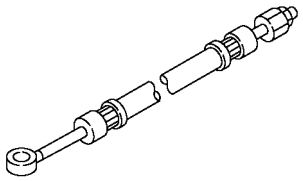
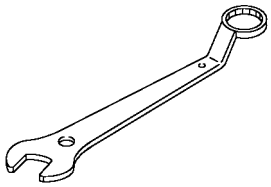
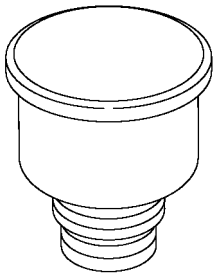
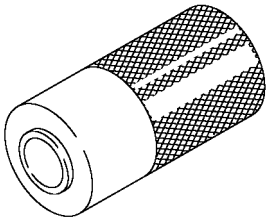
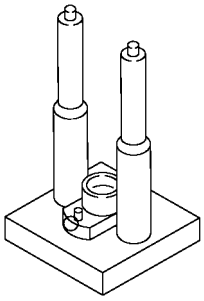
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2415	34099AC020	ADAPTER HOSE B	Used with PRESSURE GAUGE (925711000).
 B4M2416	926230000	SPANNER	● For the lock nut when adjusting backlash of gearbox. ● Measurement of rotating resistance of gearbox assembly.
 B4M2419	34199AE040	OIL CHARGE GUIDE	● Used for charging power steering oil. ● For TURBO model
 B4M2420	927640000	INSTALLER B	● Used for installing ball bearing into housing. ● For LHD model
 B4M2421	926370000	INSTALLER A	● Used for installing valve assembly into valve housing assembly. ● Used with STAND BASE (927630000). ● For LHD model

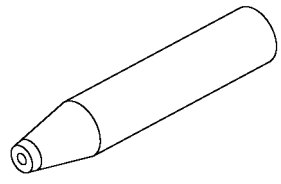
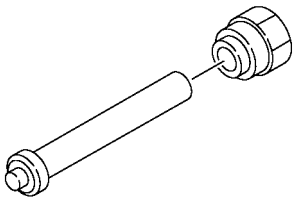
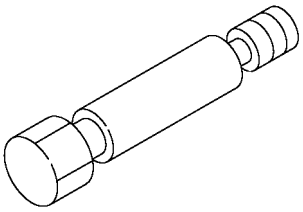
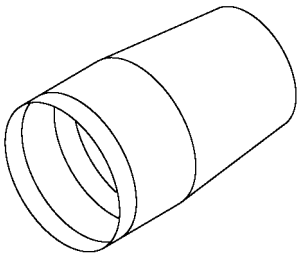
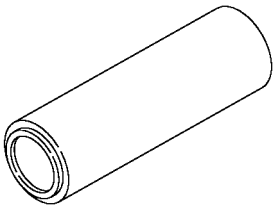
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2422	926390001	COVER & REMOVER ASSY	● Used for assembling rack assembly. ● For LHD model
 B4M2423	926420000	PLUG	● When oil leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check oil leaking points. ● For LHD model
 B4M2424	926400000	GUIDE	● Right side of rack when installing rack bush. ● Used with GUIDE (927660000). ● For LHD model
 B4M2425	927660000	GUIDE	● Right side of rack when installing rack bush. ● Used with GUIDE (926400000). ● For LHD model
 B4M2426	927620000	INSTALLER B	● Used for installing oil seal of valve housing. ● Used with INSTALLER A (926360000). ● For LHD model

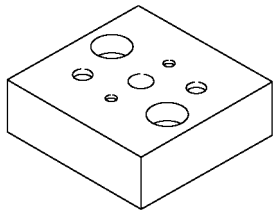
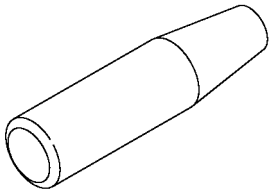
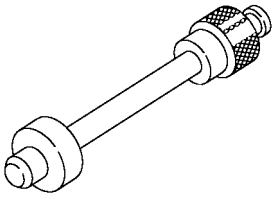
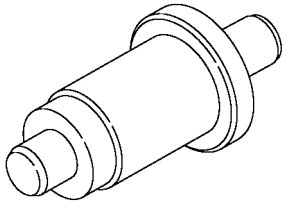
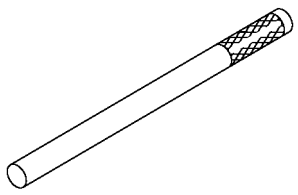
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2427	34099FA100	STAND BASE	• Used for assembling power steering gearbox. • For LHD model
 B4M2428	926360000	INSTALLER A	• Used as a guide to install oil seal. • Used with INSTALLER B (927620000). • For LHD model
 B4M2429	34199AE050	INSTALLER	• Used for installing oil seal. • For LHD model
 B4M2430	34099FA120	INSTALLER	• Used for installing valve housing oil seal. • For LHD model
 B4M2432	34199AE050	REMOVER OIL SEAL	• Used for removing back-up ring and oil seal. • For LHD model

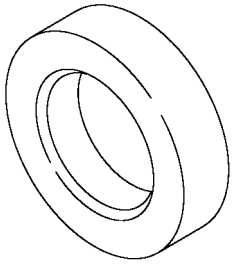
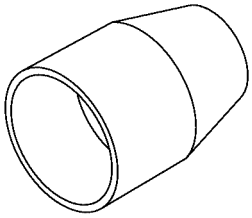
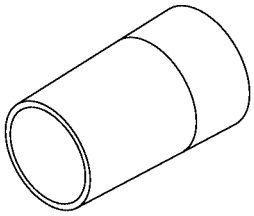
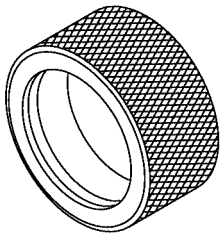
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2431	34099FA130	INSTALLER SEAL	● Used for installing valve housing oil seal. ● Used with INSTALLER AND REMOVER SEAL (34099FA120). ● For LHD model
 B4M2488	926250000	GUIDE	● Used for installing holder ASSY into rack hous-ing. ● For RHD model
 B4M2489	926270000	COVER	● Used for installing oil seal to pinion. ● For RHD model
 B4M2490	926280000	FORMER	● Used for installing seal ring to pinion. ● For RHD model

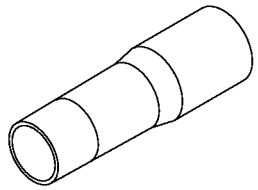
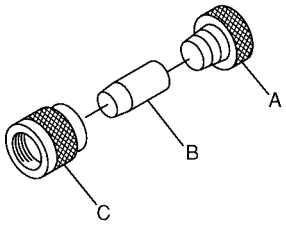
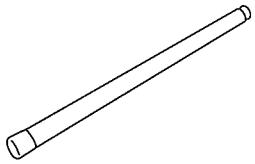
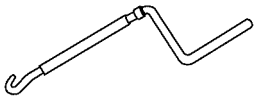
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2491	926450000	COVER	• Used for installing oil seal to pinion. • For RHD model
 B4M2492A	927490000	INSTALLER A, B, C	• Used for installing oil seal into rack ASSY. • For RHD model
 B4M2493	927580000	REMOVER	• Used for removing back-up ring and oil seal. • For RHD model
 B4M2494	927590000	WRENCH	• Used for removing wire from boot. • For RHD model

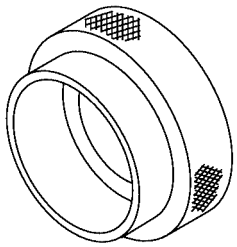
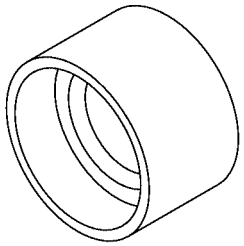
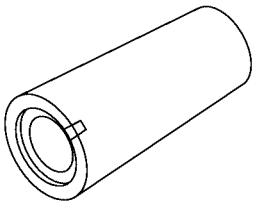
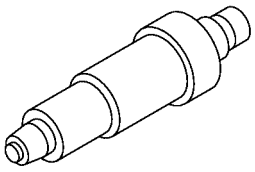
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2495	927600000	FORMER	• Used for installing seal ring to rack pinion. • For RHD model
 B4M2496	927520000	INSTALLER D	• Used for installing pinion bearing. • For RHD model
 B4M2497	927530000	INSTALLER E	• Used for installing pinion bearing. • For RHD model
 B4M2499	34099FA000	INSTALLER & REMOVER	• Used for removing and installing Y-packing. • For RHD model

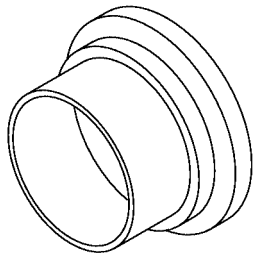
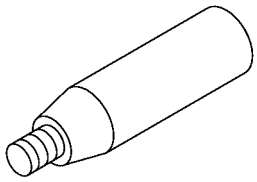
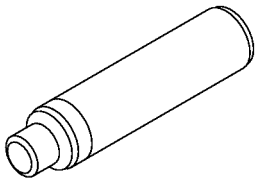
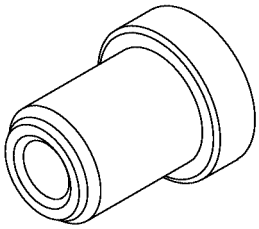
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2500	34099FA010	GUIDE	● Used for installing rack and seal into housing assembly. ● For RHD model
 B4M2501	34099FA020	GUIDE	● Used for installing valve assembly into valve housing assembly. ● For RHD model
 B4M2502	34099FA030	INSTALLER & REMOVER	● Used for removing and installing rack oil seal (outer & inner). ● For RHD model
 B4M2503	34099FA040	INSTALLER	● Used for installing rack oil seal (outer). ● For RHD model

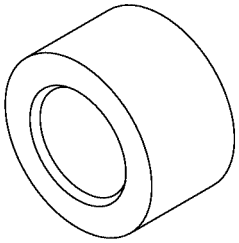
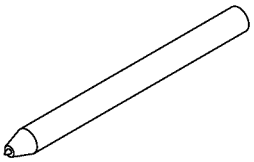
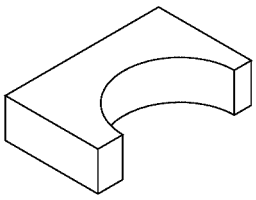
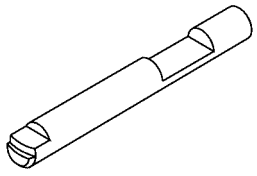
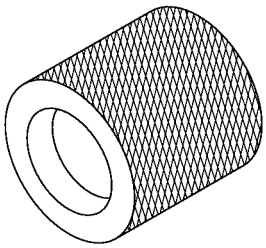
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2504	34099FA050	SPACER	● Used for installing bearing into valve housing. ● For RHD model
 B4M2505	34099FA060	PUNCH	● Used for caulking. ● For RHD model
 B4M2506	34099FA070	BASE	● Used for supporting housing assembly. ● For RHD model
 B4M2507	34099FA080	PUNCH	● Used for removing caulking. ● For RHD model

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2508	926050000	FORMER	● Used for installing seal ring to rack pinion. ● For RHD model

2. GENERAL PURPOSE TOOLS S601001A1702

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 steering gearbox.

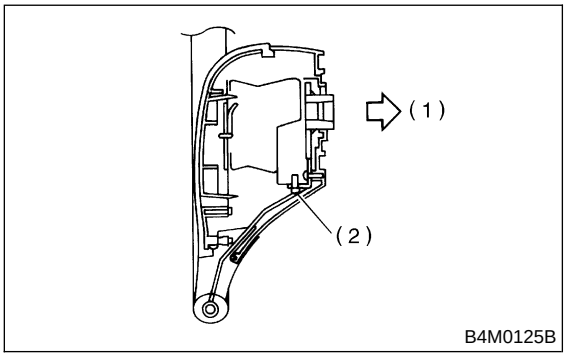
2. Steering Wheel S601274

A: REMOVAL S601274A18

1) Disconnect ground terminal from battery.
2) Set tires to straight-ahead position.
3) Remove airbag module. (with airbag model) <Ref. to AB-12 REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing airbag module service (if so equipped). <Ref. to AB-12 CAUTION, Driver's Airbag Module.>

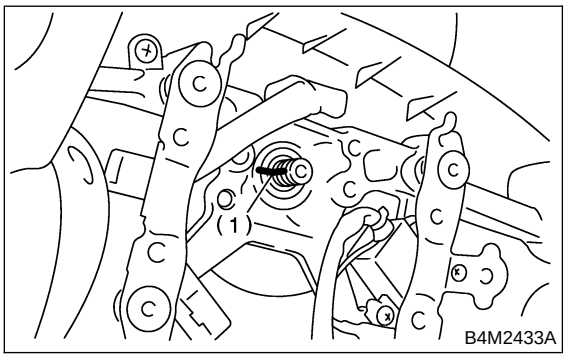
4) Remove lower screw and slide horn pad assembly forward, then disconnect connector. (without airbag model)
5) Remove horn pad by pulling on it. (without airbag model)



(1) Front
(2) Screw

6) Remove steering wheel nut, and then draw out steering wheel from shaft using steering puller.

NOTE:
Make matching marks on steering wheel and steering column in advance.



(1) Matching mark

B: INSTALLATION S601274A11

1) Align center of roll connector. <Ref. to AB-20 ADJUSTMENT, Roll Connector.>
2) Install in the reverse order of removal.

NOTE:
Align matching marks on steering wheel and steering column.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

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

WARNING:
Always refer to "Airbag System" before performing airbag module service (if so equipped). (with airbag model) <Ref. to AB-12 CAUTION, Driver's Airbag Module.>

CAUTION:
Insert roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage. Draw out airbag system connector, horn connector and cruise control connectors from guide hole of steering wheel lower end. (with airbag model)

C: INSPECTION S601274A10

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

3. Universal Joint S601273

A: REMOVAL S601273A18

1) Set the vehicle on the lift.
2) Remove the steering wheel. <Ref. to PS-27 REMOVAL, Steering Wheel.>
3) Lift-up the vehicle.
4) Remove universal joint bolts and then remove universal joint.

CAUTION:
Scribe alignment marks on universal joint so that it can be reassembled at the original serration.

B: INSTALLATION S601273A11

1) Install universal joint.
   (1) Align bolts hole on the long yoke side of universal joint with the cutout at the serrated section of shaft end, and insert universal joint.
   (2) Align bolt hole on the short yoke side of universal joint with the cutout at the serrated section of gearbox assembly. Lower universal joint completely.
   (3) Temporarily tighten bolt on the short yoke side. Raise universal joint to make sure the bolt is properly passing through the cutout at the serrated section.
   (4) Tighten bolt on the long yoke, then that on the short yoke side.

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

CAUTION:
● Make sure that universal joint bolt is tightened through notch in shaft serration.
● Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox to DOJ:
Over 15 mm (0.59 in)

2) Lower the vehicle.
3) Align center of roll connector. (with airbag model) <Ref. to AB-20 ADJUSTMENT, Roll Connector.>

CAUTION:
Ensure that front wheel are set straight forward direction.

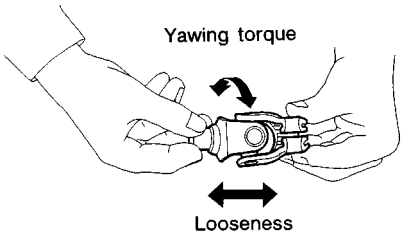
4) Install steering wheel and airbag module. (with airbag model) <Ref. to PS-27 INSPECTION, Steering Wheel.>

WARNING:
Always refer to “Airbag System” before performing airbag module service (if so equipped). <Ref. to AB-12 CAUTION, Driver’s Airbag Module.> and <Ref. to AB-13 INSTALLATION, Driver’s Airbag Module.>

5) Install horn pad to steering wheel. (without airbag model)

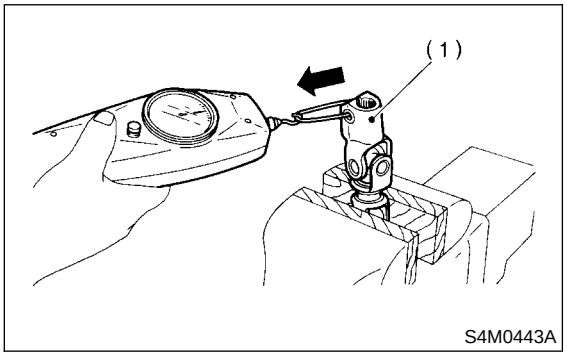
C: INSPECTION S601273A10

Clean the disassembled parts with a cloth, and check for wear, damage, or any other faults. If necessary, repair or replace faulty parts.

Inspection	Corrective action
• Free play • Swinging torque Yawing torque Looseness  G4M0089 **Standard value of universal joint free play: 0 mm (0 in)** **Max. value of universal joint swinging torque: 0.3 N·m (0.03 kgf-m, 0.2 ft-lb)**	Replace if faulty.

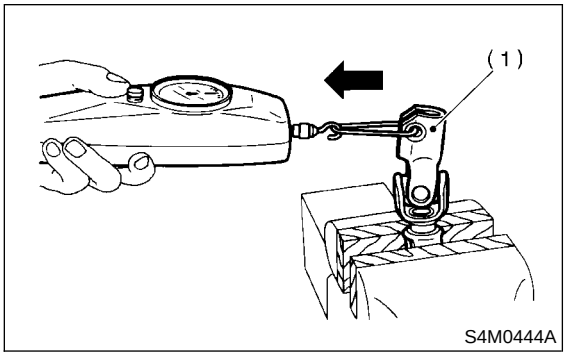
Measurement of folding torque of universal joint is as shown in the figures.

Service limit:
Maximum load; 5.49 N (0.56 kgf, 1.23 lb) or less



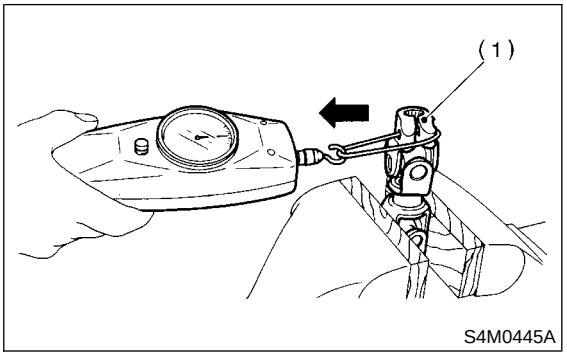
(1) Long yoke

Service limit:
Maximum load; 5.49 N (0.56 kgf, 1.23 lb) or less



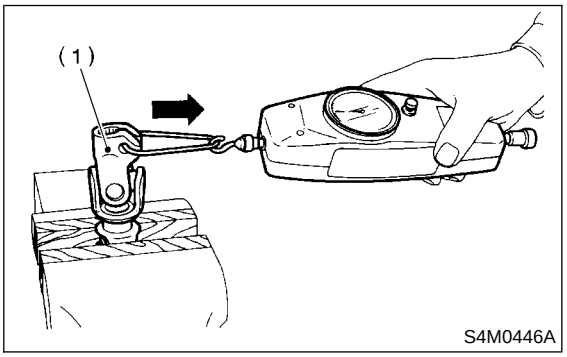
(1) Long yoke

Service limit:
Maximum load; 8.43 N (0.86 kgf, 1.90 lb) or less



(1) Short yoke

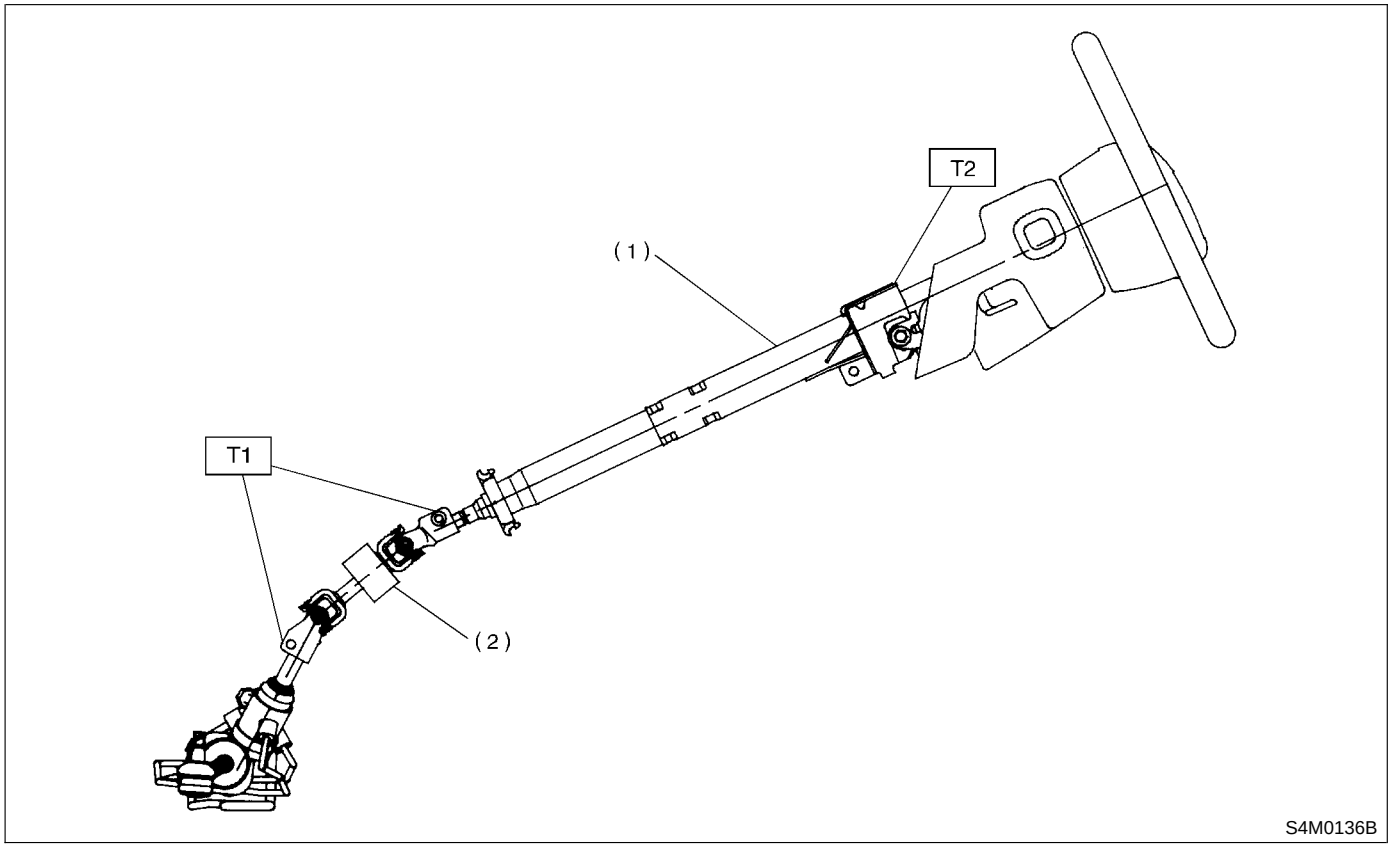
Service limit:
Maximum load; 8.43 N (0.86 kgf, 1.90 lb) or less



(1) Short yoke

4. Tilt Steering Column S601544

A: REMOVAL S601544A18



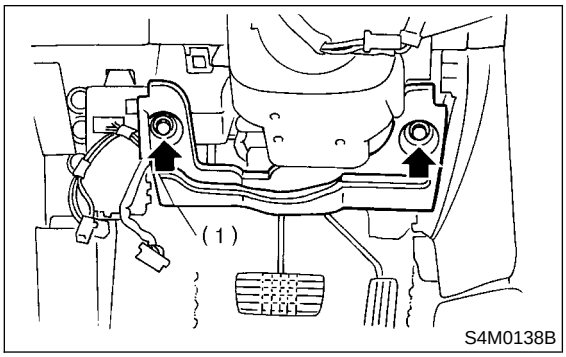
(1) Tilt steering column
(2) Universal joint

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 the lift.
2) Disconnect battery minus terminal.
3) Remove airbag module. <Ref. to AB-12 REMOVAL, Driver's Airbag Module.>

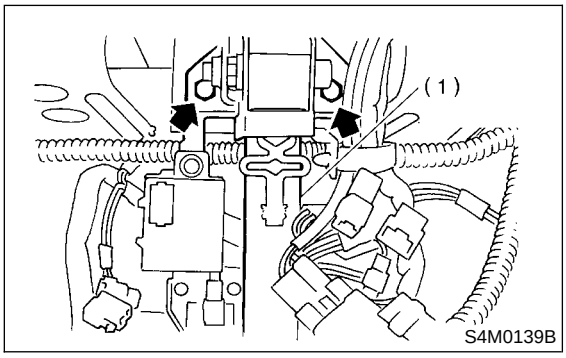
WARNING:
Always refer to "Airbag System" before performing airbag module service (if so equipped). <Ref. to AB-12 CAUTION, Driver's Airbag Module.>

4) Remove steering wheel. <Ref. to PS-27 REMOVAL, Steering Wheel.>
5) Lift-up the vehicle.
6) Remove universal joint. <Ref. to PS-28 REMOVAL, Universal Joint.>
7) Lower the vehicle.
8) Remove trim panel under instrument panel.
9) Remove knee bolster.



(1) Knee bolster

10) Disconnect connectors for ignition switch and combination switch wiring harness under instrument panel.
11) Remove the two bolts under instrument panel securing steering column.



(1) Steering column

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

CAUTION:
Be sure to remove universal joint before removing steering shaft assembly installing bolts when removing steering shaft assembly or when lowering it for servicing of other parts.

B: INSTALLATION S601544A11

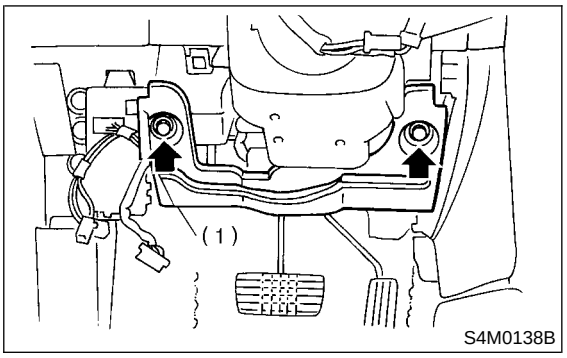
1) Insert end of steering shaft into toe board grommet.
2) Tighten steering shaft mounting bolts under instrument panel.

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

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

NOTE:
Make sure to apply double lock.

5) Install lower column cover with tilt lever held in the lowered position.
6) Install universal joint. <Ref. to PS-28 INSTALLATION, Universal Joint.>
7) Install knee bolster.



(1) Knee bolster

8) Align center of roll connector. <Ref. to AB-20 ADJUSTMENT, Roll Connector.>

CAUTION:
Ensure that front wheels are set in straight forward direction.

9) Install steering wheel. <Ref. to PS-27 INSTALLATION, Steering Wheel>
Set steering wheel to neutral and install it onto steering shaft.

CAUTION:
Insert roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage. Draw out airbag system connector, horn connector and cruise control connectors from guide hole of steering wheel lower end.

10) Install airbag module to steering wheel. (with airbag model) <Ref. to AB-13, INSTALLATION, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing the service operation. <Ref. to AB-12 CAUTION, Driver's Airbag Module.>

11) Install horn pad to steering wheel. (without air-bag model)

C: DISASSEMBLY S601544A06

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

D: ASSEMBLY S601544A02

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

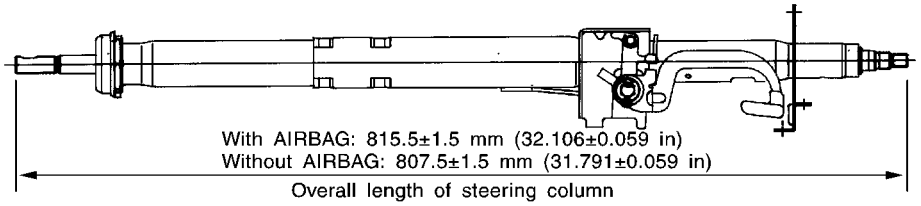
Tightening torque:
1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

CAUTION:
Don't overtorque screw.

E: INSPECTION S601544A10

1. BASIC INSPECTION S601544A1001

Clean the disassembled parts with a cloth, and check for wear, damage, or any other faults. If necessary, repair or replace faulty parts.

Inspection	Corrective action
• Overall length of steering column Measure overall length of steering column. Standard overall length of steering column:  S4M0141B	Replace steering column assembly.

2. AIRBAG MODEL INSPECTION S601544A1002

WARNING:
For airbag model inspection procedures, refer to "Airbag System". <Ref. to AB-12 CAUTION, Airbag Module.> and <Ref. to AB-13 INSPECTION, Driver's Airbag Module.>

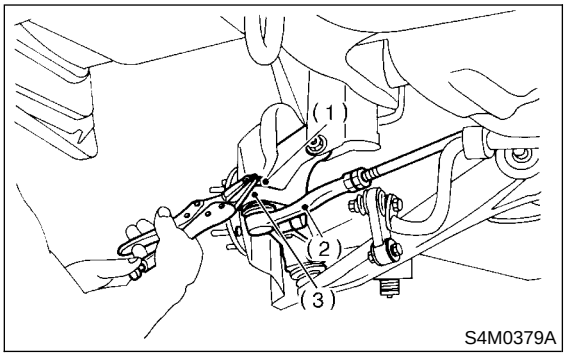
5. Steering Gearbox [LHD Model] S601272

A: REMOVAL S601272A18

1) Disconnect battery ground terminal.
2) Loosen front wheel nut.
3) Lift vehicle and remove front wheels.
4) Remove front exhaust pipe assembly. (Non-turbo model)
With OBD:
<Ref. to EX(SOHC)-5, REMOVAL, Front Exhaust Pipe.>
Without OBD:
<Ref. to EX(SOHCw/oOBD)-6, REMOVAL, Front Exhaust Pipe.>

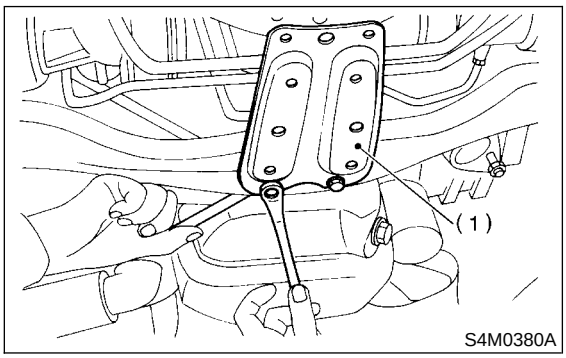
WARNING:
Be careful, exhaust pipe is hot.

5) Using a puller, remove tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



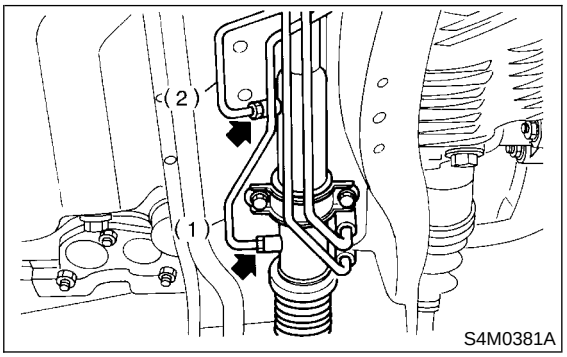
(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

6) Remove jack-up plate and front stabilizer.



(1) Jack-up plate

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

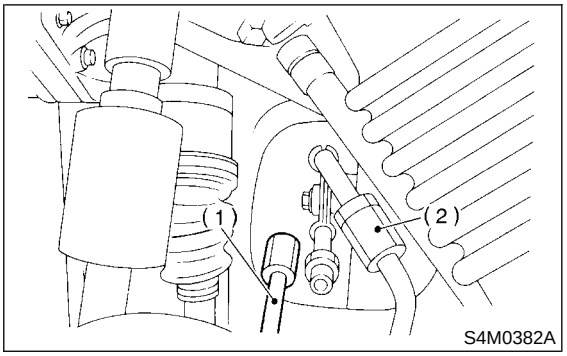


(1) Pipe A
(2) Pipe B

8) Remove universal joint. <Ref. to PS-28, REMOVAL, Universal Joint.>
9) Disconnect pipes C and D from pipe of gearbox.

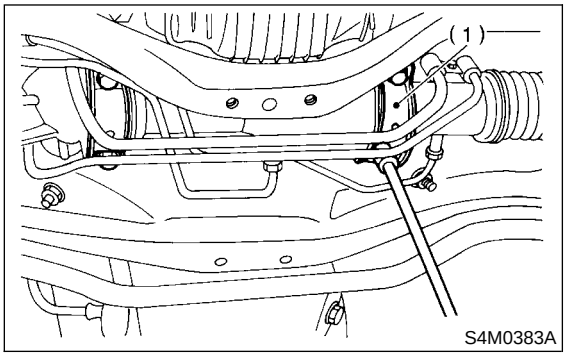
CAUTION:
Be careful not to damage these pipes.

NOTE:
Disconnect upper pipe D first, and lower pipe C second.



(1) Pipe C
(2) Pipe D

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

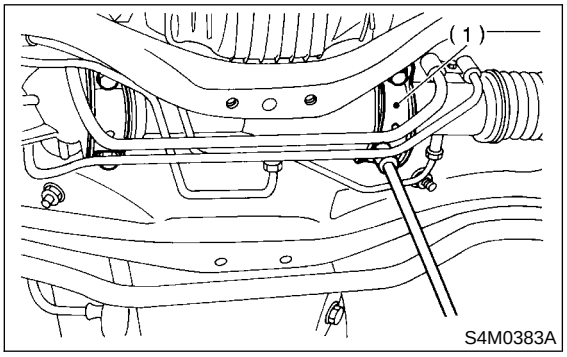


(1) Clamp

B: INSTALLATION S601272A11

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

Tightening torque:
59 N·m (6.0 kgf-m, 43 ft-lb)



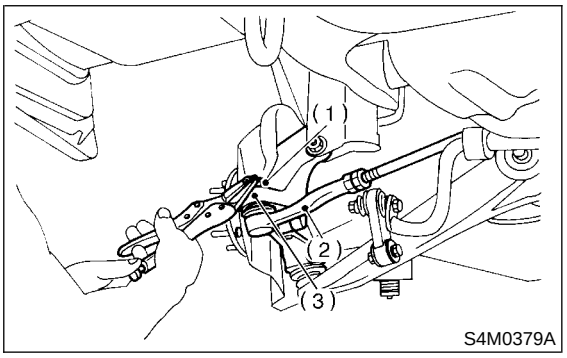
(1) Clamp

3) Install universal joint. <Ref. to PS-28, INSTALLATION, Universal Joint.>

4) Connect tie-rod end and knuckle arm, and tighten with castle nut. Fit cotter pin into the nut and bend the pin to lock.

Castle nut tightening torque:
Tighten to 27.0 N·m (2.75 kgf-m, 19.9 ft-lb), and tighten further within 60° until cotter pin hole is aligned with a slot in the nut.

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



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

5) Install front stabilizer to vehicle. <Ref. to FS-22, INSTALLATION, Front Stabilizer.>
6) Install front exhaust pipe assembly. (Non-turbo model)
With OBD: <Ref. to EX(SOHC)-6, INSTALLATION, Front Exhaust Pipe.>
Without OBD: <Ref. to EX(SOHCw/oOBD)-7, INSTALLATION, Front Exhaust Pipe.>
7) Install tires.
8) Tighten wheel nuts to the specified torque.

Tightening torque:
88 N·m (9.0 kgf-m, 65 ft-lb)

9) Connect ground terminal to battery.
10) Pour fluid into oil tank, and bleed air.
<Ref. to PS-101, Power Steering Fluid.>
11) Check for fluid leaks. <Ref. to PS-51, OIL LEAKING, INSPECTION, Steering Gearbox [LHD Model].>
12) Install jack-up plate.

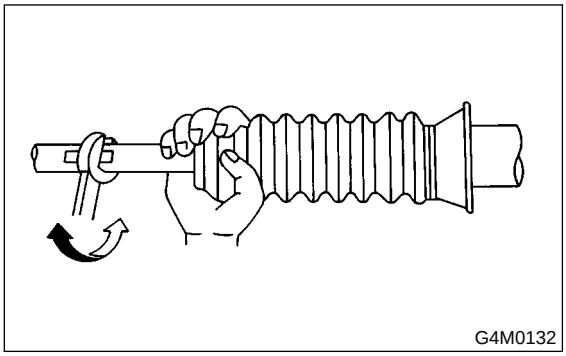
WARNING:
Be careful, exhaust manifold is hot.

13) Lower vehicle.
14) Check fluid level in oil tank.

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

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

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

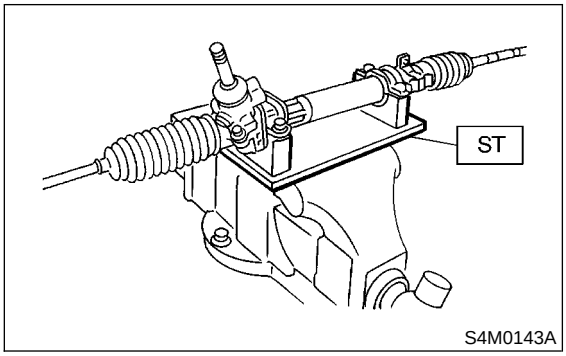

G4M0132

C: DISASSEMBLY *S601272A06*

1. RACK HOUSING ASSEMBLY *S601272A0601*

1) Disconnect four pipes from gearbox.
2) Secure gearbox removed from vehicle in vise using ST.
ST 926200000 STAND

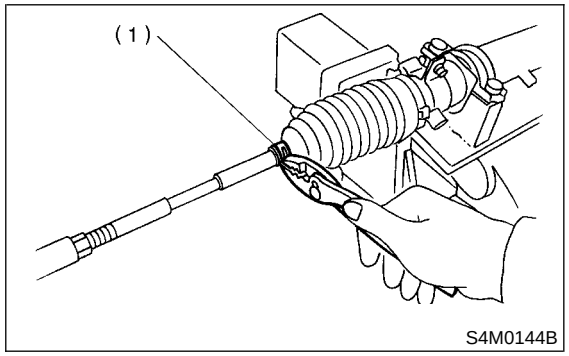
CAUTION:
Secure the gearbox in a vise using the ST as shown. Do not attempt to secure it without this ST.



S4M0143A

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

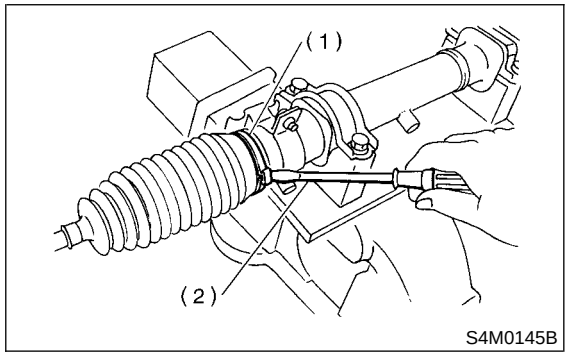
4) Remove small clip from boot using pliers, and move boot to tie-rod end side.



S4M0144B

(1) Clip

5) Using standard screwdriver, remove band from boot.

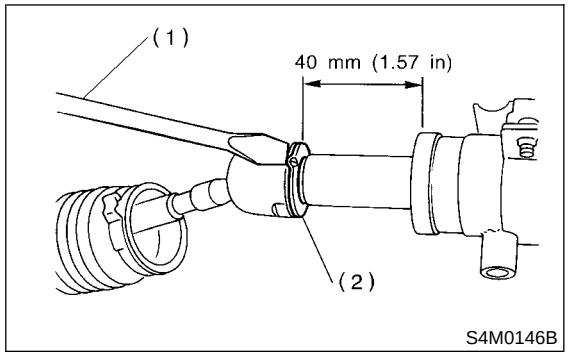


S4M0145B

(1) Band
(2) Standard screwdriver

6) Extend rack approximately 40 mm (1.57 in) out. Unlock lock wire at lock washer on each side of tie-rod end using a standard screwdriver.

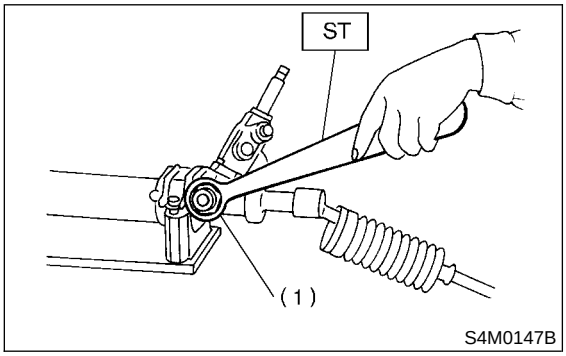
CAUTION:
Be careful not to scratch rack surface as oil leaks may result.



S4M0146B

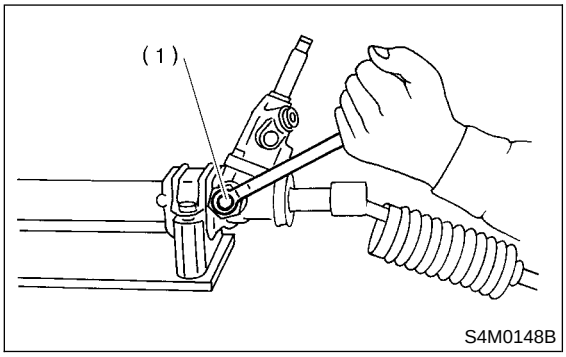
(1) Standard screwdriver
(2) Lock washer

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



(1) Lock nut

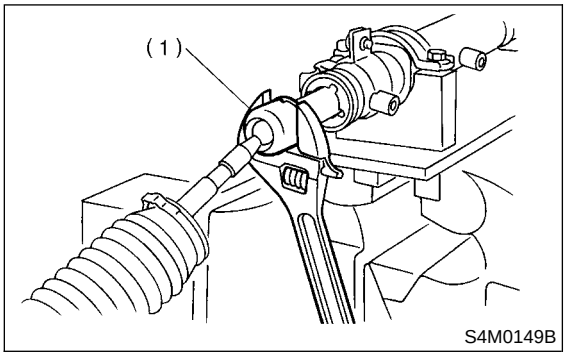
8) Tighten adjusting screw until it no longer tightens.



(1) Adjusting screw

9) Using a wrench [32 mm (1.26 in) width across flats] or adjustable wrench, remove tie-rod.

CAUTION:
● Check ball joint for free play, and tie-rod for bends. Replace if necessary.
● Check dust seals used with tie-rod end ball joint for damage or deterioration. Replace if necessary.

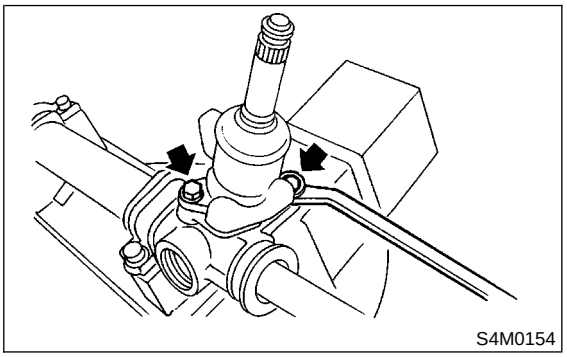


(1) Tie-rod

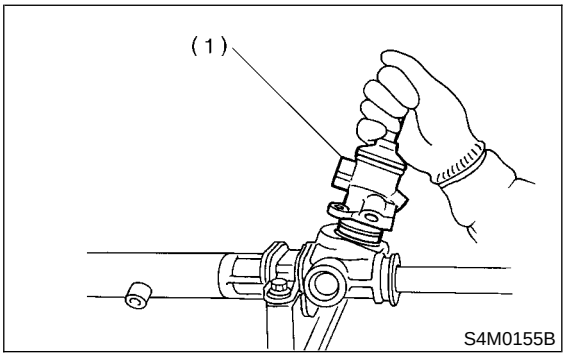
10) Loosen adjusting screw and remove spring and sleeve.

CAUTION:
Replace spring and/or sleeve if damaged.

11) Remove two bolts securing valve assembly.

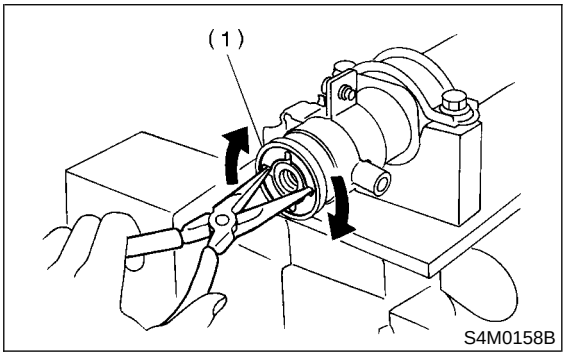


12) Carefully draw out input shaft and remove valve assembly.



(1) Valve ASSY

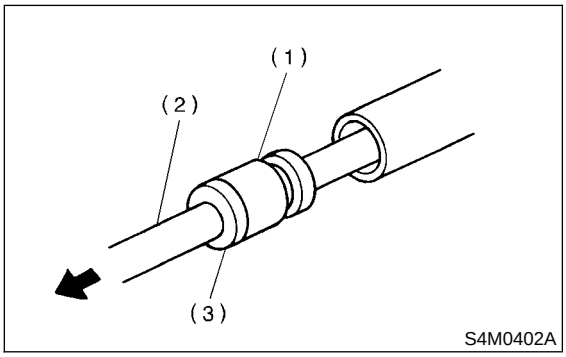
13) Using a sharp pointed pliers, rotate the rack stopper in the direction of the arrow until the end of the circlip comes out of the stopper. Rotate the circlip in the opposite direction and pull it out.



(1) Rack stopper

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

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

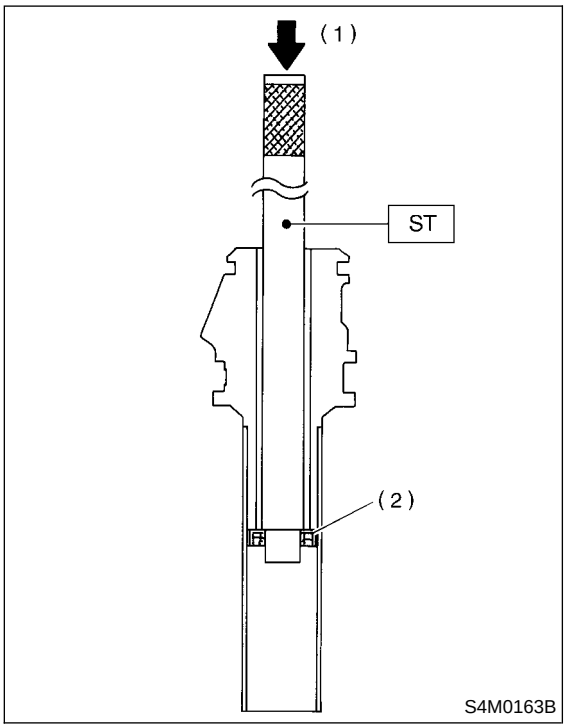


(1) Rack bushing
(2) Rack ASSY
(3) Rack stopper

15) Remove rack bushing and rack stopper from rack assembly.

CAUTION:
Do not reuse removed rack bushing and circlip.

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



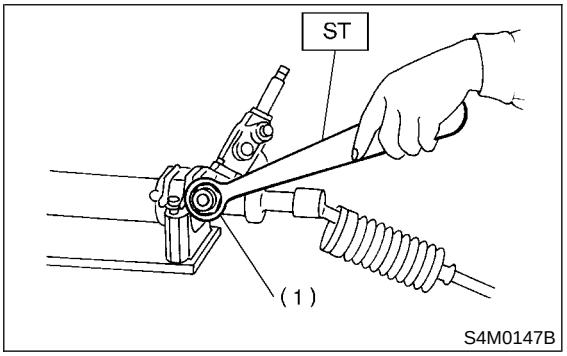
(1) Press
(2) Oil seal

NOTE:
Discard removed oil seal.

2. CONTROL VALVE ASSEMBLY S601272A0602

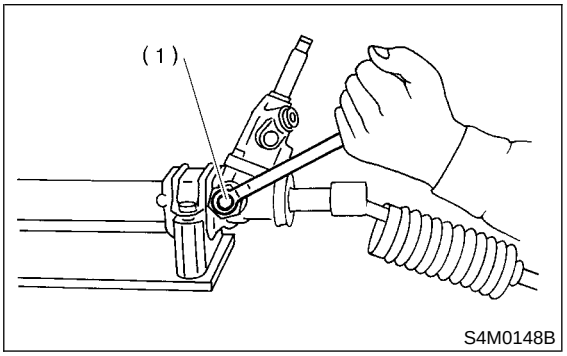
NOTE:
Parts requiring replacement are described in the smallest unit of spare parts including damaged parts and spare parts damaged. In actual disassembly work, accidental damage as well as inevitable damage to some related parts must be taken into account, and spare parts for them must also be prepared. However, it is essential to pinpoint the cause of trouble, and limit the number of replacement parts as much as possible.

1) Using ST, loosen lock nut.
ST 926230000 SPANNER



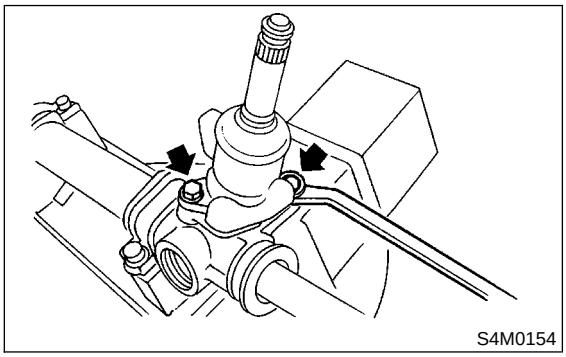
(1) Lock nut

2) Tighten adjusting screw until it no longer tightens.

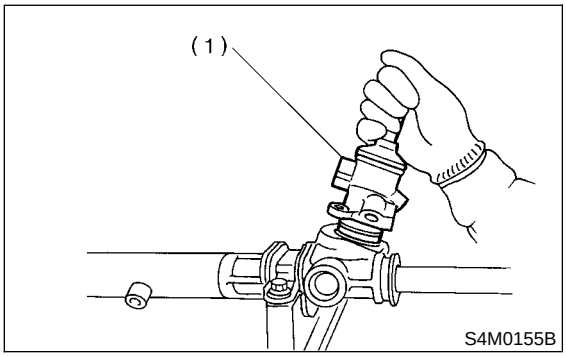


(1) Adjusting screw

3) Remove two bolts securing valve assembly.

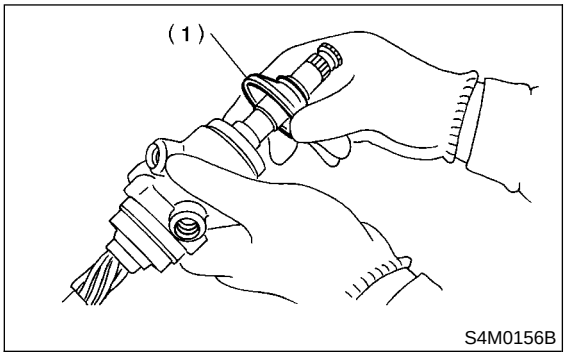


4) Carefully draw out input shaft and remove valve assembly.



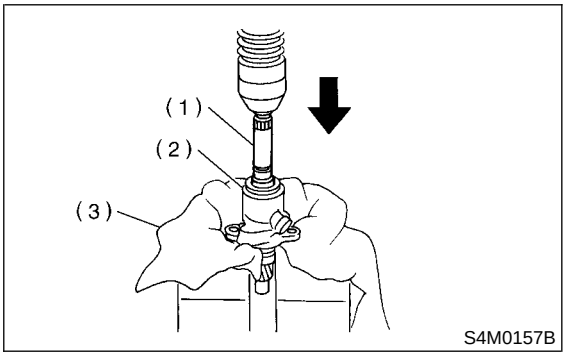
(1) Valve ASSY

5) Slide dust cover out.



(1) Dust cover

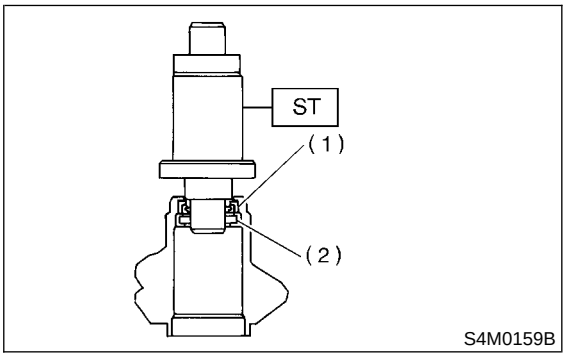
6) Using a press remove pinion and valve assembly from valve housing.



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

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

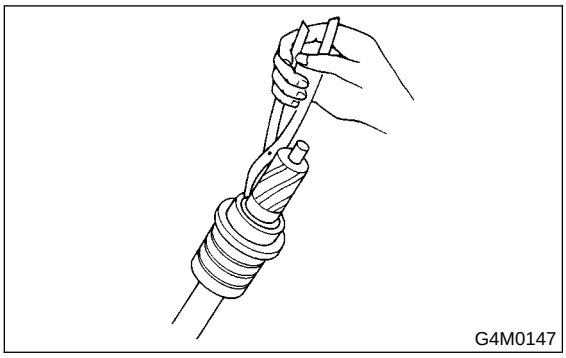
CAUTION:
● Do not apply a force to end surface of valve housing.
● Do not reuse oil seal after removal.



(1) Oil seal
(2) Special bearing

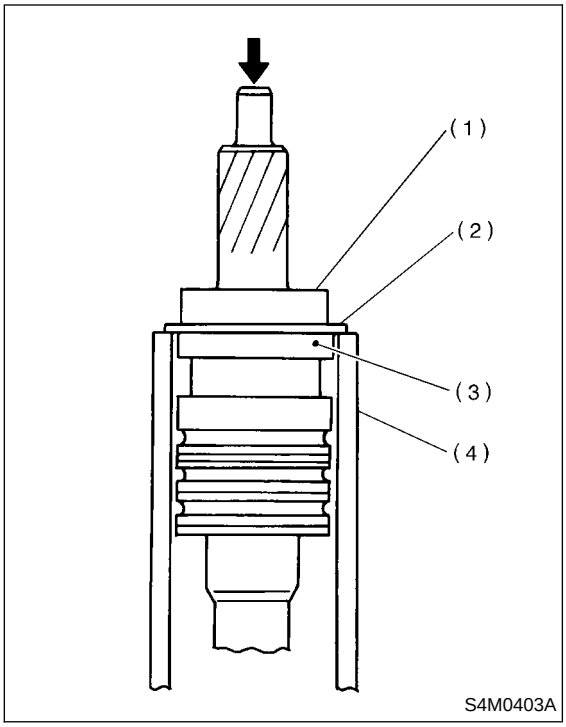
8) Remove snap ring using snap ring pliers.

CAUTION:
● Do not reuse removed snap ring.
● Be careful not to scratch pinion and valve assembly.



9) Press out bearing together with backing washer using pipe of I.D. 38.5 to 39.5 mm (1.516 to 1.555 in) and press.

CAUTION:
Do not reuse removed bearing.



(1) Bearing
(2) Backing washer
(3) Oil seal
(4) Pipe

10) Remove oil seal.

CAUTION:
Do not reuse removed oil seal.

D: ASSEMBLY S601272A02

1. RACK HOUSING ASSEMBLY S601272A0201

CAUTION:
Use only SUBARU genuine grease for gearbox.

Grease:
VALIANT GREASE M2
[Part No. 003608001, net 0.5 kg (1.1 lb)]

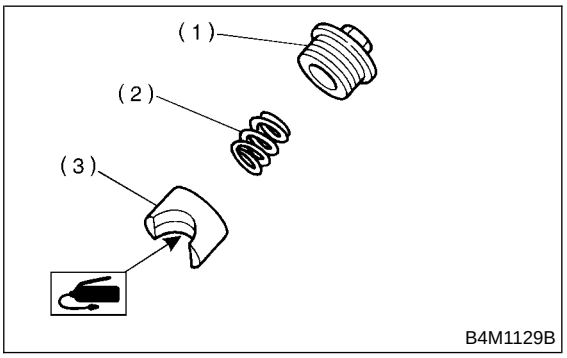
1) Clean all parts and tools before reassembling.
2) Apply grease to teeth of rack so that grease applied is about as high as teeth, and also apply a thin film of grease to sliding portion of rack shaft.

CAUTION:
● When moving rack to stroke end without tie-rod attached, prevent shocks from being applied at the end.
● Do not apply grease to threaded portion at end of rack shaft.
● Move rack shaft to stroke end two (2) or three (3) times to squeeze grease which accumulates on both ends. Remove grease to prevent it from choking air passage hole.

3) Apply grease to sleeve insertion hole.
4) Apply grease to dust seal insertion hole.

CAUTION:
Apply clean grease with clean hands. If material having a sharp edge is used for applying grease, oil seal at the inside might be damaged.

5) Apply grease to sliding surface of sleeve and spring seat, then insert sleeve into pinion housing. Fit spring into sleeve screw, pack grease inside of screw, then install the screw.



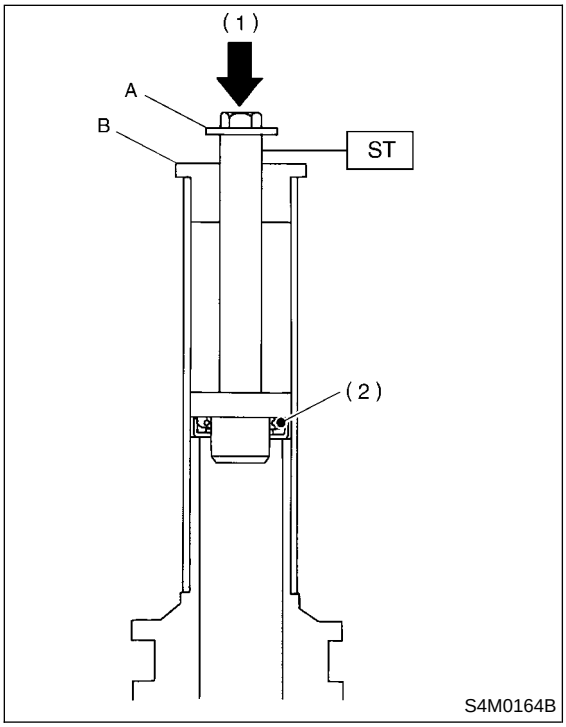
(1) Adjusting screw
(2) Spring
(3) Sleeve

6) Force-fit oil seal using ST.
ST 34099FA110 INSTALLER

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

NOTE:
● Apply specified power steering fluid to oil seal.

● Pay special attention not to install oil seal in wrong direction.
● Push oil seal until the stepped portion of A contacts end face of B.

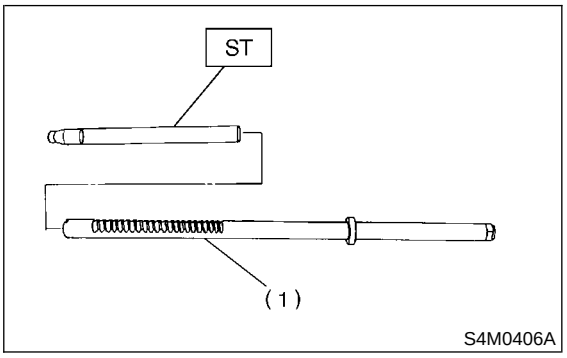


(1) Press
(2) Oil seal

7) Fixing rack housing
Fix rack housing in vise using ST.
ST 926200000 STAND

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

8) Fit 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



(1) Rack ASSY

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

CAUTION:
● Be careful not to block air passage with grease. Remove excessive grease.
● After fitting cover, check air passage hole for clogging. If clogged, open by removing grease from the hole.
● Check rack shaft for damage.
● Apply specified power steering fluid to this ST and surface of piston ring to prevent seal from being damaged.

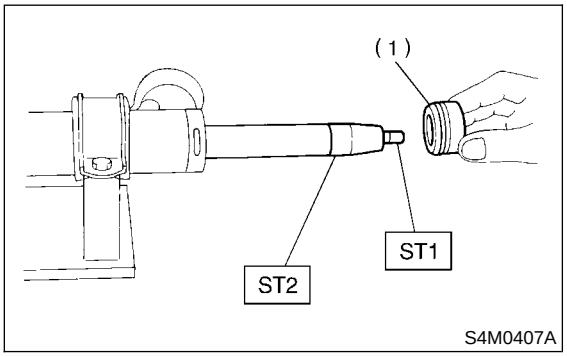
10) Insert rack assembly into rack housing from cylinder side, and remove ST after it has passed completely through oil seal.

NOTE:
Before inserting rack assembly, apply a coat of specified power steering fluid to surfaces of ST and rack piston.

ST 926390001 COVER & REMOVER

11) Fit ST1 and ST2 over the end of rack, and install 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 rack bushing in specified power steering fluid before installing, and pay attention not to damage O-ring and oil seal.

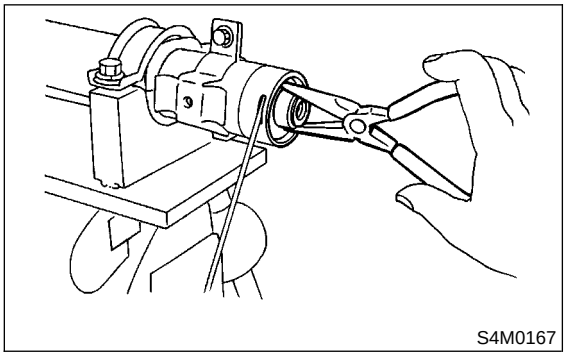


(1) Rack bushing ASSY

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

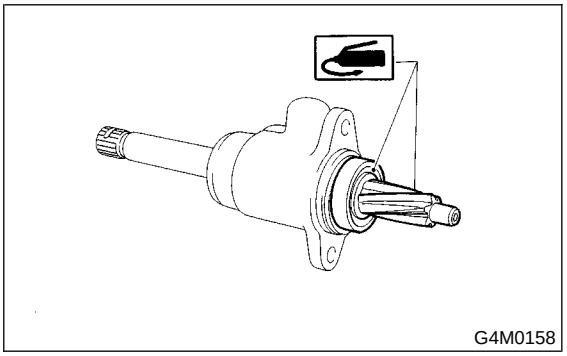
CAUTION:
Be careful not to scratch rack while winding circlip.

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



14) Fit mounting rubber onto rack housing.

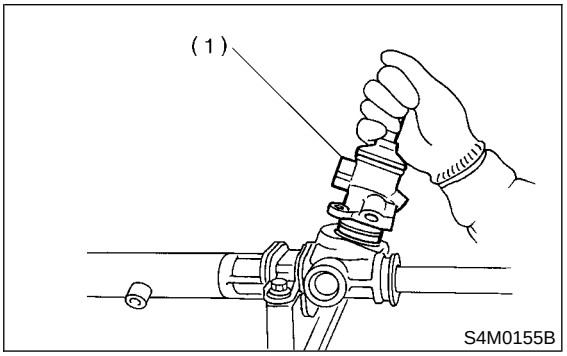
15) Apply genuine grease to pinion gear and bearing of valve assembly.



16) Install gasket on valve assembly. Insert valve assembly into place while facing rack teeth toward pinion.

CAUTION:
Be sure to use a new gasket.

NOTE:
Do not allow packing to be caught when installing valve assembly.



(1) Valve ASSY

17) Tighten bolts alternately to secure valve assembly.

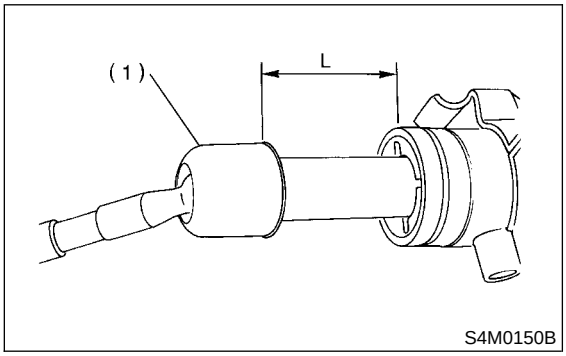
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

CAUTION:
Be sure to alternately tighten bolts.

18) Install lock washers and tighten left and right tie-rods into rack ends.

On condition
L: Approximately 40 mm (1.57 in)

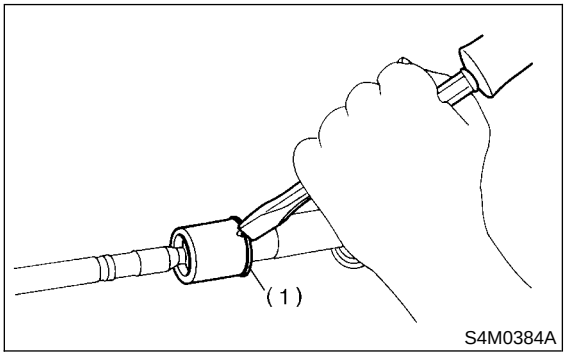
Tightening torque:
78 N·m (8.0 kgf-m, 58 ft-lb)



(1) Tie-rod

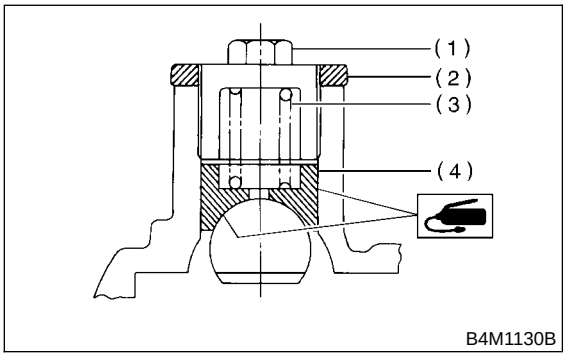
19) Bend lock washer using a chisel.

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



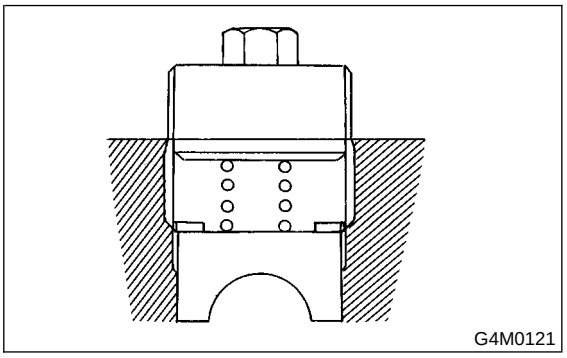
(1) Lock washer

20) Rack and pinion backlash adjustment
(1) Loosen adjusting screw.
(2) Rotate input shaft so that rack is in the straight ahead direction.
(3) Apply grease to sleeve.



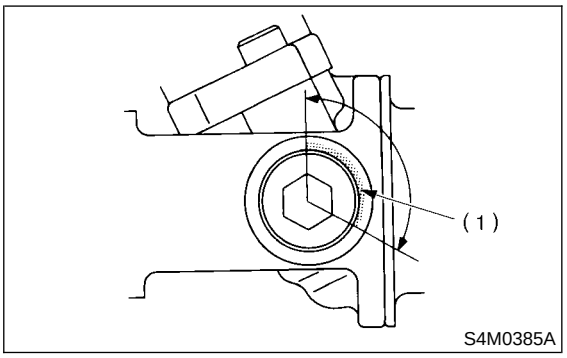
(1) Adjusting screw
(2) Lock nut
(3) Spring
(4) Sleeve

(4) Tighten adjusting screw by two threads.



(5) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.

Liquid packing:
THREE BOND 1141



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

(6) Tighten adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and back off 25°.
(7) Install lock nut. While holding adjusting screw with a wrench, tighten lock nut using ST.
ST 926230000 SPANNER

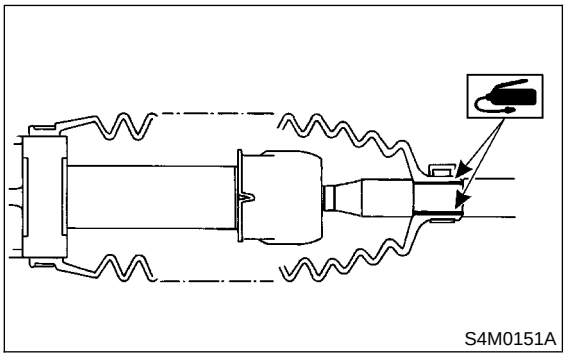
Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 29 ft-lb)

NOTE:
● Hold adjusting screw with a wrench to prevent it from turning while tightening lock nut.
● Make adjustment so that steering wheel can be rotated fully from lock to lock without binding.

21) Inspect for service limit as per article of “Service limit”. <Ref. to PS-49, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD Model].> Make replacement and adjustment if necessary.

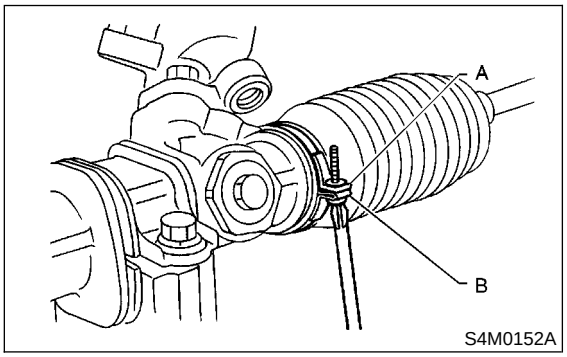
22) Install boot to housing.

NOTE:
● Before installing boot, be sure to apply grease to the groove of tie-rod.
● Install fitting portions of boots to the following portions in both sides of assembled steering gear-box.
The groove on gearbox
The groove on the rod
● Make sure that boot is installed without unusual inflation or deflation.


S4M0151A

23) Using a screwdriver, tighten the screw until the ends “A” and “B” of the band come into contact with each other.

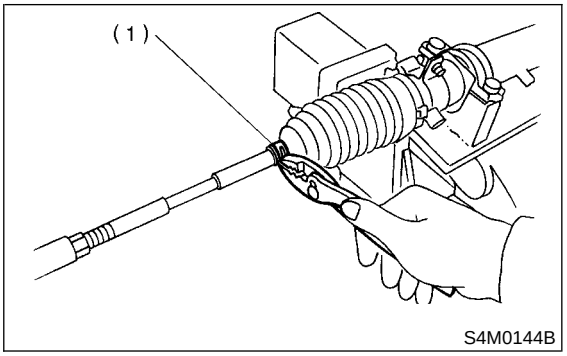
NOTE:
Always tighten the band from the underside of the gearbox.



S4M0152A

24) Fix boot end with clip (small).

CAUTION:
After installing, check boot end is positioned into groove on tie-rod.



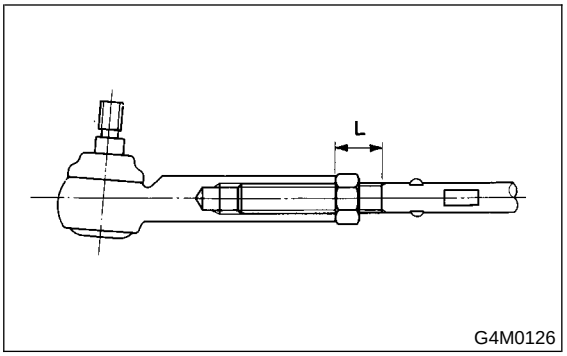
S4M0144B

(1) Clip

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

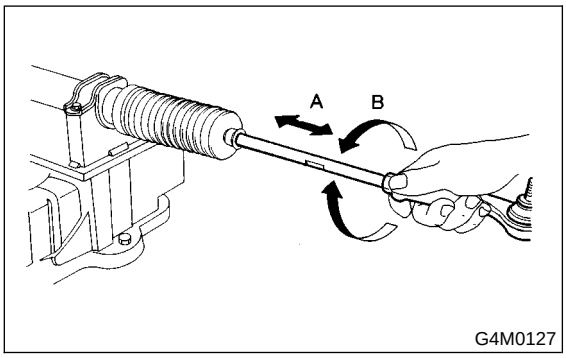
Installed tie-rod length: L
15 mm (0.59 in)

NOTE:
Pay attention to difference between right and left tie-rod ends.



G4M0126

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



27) Remove gearbox from ST.
ST 926200000 STAND
28) Install four pipes on gearbox.
(1) Connect pipes A and B to four pipe joints of gearbox. Connect upper pipe B first, and lower pipe A.

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

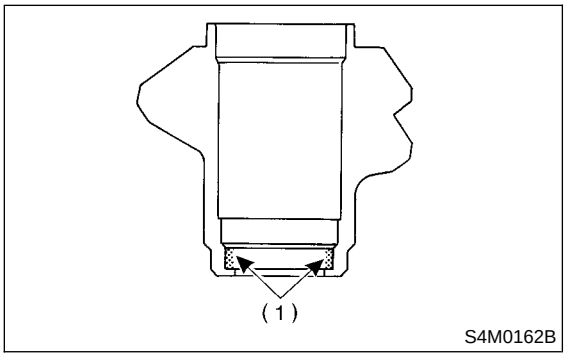
(2) Connect pipes C and D to gearbox.
Connect lower pipe C first, and upper pipe D second.

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

2. CONTROL VALVE ASSEMBLY S601272A0202

Specified steering grease:
VALIANT GREASE M2 (Part No. 003608001)

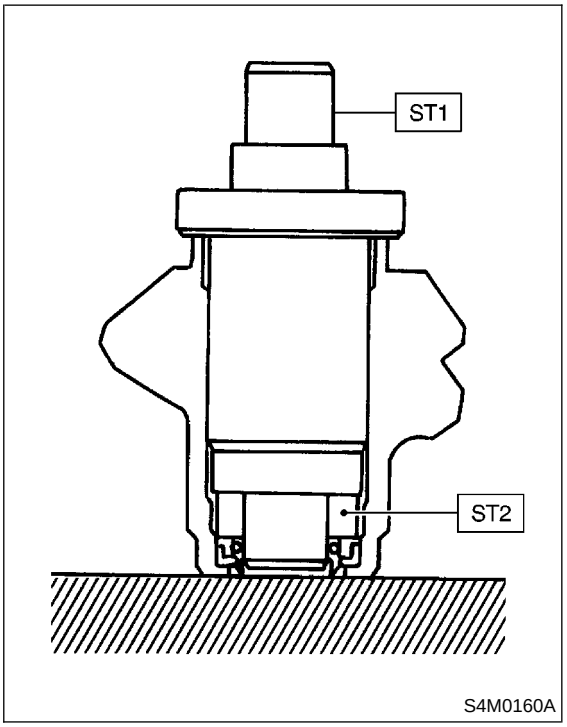
1) Clean all parts and tools before reassembling.
2) Apply a coat of specified power steering fluid to inner wall of valve housing.



(1) Fluid

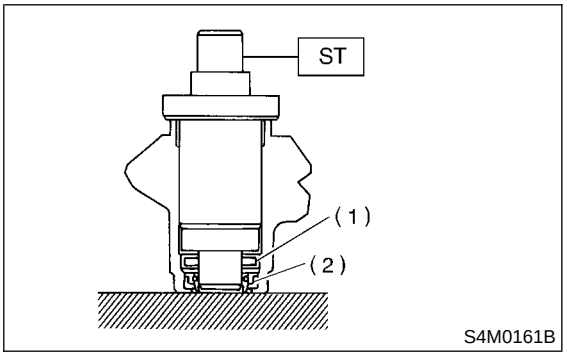
3) Attach ST2 to ST1, and press oil seal into place using a press.

ST1 34099FA120 SEAL INSTALLER & REMOVER
ST2 34099FA130 SEAL INSTALLER
(1) Face oil seal in the direction shown in figure when installing.
(2) To avoid scratching oil seal, apply a coat of grease to contact surface of installer and oil seal.
(3) To facilitate installation, attach oil seal to installer and position in valve housing before pressing into place.



4) Using ST and press, install special bearing in valve housing.
ST 34099FA120 SEAL INSTALLER & REMOVER

NOTE:
To facilitate installation, attach ball bearing to remover and position in valve housing before pressing it into place.

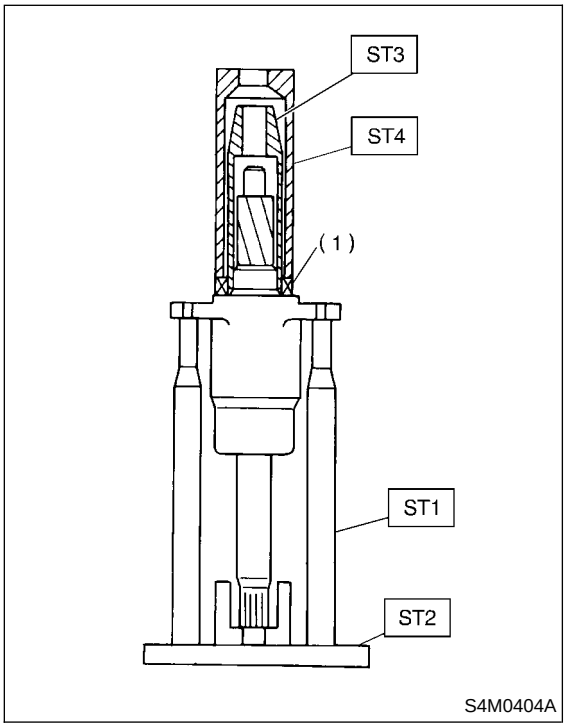


(1) Special bearing
(2) Oil seal

5) Put vinyl tape around pinion shaft splines to protect oil seal from damage.
6) Fit pinion and valve assembly into valve housing.

NOTE:
Apply specified power steering fluid to outer diameter surface of input shaft and outer surface of valve body seal ring, and pay special attention not to damage seal when inserting pinion and valve assembly.

7) Secure valve assembly to ST1 and ST2.
8) Put ST3 over pinion, and insert oil seal, then force-fit oil seal into housing using ST4.
ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
ST3 926360000 INSTALLER A
ST4 927620000 INSTALLER B

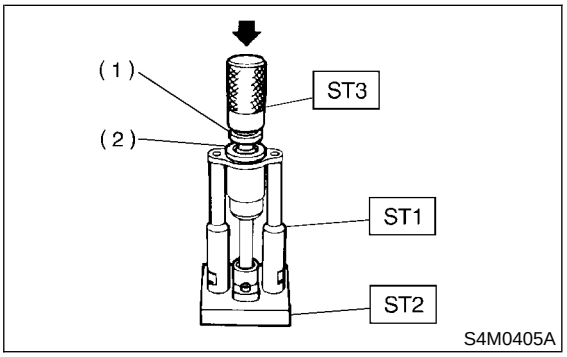


(1) Oil seal

NOTE:
● Apply specified power steering fluid to oil seal and ST3, being careful not to damage oil seal lip.
● Push oil seal until ST3 contacts housing end face.

9) Remove ST3, and fit backing washer.

10) Force-fit ball bearing using ST3.
ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
ST3 927640000 INSTALLER B



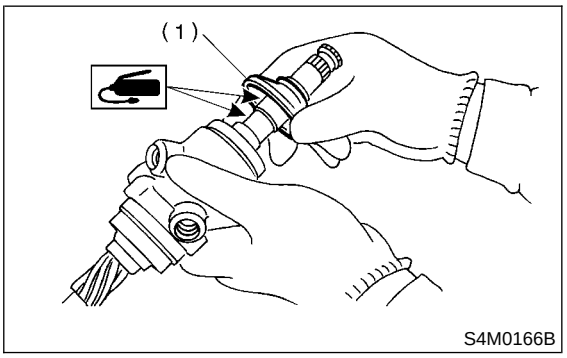
(1) Ball bearing
(2) Backing washer

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

11) Install snap ring using snap ring pliers.

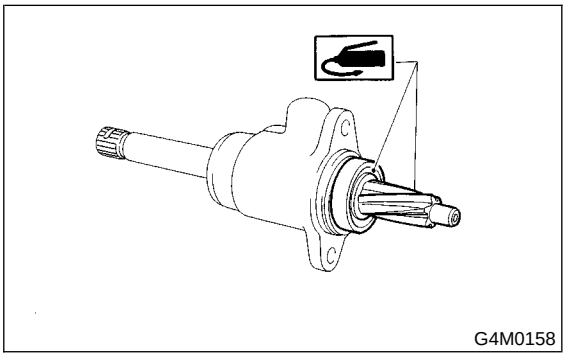
NOTE:
Rotate snap ring to check for proper installation.

12) Apply specified grease to dust cover.



(1) Dust cover

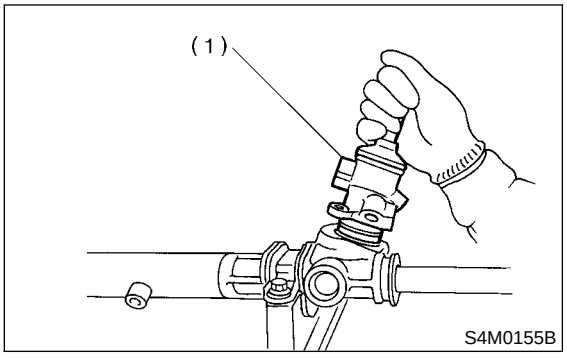
13) Install dust cover on valve assembly.
14) Apply genuine grease to pinion gear and bearing of valve assembly.



15) Install gasket on valve assembly. Insert valve assembly into place while facing rack teeth toward pinion.

CAUTION:
Be sure to use a new gasket.

NOTE:
Do not allow packing to be caught when installing valve assembly.



(1) Valve ASSY

16) Tighten bolts alternately to secure valve assembly.

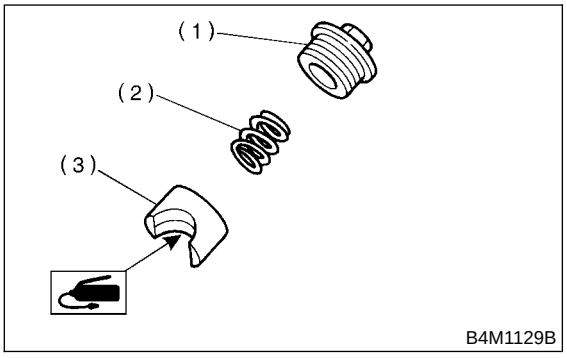
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

CAUTION:
Be sure to alternately tighten bolts.

17) Apply grease to sleeve insertion hole.
18) Apply grease to dust seal insertion hole.

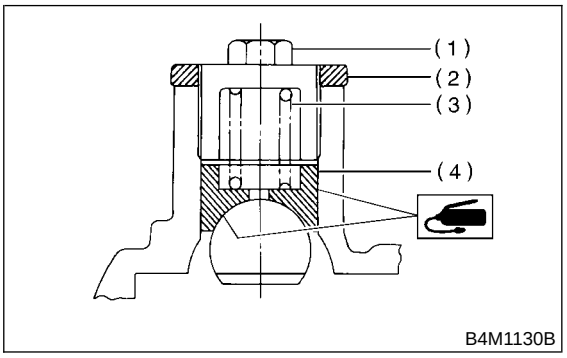
CAUTION:
Apply clean grease with clean hands. If material having a sharp edge is used for applying grease, oil seal at the inside might be damaged.

19) Apply grease to sliding surface of sleeve and spring seat, then insert sleeve into pinion housing. Fit spring into sleeve screw, pack grease inside of screw, then install the screw.



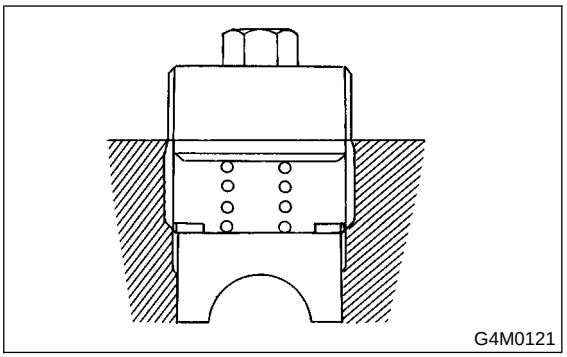
(1) Adjusting screw
(2) Spring
(3) Sleeve

20) Rack and pinion backlash adjustment
(1) Loosen adjusting screw.
(2) Rotate input shaft so that rack is in the straight ahead direction.
(3) Apply grease to sleeve.



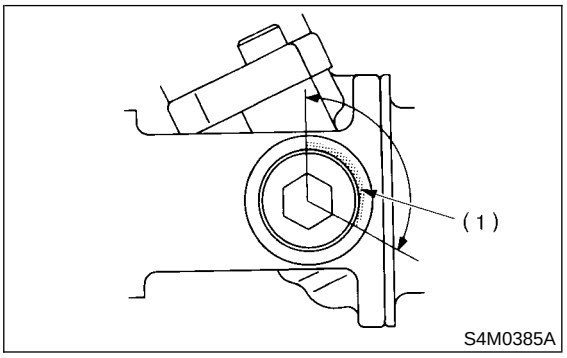
(1) Adjusting screw
(2) Lock nut
(3) Spring
(4) Sleeve

(4) Tighten adjusting screw by two threads.



(5) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.

Liquid packing:
THREE BOND 1141



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

(6) Tighten adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and back off 25°.

(7) Install lock nut. While holding adjusting screw with a wrench, tighten lock nut using ST.
ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 29 ft-lb)

NOTE:
● Hold adjusting screw with a wrench to prevent it from turning while tightening lock nut.
● Make adjustment so that steering wheel can be rotated fully from lock to lock without binding.

21) Check for service limit as per article of “Service limit”. <Ref. to PS-49, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD Model].> Make replacement and adjustment if necessary.

E: INSPECTION S601272A10

1. BASIC INSPECTION S601272A1001

1) Clean all disassembled parts, and check for wear, damage, or any other faults, then repair or replace as necessary.
2) When disassembling, check inside of gearbox for water. If any water is found, carefully check 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) Bend of input shaft (2) Damage on serration	If bend or damage is excessive, replace entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If outer wall slips, lip is worn out or damage is found, replace it with new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust backlash properly. By measuring turning torque of gearbox and sliding resistance of rack, check if rack and pinion engage uniformly and smoothly with each other. (Refer to “Service limit”.) (2) Keeping rack pulled out all the way so that all teeth emerge, check teeth for damage. Even if abnormality is found in either (1) or (2), replace entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace gearbox with new one.
		(4) Wear or damage on rack bush	If free play of rack shaft in radial direction is out of the specified range, replace gearbox with new one. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If free plays of input shaft in radial and axial directions are out of the specified ranges, replace gearbox with new one. (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 on dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipes	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

2. SERVICE LIMIT S601272A1002

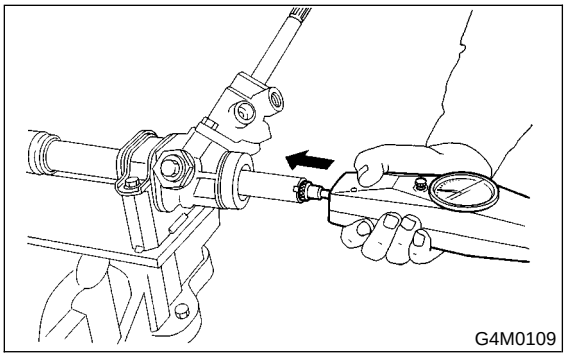
Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

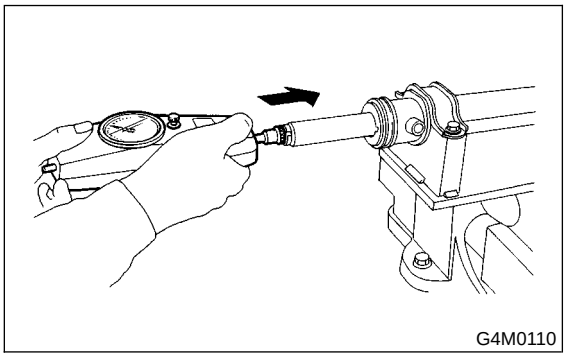
NOTE:
When making a measurement, vise gearbox by using ST. Never vise gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit
304 N (31 kgf, 68 lb) or less


G4M0109

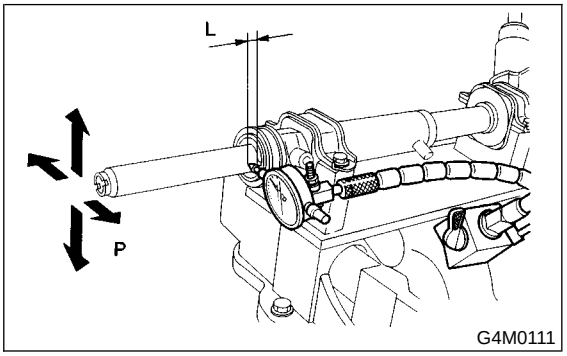

G4M0110

3. RACK SHAFT PLAY IN RADIAL DIRECTION S601272A1003

Right-turn steering:

Service limit
0.19 mm (0.0075 in) or less

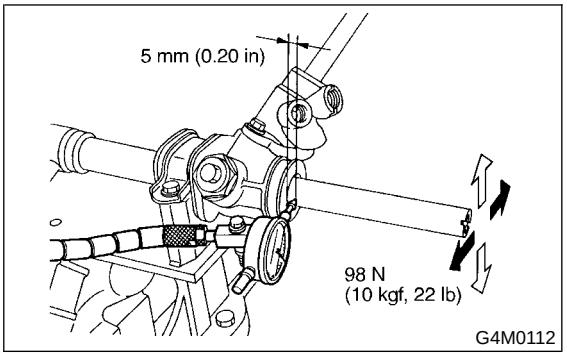
On condition
L: 5 mm (0.20 in)
P: 122.6 N (12.5 kgf, 27.6 lb)



G4M0111

Left-turn steering:

Service limit
Direction ⇦ ⇨
0.3 mm (0.012 in) or less
Direction ⬅ ➡
0.15 mm (0.0059 in) or less



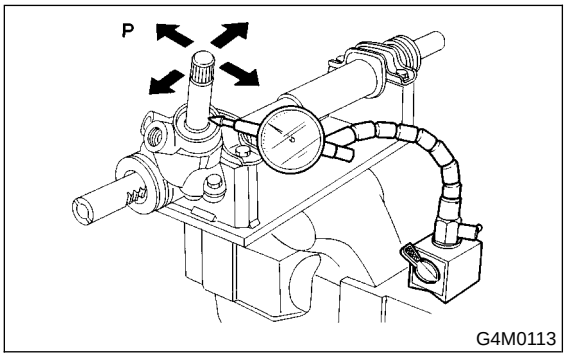
G4M0112

4. INPUT SHAFT PLAY S601272A1004

In radial direction:

Service limit
0.18 mm (0.0071 in) or less

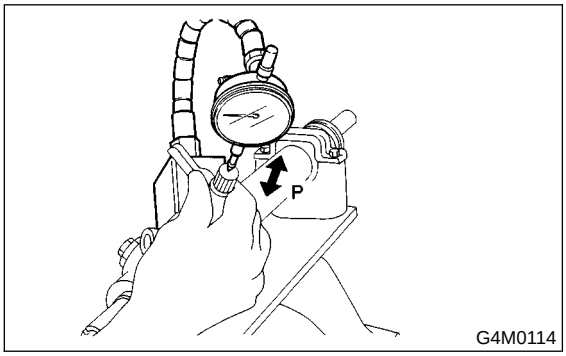
On condition
P: 98 N (10 kgf, 22 lb)



In axial direction:

Service limit
0.5 mm (0.020 in) or less

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



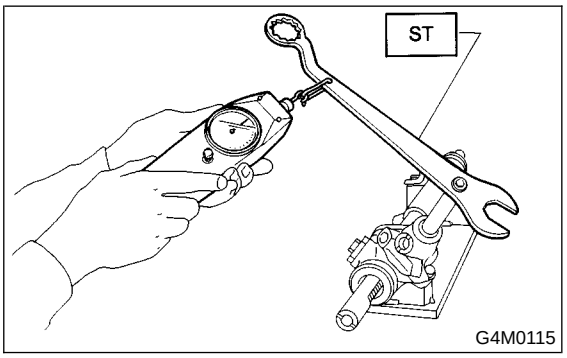
5. TURNING RESISTANCE OF GEARBOX

S601272A1005

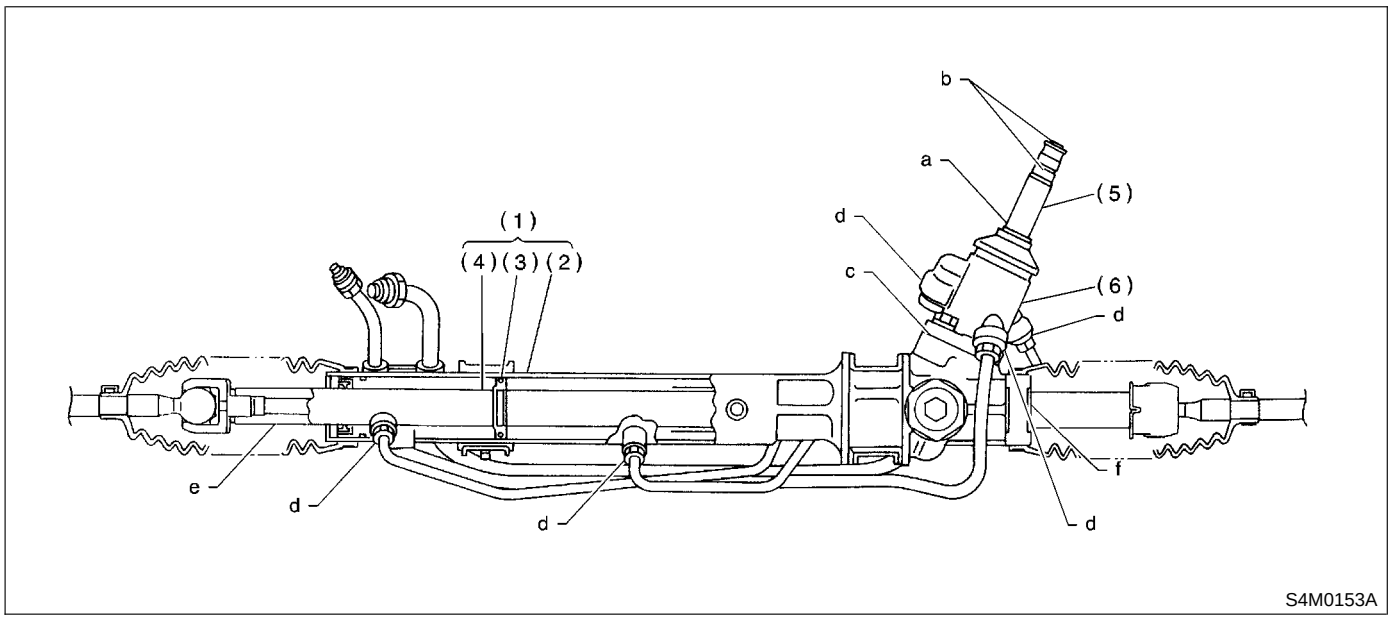
Using ST, measure gearbox turning resistance.

ST 926230000 SPANNER

Service limit:
Straight-ahead position within 30 mm (1.18 in) from rack center
Less than 11.18 N (1.14 kgf, 2.51 lb)
Maximum allowable resistance
12.7 N (1.3 kgf, 2.9 lb)



6. OIL LEAKING S601272A1006



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

NOTE:
If gearbox is dismounted without confirming where the leak is, it must be mounted again to locate the leak point.

1) Even if the location of the leak can be easily found by observing the leaking condition, it is necessary to thoroughly remove the oil from the suspected portion and turn the steering wheel from lock to lock about 30 to 40 times with engine running, then make comparison of the suspected portion between immediately after and several hours after this operation.
2) Inspect leakage from “a”.
The oil seal is damaged. Replace valve assembly with a new one.
3) Inspect leakage from “b”.
The torsion bar O-ring is damaged. Replace valve assembly with a new one.
4) Inspect leakage from “c”.
The oil seal is damaged. Replace valve assembly or oil seal with a new one.
5) Inspect leakage from “d”.
The pipe is damaged. Replace the faulty pipe or O-ring.
6) If leak is other than a, b, c, or d, and if oil is leaking from the gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove oil from the surrounding portions. Then, turn the steering wheel from lock to lock 30 to 40 times with the engine running, then make comparison of the leaked portion immediately after and several hours after this operation.
(1) Inspect leakage from “e”.
The cylinder seal is damaged. Replace rack bushing with a new one.
(2) Inspect leakage from “f”.
There are two possible causes. Take following step first. Remove the pipe assembly B from the valve housing, and close the circuit with ST.

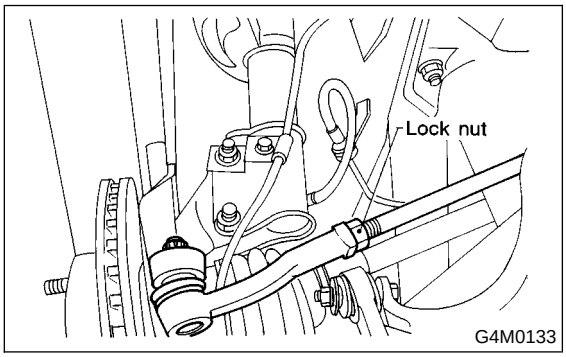
ST 926420000 PLUG

CAUTION:
● If leakage from “f” is noted again:
The oil seal of pinion and valve assembly is damaged. Replace pinion and valve assembly with a new one. Or replace the oil seal and the parts that are damaged during disassembly with new ones.
● If oil stops leaking from “f”:
The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

F: ADJUSTMENT S601272A01

1) Adjust front toe.

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



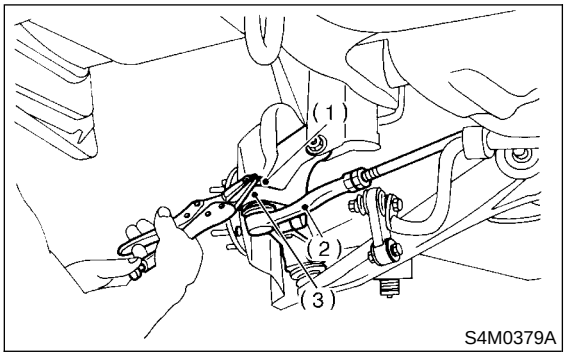
2) Adjust steering angle of wheels.

Standard of steering angle:
Inner wheel: 37.4°±1.5°
Outer wheel: 32.5°±1.5°

6. Steering Gearbox [RHD Model] S601276

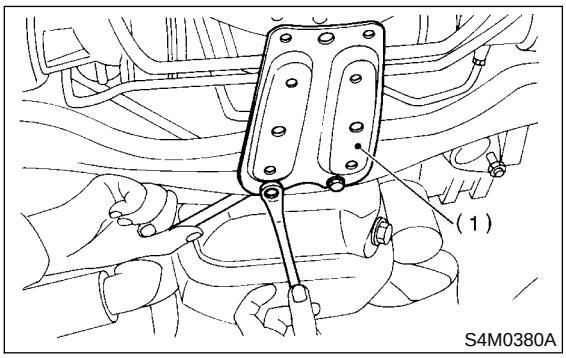
A: REMOVAL S601276A18

1) Disconnect battery minus terminal.
2) Lift vehicle with a jack and remove front wheel.
3) Disconnect front exhaust pipe assembly. (Non-turbo model)
With OBD:
<Ref. to EX(SOHC)-5, REMOVAL, Front Exhaust Pipe.>
Without OBD:
<Ref. to EX(SOHCw/oOBD)-6, REMOVAL, Front Exhaust Pipe.>
4) Remove universal joint. <Ref. to PS-28, REMOVAL, Universal Joint.>
5) Remove cotter pin and castle nut. Using a puller, remove tie-rod end from knuckle arm.



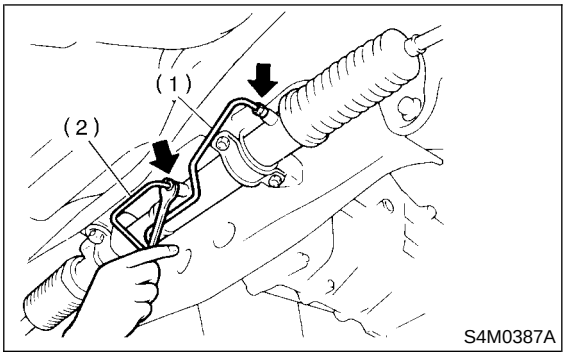
(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

6) Remove jack-up plate and stabilizer.



(1) Jack-up plate

7) Disconnect one pipe joint A from center of gearbox assembly, and connect a vinyl hose to it. While turning steering wheel to the left and right, drain fluid through the hose. Similarly, drain fluid from the other pipe joint B.



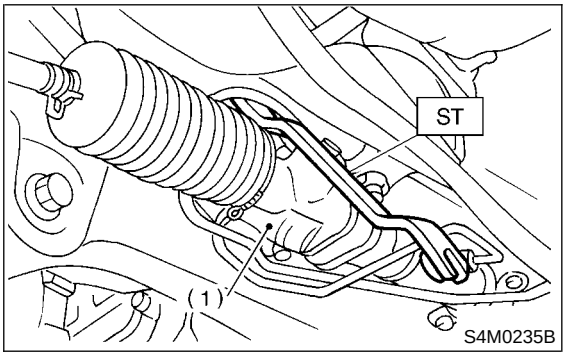
(1) Pipe A
(2) Pipe B

8) Remove lower and upper bolts from universal joint, and remove universal joint in the upward direction.

NOTE:
Scribe alignment marks on universal joint so that it can be reassembled at the original serration.

9) Using ST, remove flare nuts from control valve of gearbox assembly, and disconnect upper and lower hoses.
ST 34099AC050 GEARBOX SPANNER

CAUTION:
● Always disconnect hoses B and A in that order.
● Be careful not to damage the hoses during removal.



(1) Steering gearbox

10) Remove bolts securing gearbox to crossmember, and detach gearbox.

B: INSTALLATION S601276A11

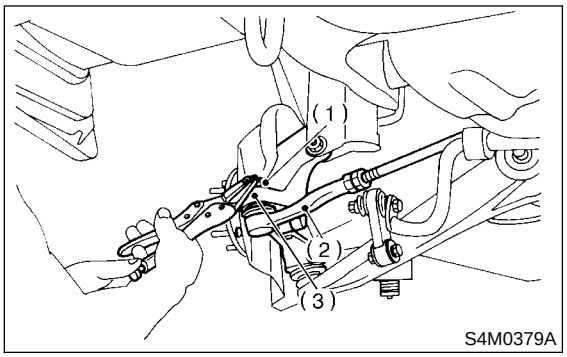
1) Insert gearbox into crossmember, being careful not to damage gearbox boot.
2) Tighten gearbox to crossmember bracket via clamp with bolt to the specified torque.

Tightening torque:
59 N·m (6.0 kgf-m, 43 ft-lb)

3) Install the universal joint. <Ref. to PS-28, INSTALLATION, Universal Joint.>
4) Connect tie-rod end and knuckle arm, and tighten with castle nut. Fit cotter pin into the nut and bend the pin to lock.

Castle nut tightening torque:
Tighten to 27.0 N·m (2.75 kgf-m, 19.9 ft-lb), and tighten further within 60° until cotter pin hole is aligned with a slot in the nut.

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



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

5) Install front stabilizer to vehicle. <Ref. to FS-22, INSTALLATION, Front Stabilizer.>
6) Install front exhaust pipe assembly. (Non-turbo model)
With OBD:
<Ref. to EX(SOHC)-6, INSTALLATION, Front Exhaust Pipe.>
Without OBD:
<Ref. to EX(SOHCw/oOBD)-7, INSTALLATION, Front Exhaust Pipe.>
7) Install tires.
8) Tighten wheel nuts to the specified torque.

Tightening torque:
88 N·m (9.0 kgf-m, 65 ft-lb)

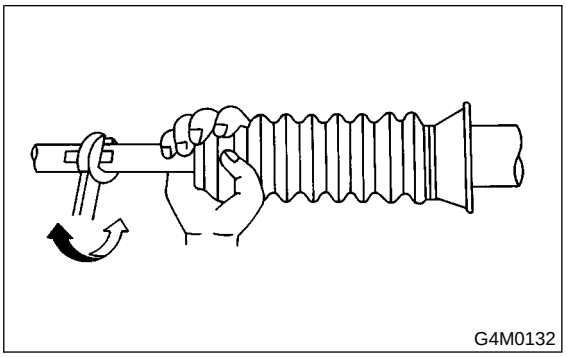
9) Connect ground terminal to battery.
10) Pour fluid into oil tank, and bleed air.
<Ref. to PS-101, Power Steering Fluid.>
11) Check for fluid leaks. <Ref. to PS-76, OIL LEAKING, INSPECTION, Steering Gearbox [RHD Model].>
12) Install jack-up plate.

WARNING:
Be careful, exhaust manifold is hot.

13) Lower vehicle.
14) Check fluid level in oil tank.
15) After adjusting toe-in and steering angle, tighten lock nut on tie-rod end.

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

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



C: DISASSEMBLY S601276A06

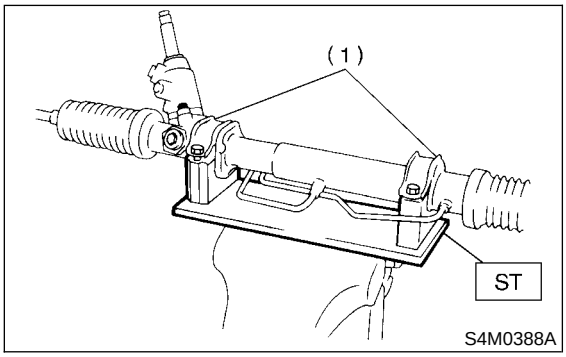
1. RACK HOUSING ASSEMBLY S601276A0601

NOTE:
Parts requiring replacement are described in the smallest unit of spare parts including damaged parts and spare parts damaged. In actual disassembly work, accidental damage as well as inevitable damage to some related parts must be taken into account, and spare parts for them must also be prepared. However, it is essential to pinpoint the cause of trouble, and limit the number of replacement parts as much as possible.

1) Disconnect four pipes from gearbox.

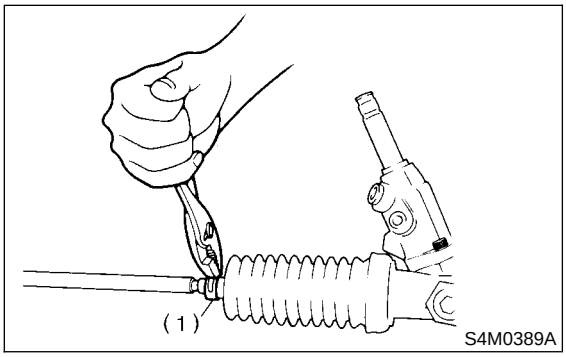
2) Secure gearbox removed from vehicle in vise using ST.
ST 926200000 STAND

CAUTION:
Secure the gearbox assembly in a vise using the ST as shown. Do not attempt to secure it without this ST.



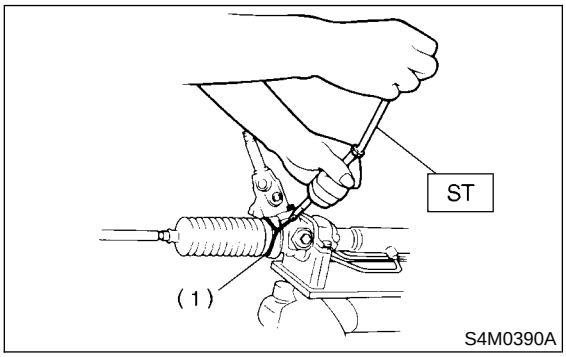
(1) Clamp

3) Pry off clip from outer end of boot, and slide boot toward tie-rod end.



(1) Clip

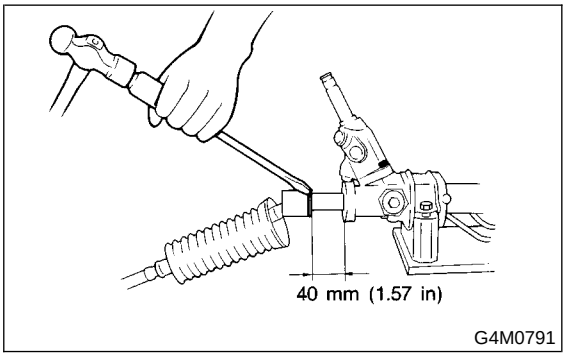
4) Using ST, remove lock wire from inner end of boot, and remove boot.
ST 927590000 WRENCH



(1) Wire

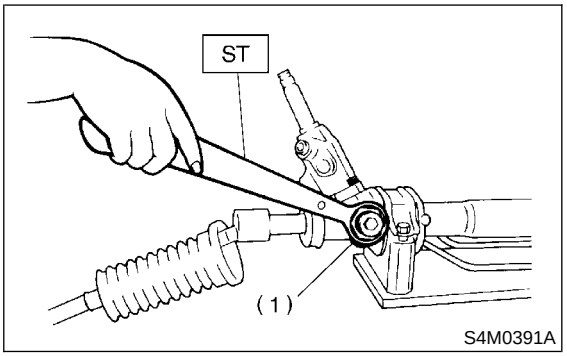
5) Extend rack approximately 40 mm (1.57 in) out. Unlock lock wire at lock washer on each side of tie-rod end using a standard screwdriver.

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



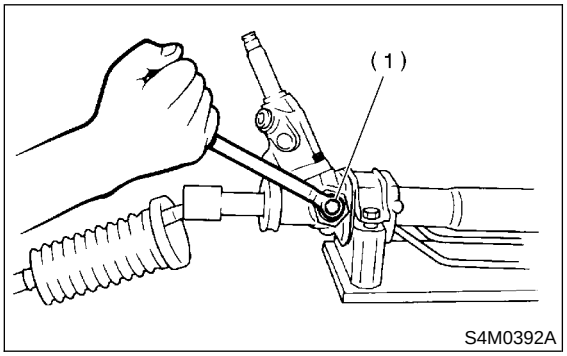
NOTE:
Parts requiring replacement are described in the smallest unit of spare parts including damaged parts and spare parts damaged. In actual disassembly work, accidental damage as well as inevitable damage to some related parts must be taken into account, and spare parts for them must also be prepared. However, it is essential to pinpoint the cause of trouble, and limit the number of replacement parts as much as possible.

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



(1) Lock nut

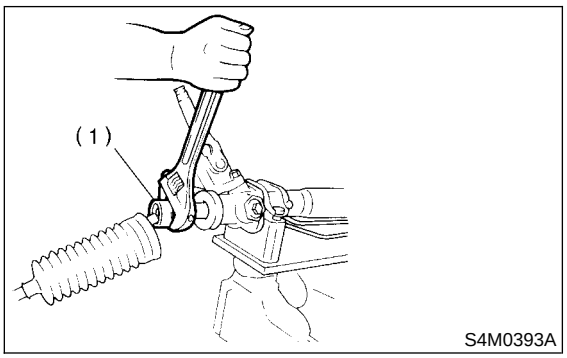
7) Tighten adjusting screw until it no longer tightens.



(1) Adjusting screw

8) Using a wrench (32 mm width across flats) or adjustable wrench, remove tie-rod.

CAUTION:
● Check ball joint for free play, and tie-rod for bends. Replace if necessary.
● Check dust seals used with tie-rod end ball joint for damage or deterioration. Replace if necessary.



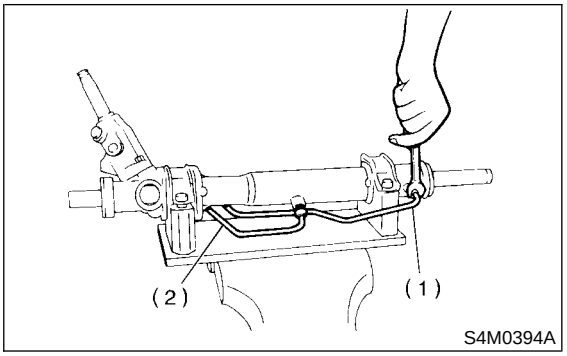
(1) Tie-rod

9) Loosen adjusting screw and remove spring and sleeve.

CAUTION:
Replace spring and/or sleeve if damaged.

10) Disconnect pipes A and B from steering body and control valve housing.

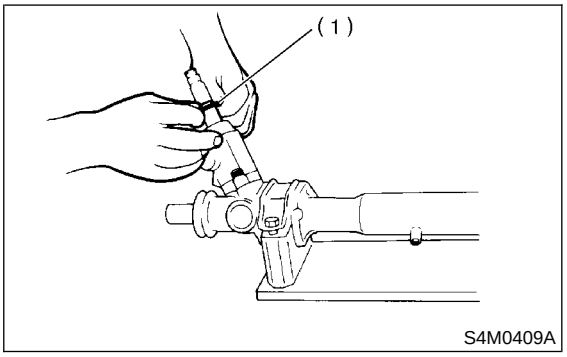
CAUTION:
Replace pipes and/or flare nuts if damaged.



(1) Pipe A
(2) Pipe B

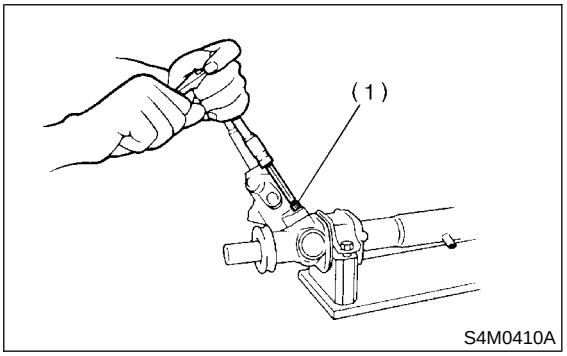
11) Slide dust cover out.

CAUTION:
● Be careful not to scratch housing or input shaft during dust cover removal. Also do not allow foreign matter to enter housing interior.
● Replace dust cover with a new one if its inside bore or lips are worn or damaged.



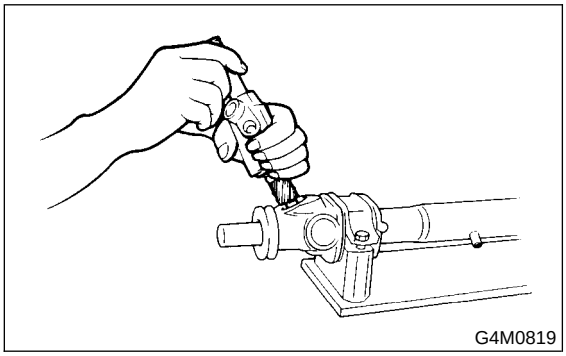
(1) Dust cover

12) Remove the two bolts securing valve housing.



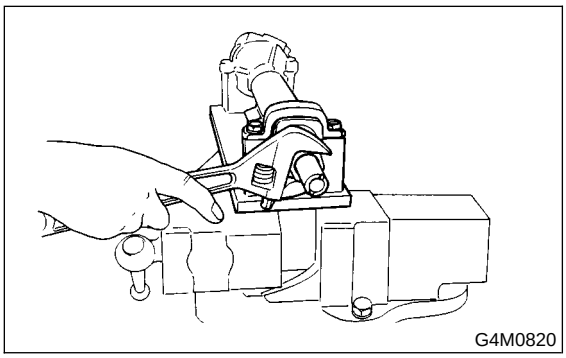
(1) Socket bolt

13) Remove valve housing, pinion and valve as a unit.


G4M0819

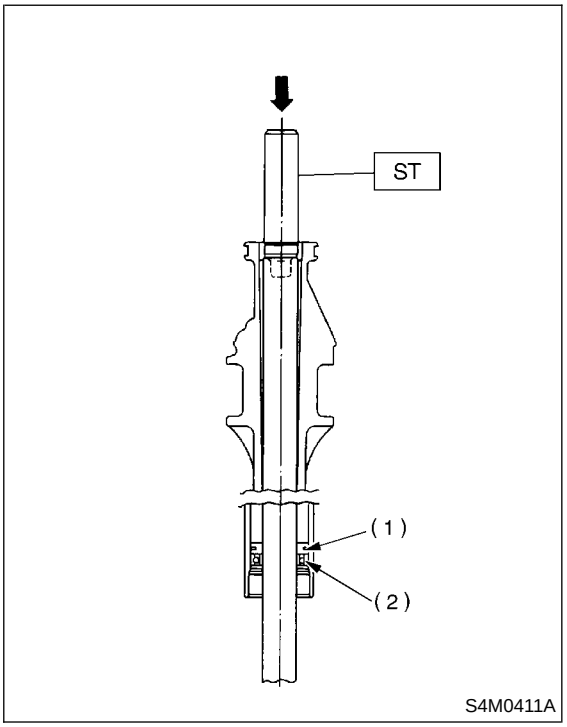
14) Remove holder using a 32 mm wrench or adjustable wrench.

CAUTION:
Discard old holder and replace with new one.


G4M0820

15) Install ST on valve side of rack and press outer side oil seal out.
ST 34099FA030 INSTALLER & REMOVER

CAUTION:
● Block pipe connection of steering body to prevent fluid from flowing out.
● Do not allow rack to come in contact with inner wall of cylinder. Otherwise, cylinder wall may be scratched, resulting in oil leaks.
● Remove holder and rack as a unit.
● Check rack and steering body for bends or cracks; replace as required.
● Discard oil seal after removal and replace with new ones.



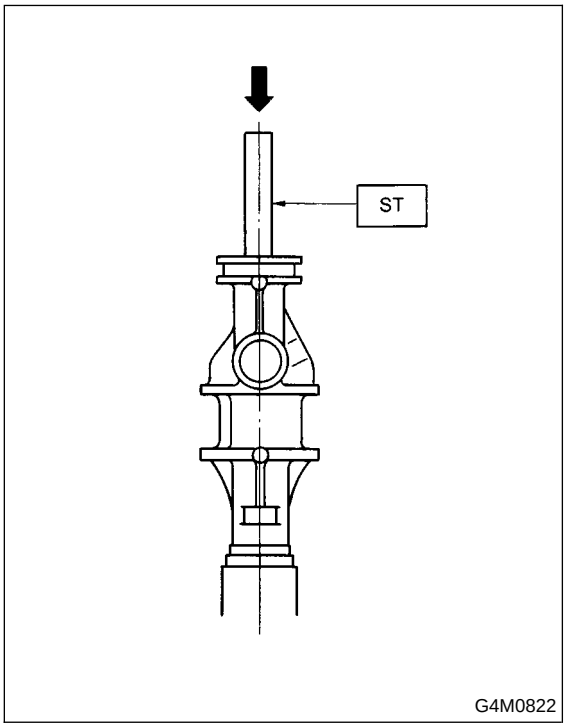
S4M0411A

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

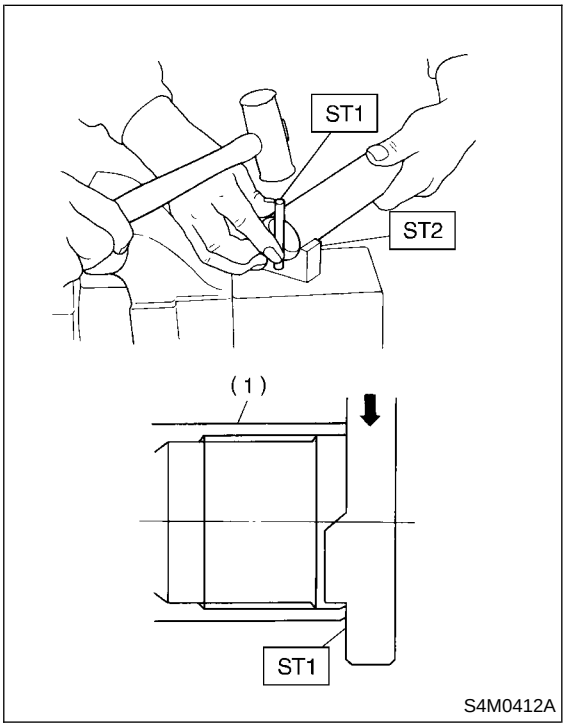
16) Insert ST from valve side and press back-up ring and oil seal out.

CAUTION:
Discard back-up ring and oil seal after removal and replace with new ones.

ST 927580000 REMOVER

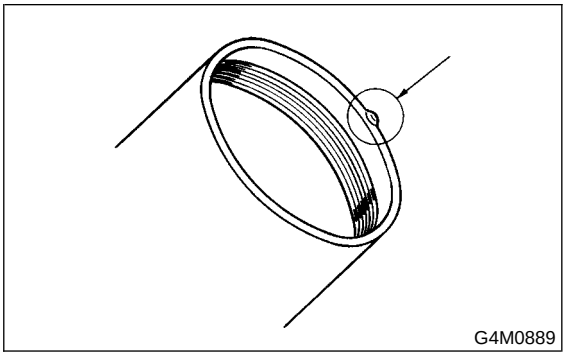


17) Using ST1 and ST2, repair cylinder's clinched sections.
ST1 34099FA080 PUNCH
ST2 34099FA070 BASE



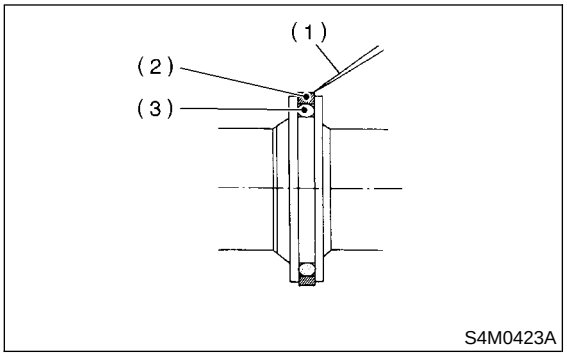
(1) Cylinder

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



19) Using a sharp-edged, long rod, remove seal ring and O-ring from rack piston.

CAUTION:
Be careful not to scratch outer surface of rack piston and seal ring groove. A scratch may reduce the sealing effect, resulting in faulty piston operation.

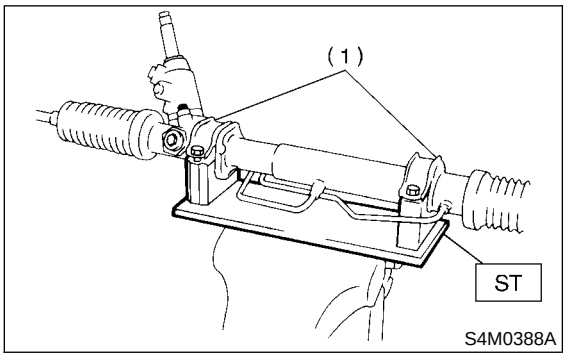


(1) Sharp-edged, long rod
(2) Seal ring
(3) O-ring

2. CONTROL VALVE ASSEMBLY S601276A0602

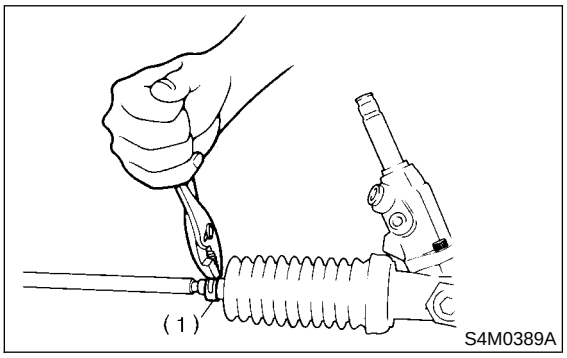
1) Disconnect four pipes from gearbox.
2) Secure gearbox removed from vehicle in vice using ST.
ST 926200000 STAND

CAUTION:
Secure the gearbox assembly in a vice using the ST as shown. Do not attempt to secure it without this ST.



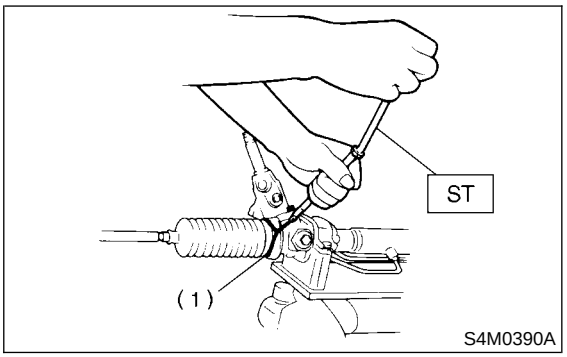
(1) Clamp

3) Pry off clip from outer end of boot, and slide boot toward tie-rod end.



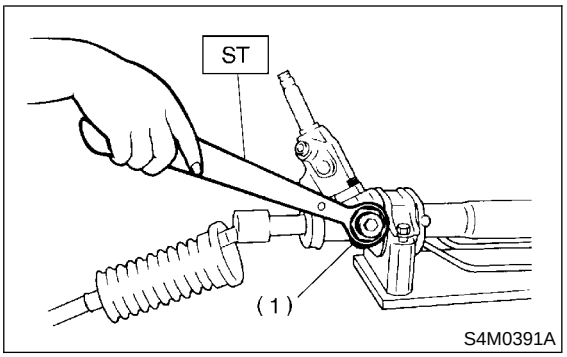
(1) Clip

4) Using ST, remove lock wire from inner end of boot, and remove boot.
ST 927590000 WRENCH



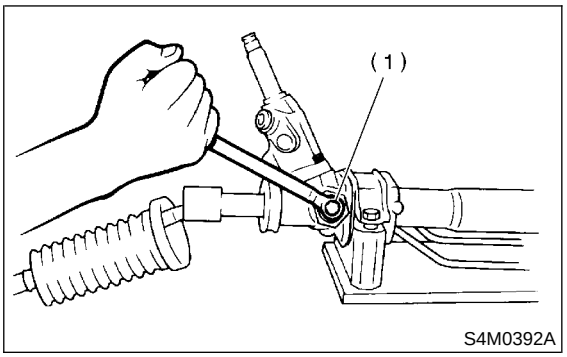
(1) Wire

5) Using ST, loosen lock nut.
ST 926230000 SPANNER



(1) Lock nut

6) Tighten adjusting screw until it no longer tightens.



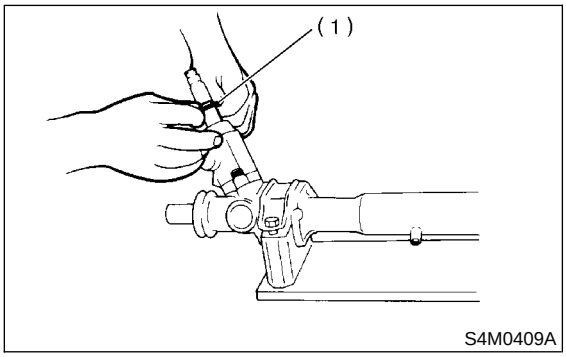
(1) Adjusting screw

7) Loosen adjusting screw and remove spring and sleeve.

CAUTION:
Replace spring and/or sleeve if damaged.

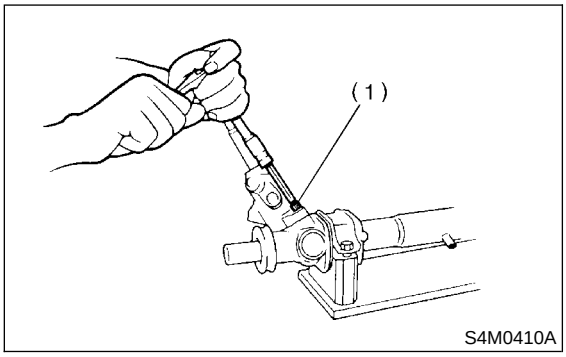
8) Slide dust cover out.

CAUTION:
● Be careful not to scratch housing or input shaft during dust cover removal. Also do not allow foreign matter to enter housing interior.
● Replace dust cover with a new one if its inside bore or lips are worn or damaged.



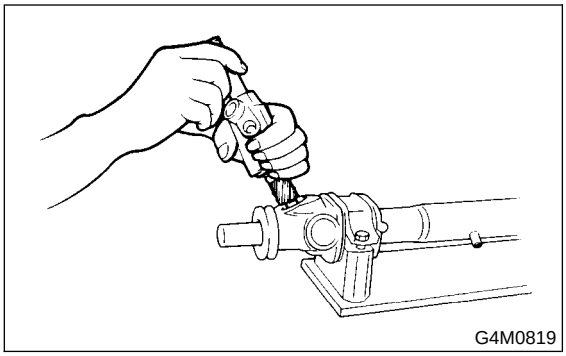
(1) Dust cover

9) Remove the two bolts securing valve housing.



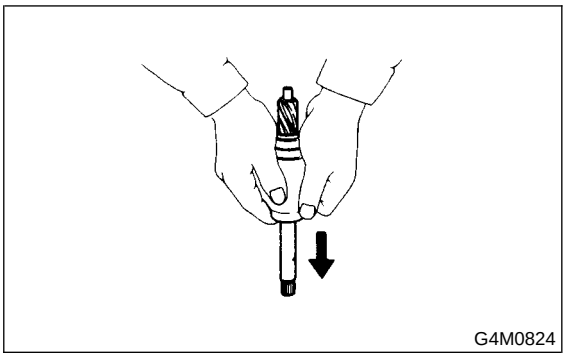
(1) Socket bolt

10) Remove valve housing, pinion and valve as a unit.



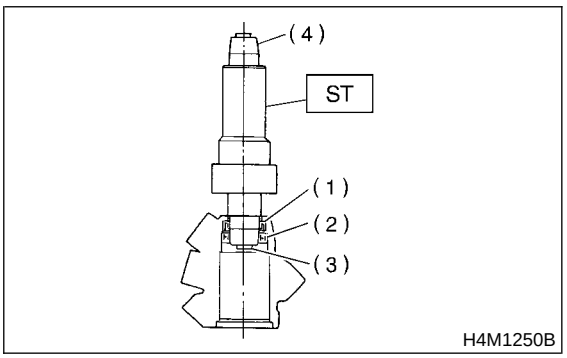
11) After removing dust cover, extract pinion and valve from valve housing.

CAUTION:
● If pinion and valve is difficult to remove, use a press.
● Discard oil seal after removal and replace with a new one.
● Check rotor for bends and serrations for damage and replace as required.



12) Using ST and press, remove dust seal, back-up washer, oil seal and ball bearing from valve housing.

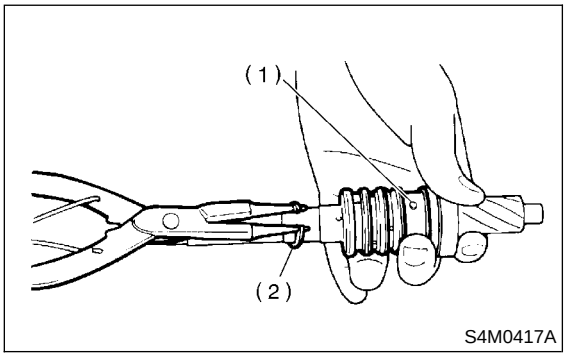
CAUTION:
● Use the “A” end of remover.
● Do not apply a force to end surface of valve housing.
● Do not reuse oil seal after removal.
ST 34099FA000 INSTALLER & REMOVER



(1) Oil seal
(2) Ball bearing
(3) A side
(4) B side

13) Remove snap ring securing valve sleeve to pinion and valve, and remove valve sleeve.

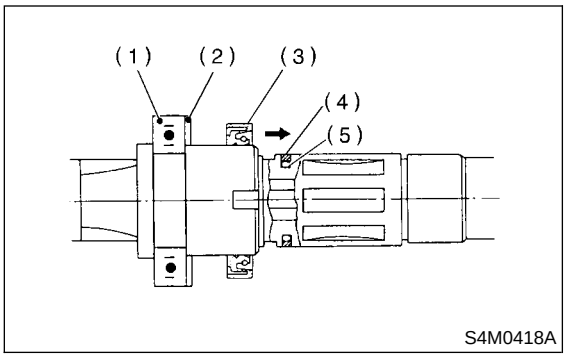
CAUTION:
Be careful not to scratch pinion and valve when removing snap ring.



(1) Valve sleeve
(2) Retaining ring

14) Remove oil seal and spacer.
15) Using a long rod, remove seal ring and O-ring from pinion.

CAUTION:
Be careful not to scratch outer surface and seal ring groove of input shaft. If scratched, sealing effect will be lost, resulting in a malfunctioning valve.



(1) Ball bearing
(2) Spacer
(3) Oil seal
(4) Seal ring
(5) O-ring

D: ASSEMBLY S601276A02

CAUTION:
Use only SUBARU genuine grease for gearbox.

Specified grease for gearbox:
VALIANT GREASE M2 (Part No. 003608001)

1. RACK HOUSING ASSEMBLY S601276A0201

1) Clean all parts and tools before reassembling.
2) Move rack shaft fully to the left and right two or three times to lubricate shaft ends with grease. Remove excess grease, being careful not to block air vent hole.

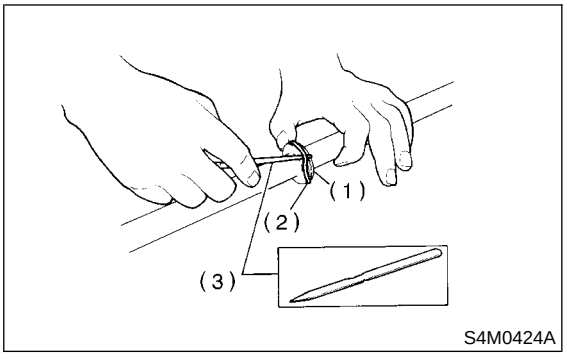
CAUTION:
● When rack is fully moved to its stroke ends with tie-rod removed, be careful not to bump rack ends.
● Ensure that screw located at end of rack shaft is free from grease.

3) Apply grease to bore wall which accommodates sleeve.

CAUTION:
Ensure that hands are clean when applying grease.

4) Install O-ring and seal ring in groove on rack piston.

CAUTION:
● Do not expand O-ring and seal ring more than necessary.
● To facilitate installation of seal ring, first position one half of entire seal ring in groove. Then slowly position the second half using a spatula, as shown.

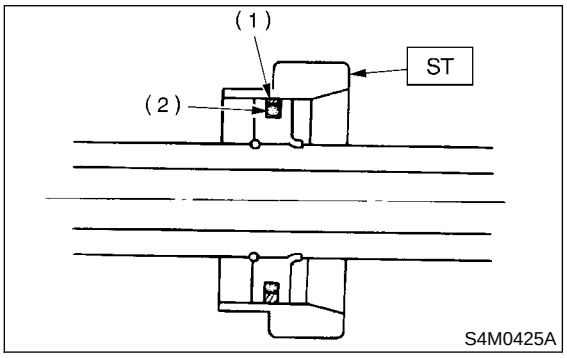


(1) O-ring
(2) Seal ring
(3) Spatula

5) Apply a coat of grease to inner surface of ST and insert rack piston into it. Leave ST at least 10 minutes until seal ring settles down in place.

CAUTION:
Be careful not to scratch rack, piston and seal ring during installation.

ST 927600000 FORMER

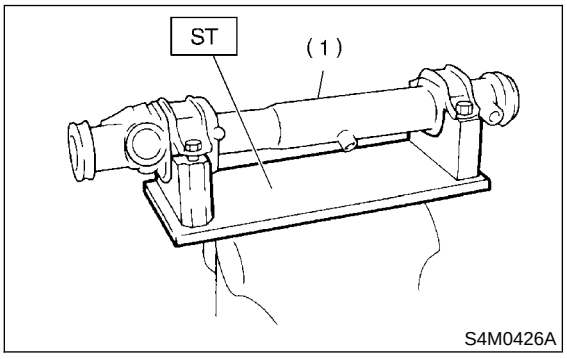


(1) Seal ring
(2) O-ring

6) Attach steering body to ST as shown. Apply a coat of grease to needle bearing.
ST 926200000 STAND

CAUTION:
- **Use a ST to support steering body.**
- **Ensure that needle bearing is free from defects. If it is faulty, replace steering body with a new one.**

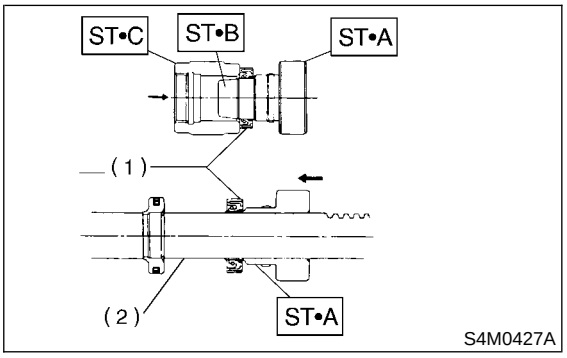
NOTE:
If steering body is removed from vehicle, be sure to remove rust and clean.



(1) Steering body

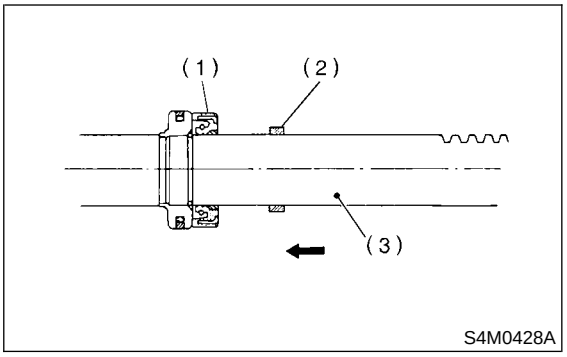
7) Using ST·B and ST·C, attach oil seal to ST·A. Insert ST·A into rack from gear side. Remove oil seal from ST·A when it approaches piston and remove STs from rack.
ST 927490000 INSTALLER; A·B·C

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



(1) Oil-seal
(2) Rack

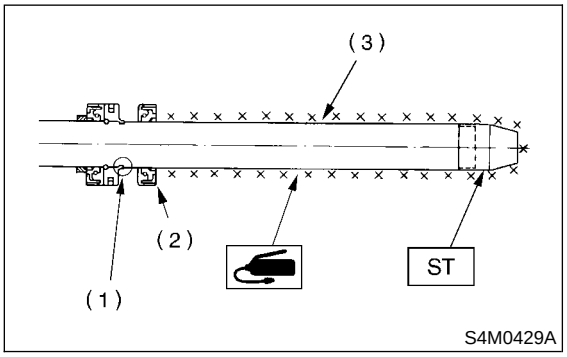
8) Install back-up ring from gear side of rack.



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

9) Install ST on rack and equally apply a thin coat of grease to rack and ST, then install oil seal.
ST 926250000 GUIDE

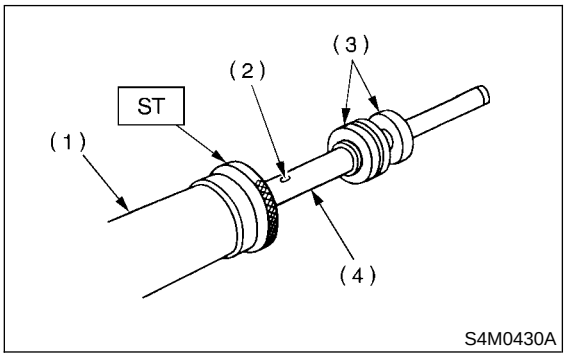
CAUTION:
Be careful not to scratch oil seal lips with piston's knurl section.



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

10) Apply a coat of grease to grooves in rack, sliding surface of sleeve and sealing surface of piston. Install ST on the end of steering body cylinder. Then insert rack into steering body from cylinder side.
ST 34099FA010 GUIDE (Oil seal)

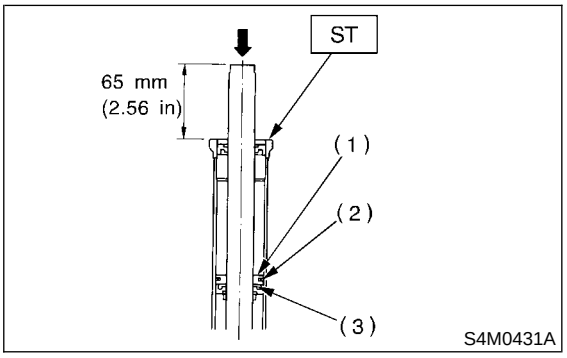
CAUTION:
- **Be sure to apply grease so that it covers the entire surface of rack gear teeth.**
- **Do not allow grease to block air vent hole on rack.**



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

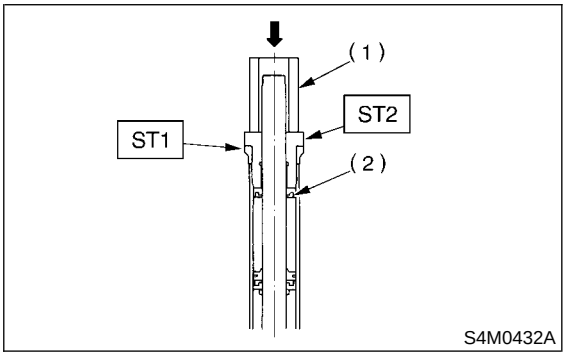
11) Slowly press inner side oil seal until distance between ST and end of rack is 65 mm (2.56 in).
ST 34099FA010 GUIDE (Oil seal)

CAUTION:
Ensure ST's inner wall is free of scratches. Otherwise, it may damage oil seal during installation.



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

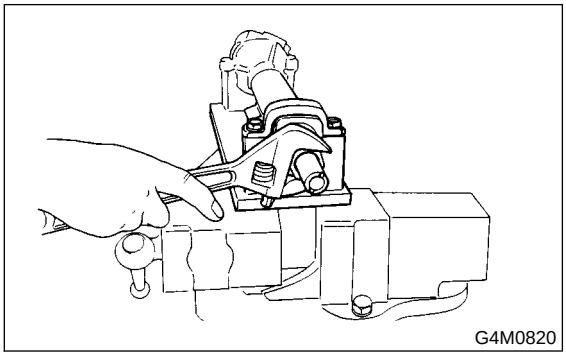
12) Pass ST2 and pipe through rack and press outer side oil seal until ST1 is in contact with ST2.
ST1 34099FA010 GUIDE (Oil seal)
ST2 34099FA040 INSTALLER (Oil seal)



(1) Pipe
(2) Outer side oil seal

13) Install holder from cylinder side of steering body.

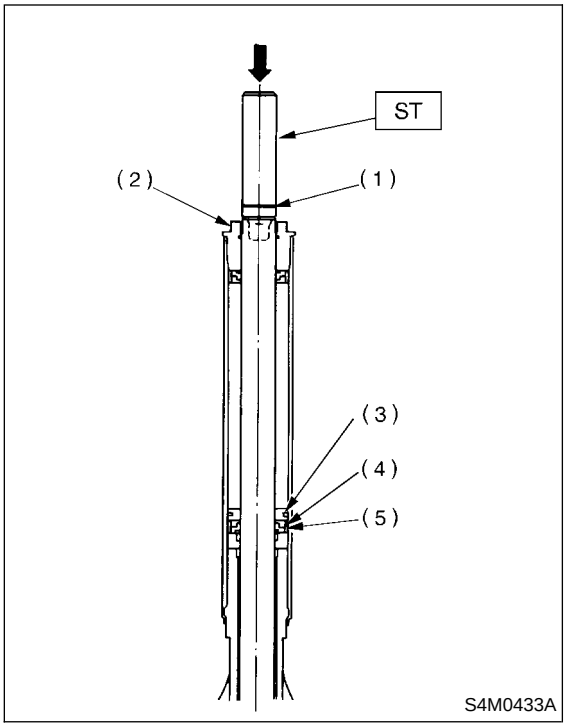
Tightening torque:
64 N·m (6.5 kgf-m, 47.0 ft-lb)


G4M0820

14) Attach ST to rack cylinder. Using a press, install back-up ring and oil seal.

NOTE:
Press ST until its groove is aligned with end of holder.

ST 34099FA030 INSTALLER & REMOVER



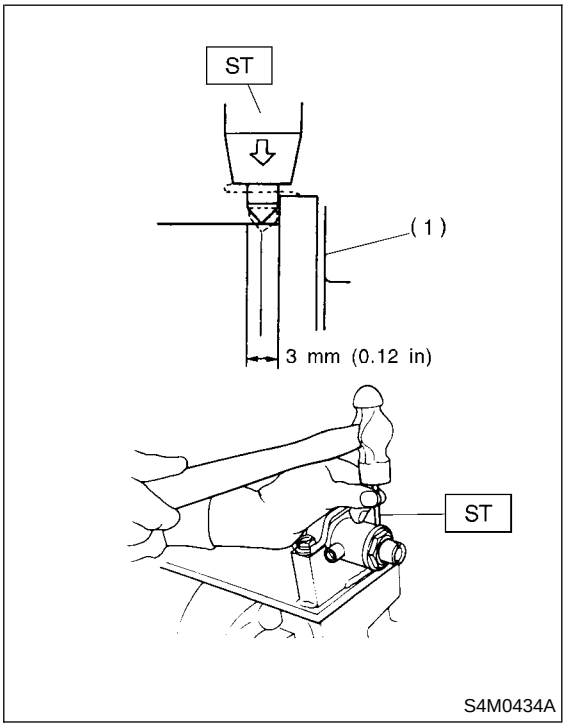
S4M0433A

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

15) Using ST, clinch steering body cylinder at a point less than 3 mm (0.12 in) from holder.

CAUTION:
Be careful not to deform holder.

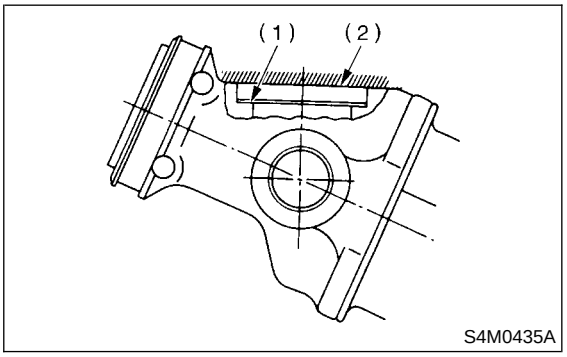
ST 34099FA060 PUNCH



S4M0434A

(1) Holder

16) Remove traces of sealer, oil, rust, etc., from mating surfaces of valve housing and steering body.
17) Position a shim in graded portion of steering body pinion housing, and apply an even coat of sealer (Fuji Bond C: 004403004) to end of pinion housing.



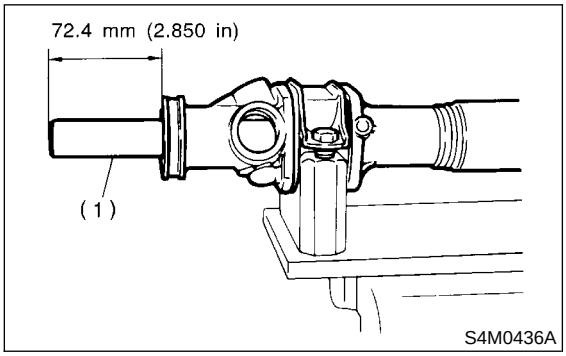
S4M0435A

(1) Shim
(2) Fuji Bond C (004403004)

18) Use the same number of shims as that used when steering body was removed.
19) If steering body, valve housing or pinion and valve is replaced with a new one, add two or three shims, install valve on pinion housing and tighten

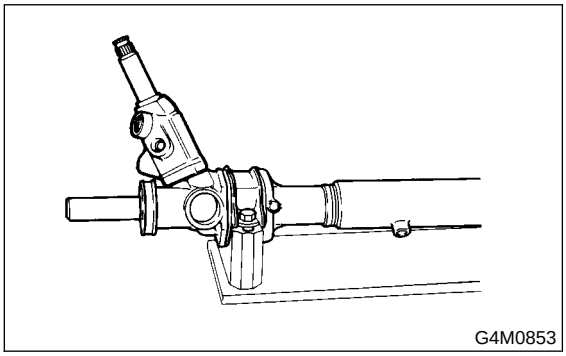
with two bolts to 25 N·m (2.5 kgf-m, 18.1 ft-lb). Then, measure clearance between steering body and valve housing using a thickness gauge. Remove shims so that the clearance is zero.

20) Extend rack 72.4 mm (2.850 in) beyond pinion side of steering body.



(1) Rack

21) Apply grease to pinion gear teeth and ball bearing. Insert valve into place.

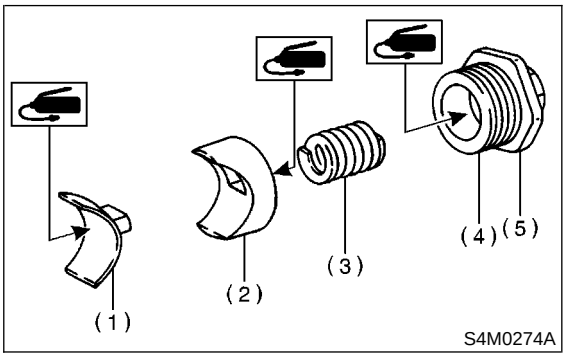


22) Alternately and slowly tighten socket bolts.

NOTE:
Replace faulty parts before installing valve. Otherwise, valve may not be installed properly.

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

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

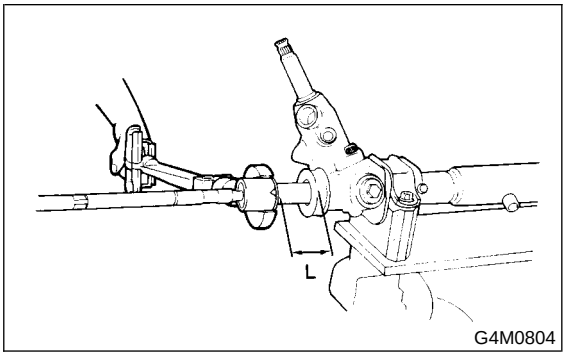


(1) Seat pad
(2) Sleeve
(3) Spring
(4) Adjusting screw
(5) Lock nut

24) Installation of tie-rod
(1) Tighten adjusting screw until it will no longer tighten.
(2) Install lock washers and tighten left and right tie-rods into rack ends.

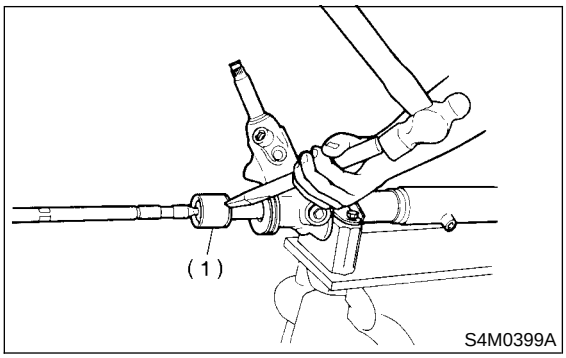
On condition
L: Approximately 40 mm (1.57 in)

Tightening torque:
78 N·m (8.0 kgf-m, 58 ft-lb)



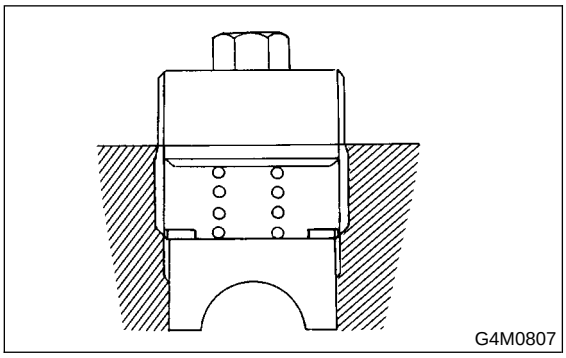
25) Using a chisel and hammer, bend lock washers (at two places).

CAUTION:
Be careful not to scratch rack.



(1) Lock washer

26) Rack and pinion backlash adjustment
(1) Loosen adjusting plug.
(2) Rotate input shaft so that rack is in the straight ahead direction. [Ensure that distance between rack end and stopper is 70.8 mm (2.787 in).]
(3) Tighten adjusting plug by two threads.



(4) Turn adjusting screw so that the entire thread area is coated with liquid packing.

Liquid packing:
THREE BOND 1102 or equivalent

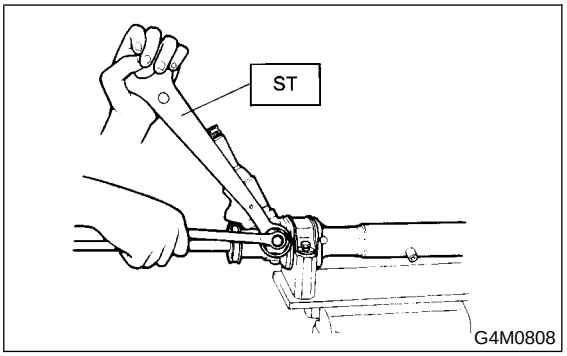
NOTE:
● Apply liquid packing of approximately 1.5 g (0.053 oz) to adjusting screw thread area.
● Also turn plug to ensure that its entire contact area is coated with liquid packing.

(5) Tighten adjusting plug to 5 N·m (0.5 kgf-m, 3.6 ft-lb) and loosen, then tighten to 5 N·m (0.5 kgf-m, 3.6 ft-lb) and loosen, and finally tighten to 5 N·m (0.5 kgf-m, 3.6 ft-lb) and loosen 30°.
(6) While holding adjusting plug using a closed wrench, tighten lock nut using ST.

ST 926300000 SPANNER

Tightening torque:
39 N·m (4 kgf-m, 29 ft-lb)

CAUTION:
● Do not allow liquid packing to come in contact with sleeve.
● While rotating input shaft to fully move rack shaft to the left and right, ensure that rack moves smoothly without binding, and that rotating torque is constant.

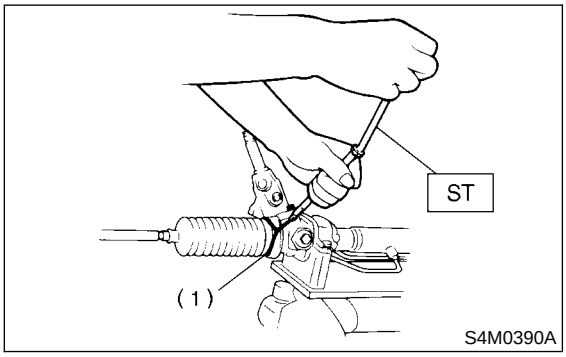


27) Installation of boot
(1) Apply a coat of grease to inner wall of boot small end.
(2) Position boot large end in rubber mount groove and gearbox, and small end in groove of tie-rod.

CAUTION:
● Ensure that both ends of boot are properly situated in grooves.
● Ensure that boot is free from abnormal swelling or dents.

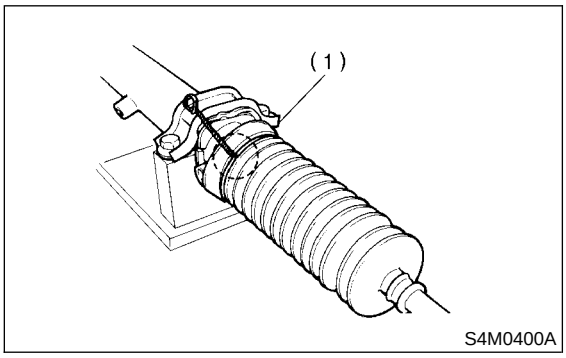
28) Attach lock wire to boot large end, and twist it while pulling it upward (with a force of approximately 39 N (4 kgf, 9 lb).
ST 927590000 WRENCH

CAUTION:
Ensure that lock wire is not loose.



(1) Wire

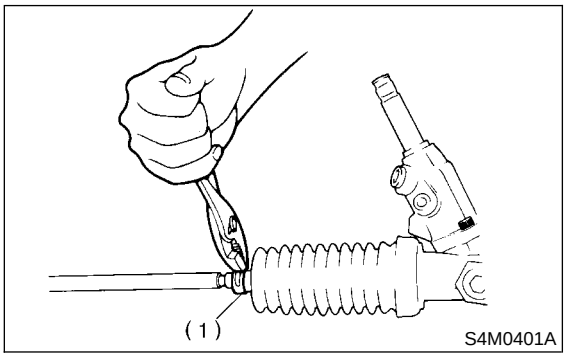
29) Then bend wire end along boot as shown.



(1) Twist wire up to this point.

30) Install clip using pliers.

CAUTION:
After installing clip, ensure that boot's small end is properly positioned in groove on tie-rod.



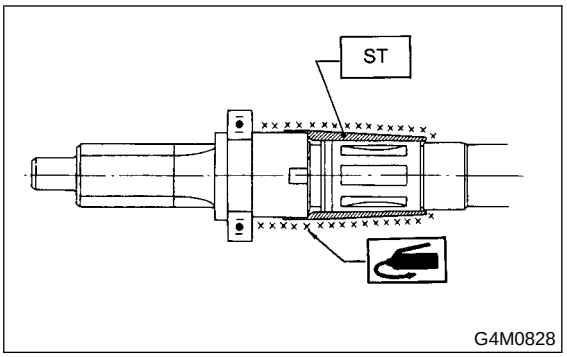
(1) Clip

31) Install pipes A and B.

Tightening torque:
Valve housing side
20 N·m (2.0 kgf-m, 14.5 ft-lb)
Steering body side
24 N·m (2.4 kgf-m, 17.4 ft-lb)

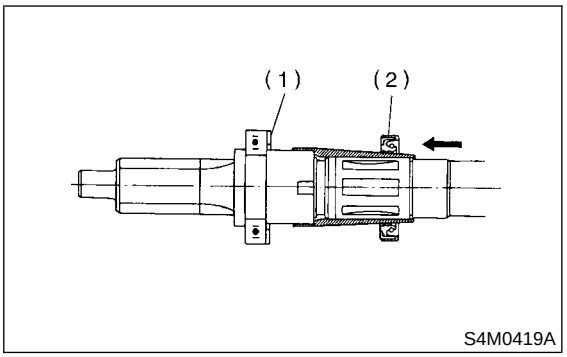
2. CONTROL VALVE ASSEMBLY S601276A0202

1) Clean all parts and tools before reassembling.
2) Attach ST to pinion, and apply grease to outer perimeter of the cover and mating surface of oil seal.
ST 926270000 COVER



3) Apply a coat of grease to spacer and sealing lips of oil seal, and install spacer and oil seal.

CAUTION:
- **Face chamfered side of spacer toward oil seal.**
- **Face oil seal in correct direction.**

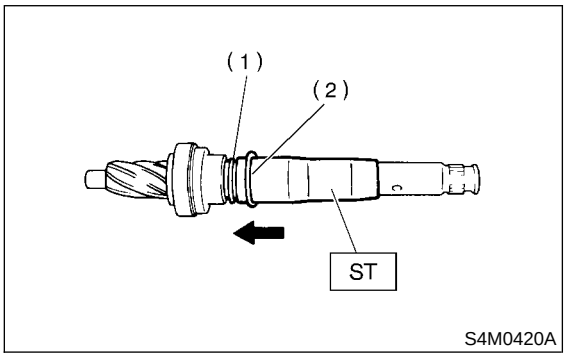


(1) Spacer
(2) Oil seal

4) Install ST to input shaft, and apply a coat of grease to the cover surface. Install O-ring and seal ring.

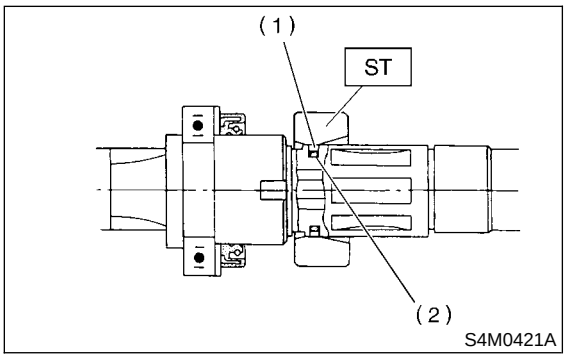
CAUTION:
Do not expand O-ring and seal ring more than necessary.

ST 926450000 COVER



(1) O-ring
(2) Seal ring

5) Apply a coat of grease to inner wall of ST, and secure seal ring assembled in the former procedure as shown. Leave seal ring unattended for approximately 10 minutes until it settles down.
ST 926280000 FORMER



(1) Seal ring
(2) O-ring

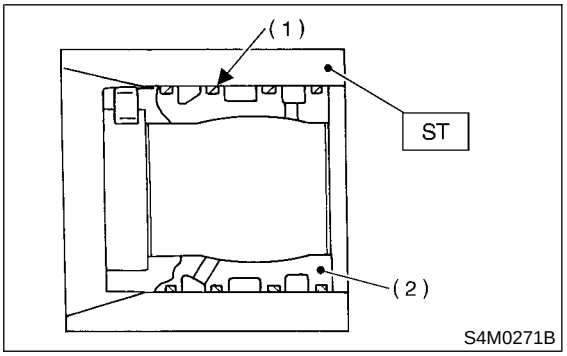
6) Remove the four seal rings from the valve sleeve using a sharp-pointed tool.

CAUTION:
Be careful not to scratch seal ring grooves on the valve sleeve. A scratch may reduce the sealing effect, resulting in faulty valve operation.

7) Clean the valve sleeve.
8) Attach the four seal rings to the valve sleeve grooves.

CAUTION:
Do not expand the seal rings more than necessary.

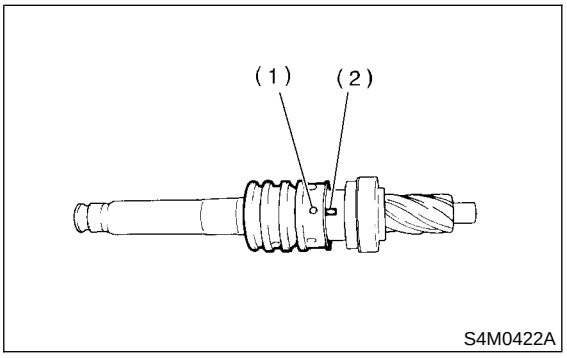
9) Apply a coat of grease to the inner wall of the ST. Secure the four seal rings (installed in the former procedure) using the ST as shown in the figure. Leave the seal rings for approximately 10 minutes until they have properly set.
ST 926050000 FORMER



(1) Seal ring
(2) Valve sleeve

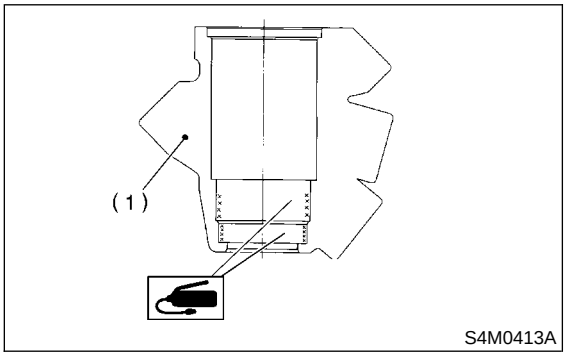
10) While aligning valve sleeve pin with groove on pinion, secure with snap ring.

CAUTION:
- **Be careful not to damage inner wall of valve sleeve and contact surface of pinion.**
- **Before assembling valve sleeve and pinion, clean in kerosene and dry with compressed air.**



(1) Pin
(2) Groove on pinion

11) Apply a coat of grease to inner wall of valve housing, oil seal and outer perimeter of dust seal.



(1) Valve housing

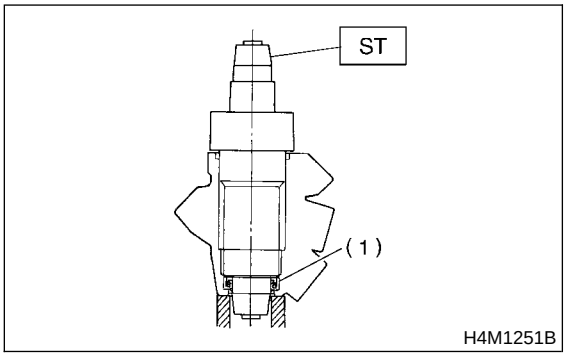
12) Using ST and press, install oil seal in valve housing.

(1) Face oil seal in the direction shown in figure when installing.

(2) To avoid scratching oil seal, apply a coat of grease to contact surface of installer and oil seal.

(3) To facilitate installation, attach oil seal to installer and position in valve housing before pressing into place.

ST 34099FA000 INSTALLER & REMOVER



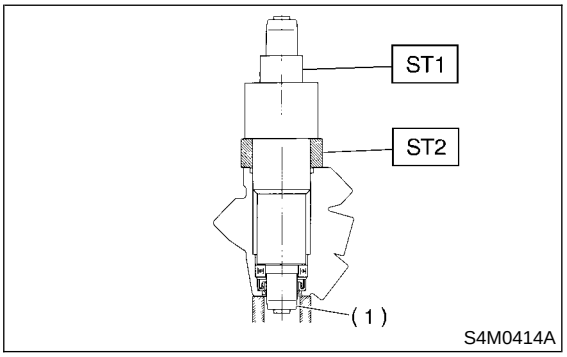
(1) Oil seal

13) Attach ST2 to ST1, and press ball bearing into place using a press.

NOTE:

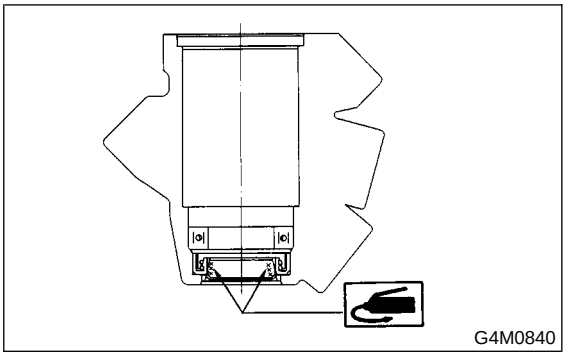
- To facilitate installation, attach ball bearing to remover and position in valve housing before pressing it into place.
- Use the “B” end of remover.

ST1 34099FA000 INSTALLER & REMOVER
ST2 34099FA050 SPACER



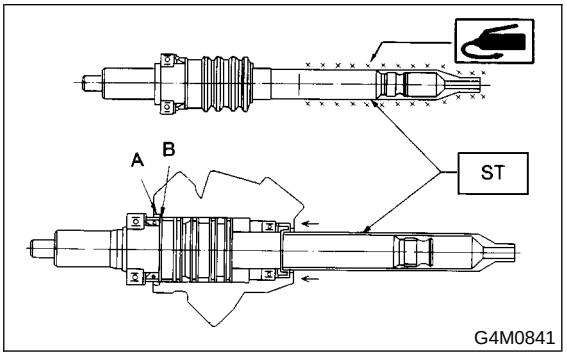
(1) B side

14) Charge oil seal with specified steering grease.



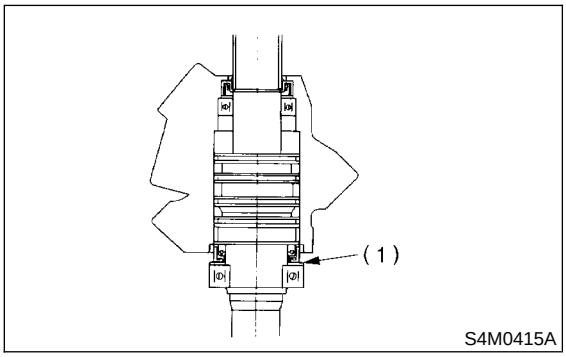
15) Apply a coat of specified steering grease to ST surface, and install ST onto end of input shaft. Insert pinion and valve until “A” of oil seal contacts “B” of valve housing. The ST is used to prevent scratching oil seal.

ST 34099FA020 GUIDE



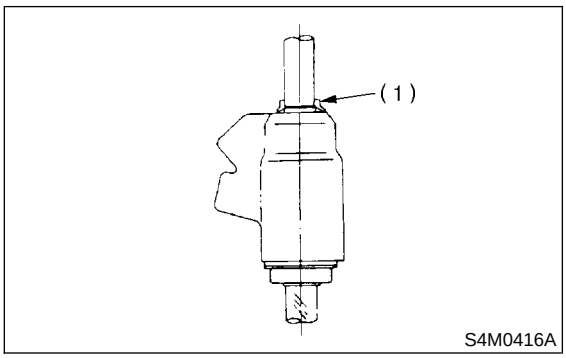
16) While supporting pinion and valve, push end of pinion until bearing contacts brazed end of valve housing.

CAUTION:
Do not allow spacer to extend beyond brazed end. Otherwise, pinion cannot be inserted properly.



(1) Spacer

17) Apply a coat of grease to sealing lips of dust cover, and insert dust cover until it contacts staged portion of input shaft.



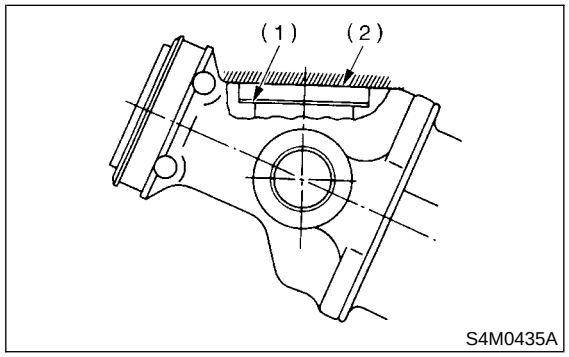
(1) Dust cover

18) Adjust sealing lip-to-housing end clearance to 0 to 0.5 mm (0 to 0.020 in). If sealing lip is too close to housing end, steering wheel will not return smoothly; if it is too far from housing end, dust or dirt will enter the clearance.

NOTE:
Ensure that pinion and valve is properly positioned in valve housing before adjustment.

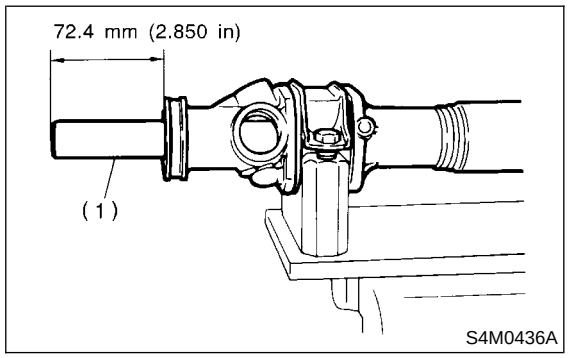
19) Remove traces of sealer, oil, rust, etc., from mating surfaces of valve housing and steering body.

20) Position a shim in graded portion of steering body pinion housing, and apply an even coat of sealer (Fuji Bond C: 004403004) to end of pinion housing.



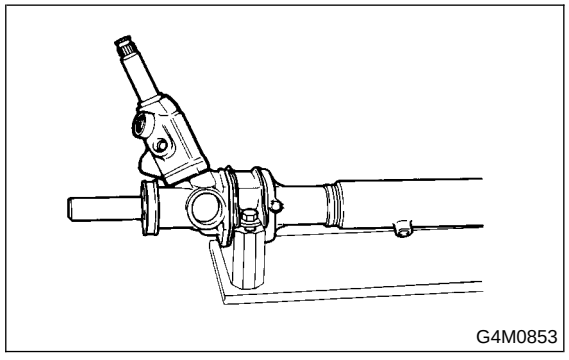
(1) Shim
(2) Fuji Bond C (004403004)

21) Use the same number of shims as that used when steering body was removed.
22) If steering body, valve housing or pinion and valve is replaced with a new one, add two or three shims, install valve on pinion housing and tighten with two bolts to 25 N·m (2.5 kgf-m, 18.1 ft-lb). Then, measure clearance between steering body and valve housing using a thickness gauge. Remove shims so that the clearance is zero.
23) Extend rack 72.4 mm (2.850 in) beyond pinion side of steering body.



(1) Rack

24) Apply grease to pinion gear teeth and ball bearing. Insert valve into place.

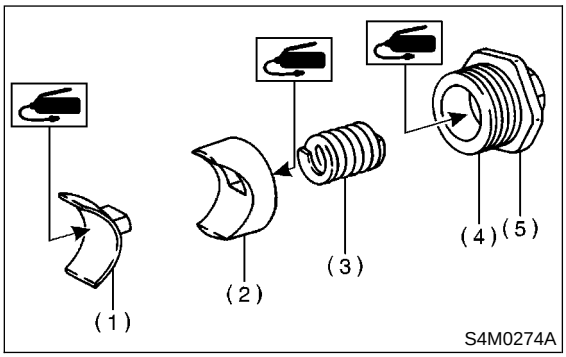


25) Alternately and slowly tighten socket bolts.

NOTE:
Replace faulty parts before installing valve. Otherwise, valve may not be installed properly.

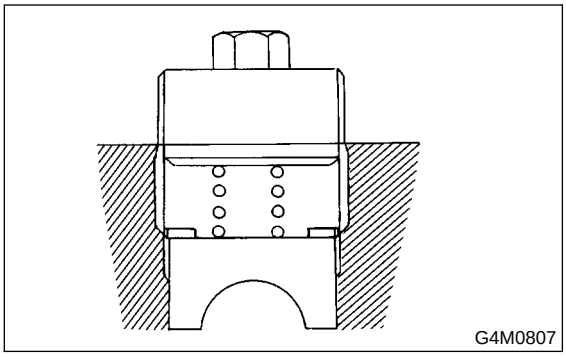
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

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



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

27) Rack and pinion backlash adjustment
(1) Loosen adjusting plug.
(2) Rotate input shaft so that rack is in the straight ahead direction. [Ensure that distance between rack end and stopper is 70.8 mm (2.787 in).]
(3) Tighten adjusting plug by two threads.



(4) Turn adjusting screw so that the entire thread area is coated with liquid packing.

Liquid packing:
THREE BOND 1102 or equivalent

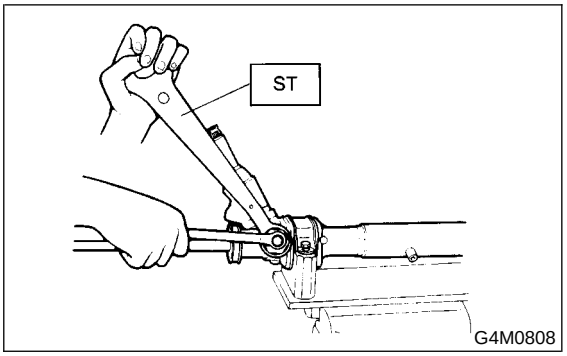
NOTE:
● Apply liquid packing of approximately 1.5 grams (0.053 oz) to adjusting screw thread area.
● Also turn plug to ensure that its entire contact area is coated with liquid packing.

(5) Tighten adjusting plug to 5 N·m (0.5 kgf-m, 3.6 ft-lb) and loosen, then tighten to 5 N·m (0.5 kgf-m, 3.6 ft-lb) and loosen, and finally tighten to 5 N·m (0.5 kgf-m, 3.6 ft-lb) and loosen 30°.
(6) While holding adjusting plug using a closed wrench, tighten lock nut using ST.

ST 926300000 SPANNER

Tightening torque:
39 N·m (4 kgf-m, 29 ft-lb)

CAUTION:
● Do not allow liquid packing to come in contact with sleeve.
● While rotating input shaft to fully move rack shaft to the left and right, ensure that rack moves smoothly without binding, and that rotating torque is constant.

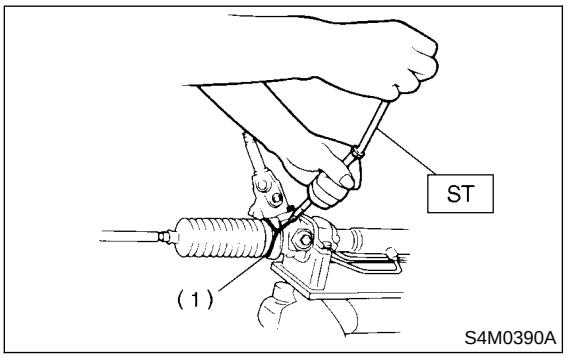


28) Installation of boot
(1) Apply a coat of grease to inner wall of boot small end.
(2) Position boot large end in rubber mount groove and gearbox, and small end in groove of tie-rod.

CAUTION:
● Ensure that both ends of boot are properly situated in grooves.
● Ensure that boot is free from abnormal swelling or dents.

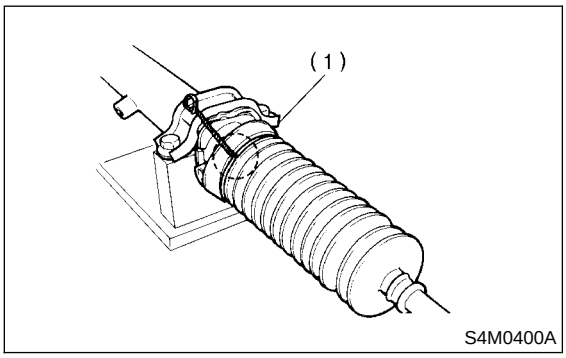
29) Attach lock wire to boot large end, and twist it while pulling it upward (with a force of approximately 39 N (4 kgf, 9 lb).
ST 927590000 WRENCH

CAUTION:
Ensure that lock wire is not loose.



(1) Wire

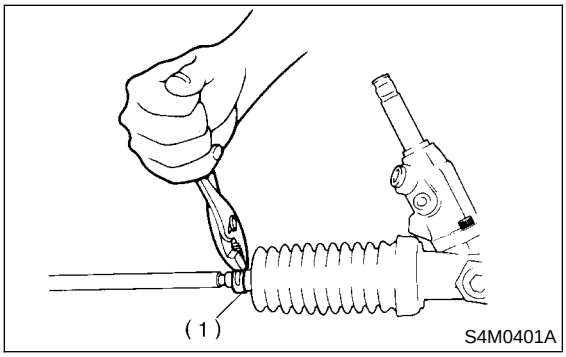
30) Then bend wire end along boot as shown.



(1) Twist wire up to this point.

31) Install clip using pliers.

CAUTION:
After installing clip, ensure that boot's small end is properly positioned in groove on tie-rod.



(1) Clip

E: INSPECTION S601276A10

1. BASIC INSPECTION S601276A1001

1) Clean all disassembled parts, and check for wear, damage, or any other faults, then repair or replace as necessary.
2) When disassembling, check inside of gearbox for water. If any water is found, carefully check 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) Bend of input shaft (2) Damage on serration	If bend or damage is excessive, replace entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If outer wall slips, lip is worn out or damage is found, replace it with new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust backlash properly. By measuring turning torque of gearbox and sliding resistance of rack, check if rack and pinion engage uniformly and smoothly with each other. (Refer to “Service limit”.) (2) Keeping rack pulled out all the way so that all teeth emerge, check teeth for damage. Even if abnormality is found in either (1) or (2), replace entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace gearbox with new one.
		(4) Wear or damage on rack bush	If free play of rack shaft in radial direction is out of the specified range, replace gearbox with new one. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If free plays of input shaft in radial and axial directions are out of the specified ranges, replace gearbox with new one. (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 on dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipes	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

2. SERVICE LIMIT S601276A1002

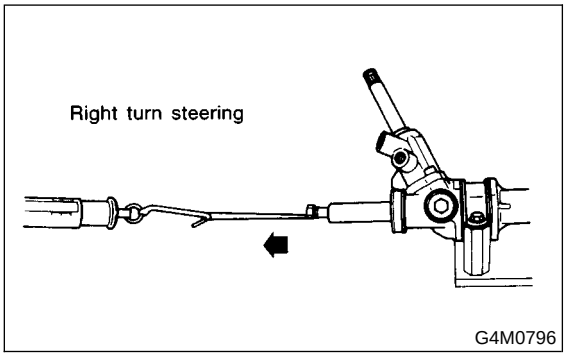
Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

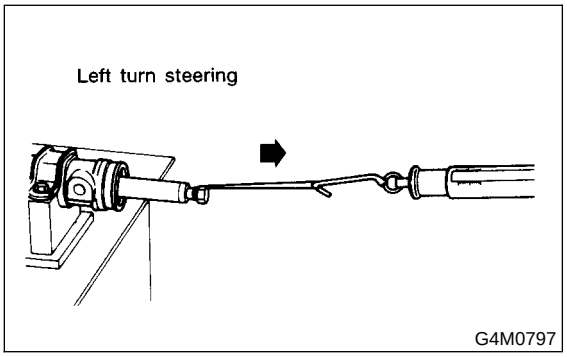
NOTE:
When making a measurement, vise gearbox by using ST. Never vise gearbox by inserting aluminum plates, etc. between vise and gearbox.
ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit
304 N (31 kgf, 68 lb) or less

Difference between left and right sliding resistance
Less than 20%



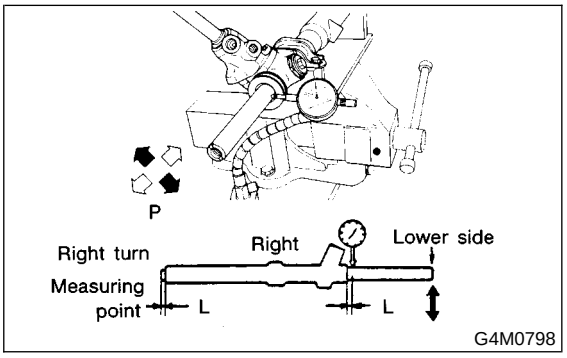


3. RACK SHAFT PLAY IN RADIAL DIRECTION S601276A1003

Right-turn steering:

Service limit
Less than 0.4 mm (0.016 in) (direction ⬅ ➡)
Less than 0.6 mm (0.024 in) (direction ⇦ ⇨)

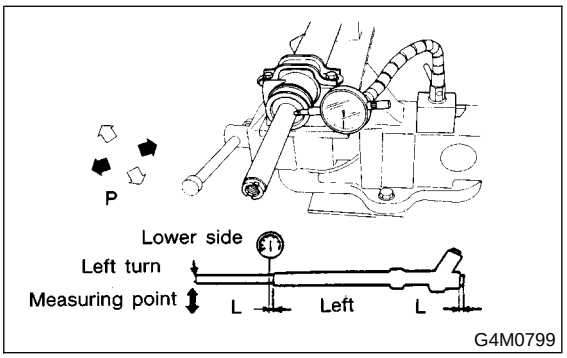
On condition
L: 5 mm (0.20 in)
P: 98 N (10 kgf, 22 lb)



Left-turn steering:

Service limit
Less than 0.4 mm (0.016 in) (direction ⬅ ➡ and ⇦ ⇨)

On condition
L: 5 mm (0.20 in)
P: 98 N (10 kgf, 22 lb)

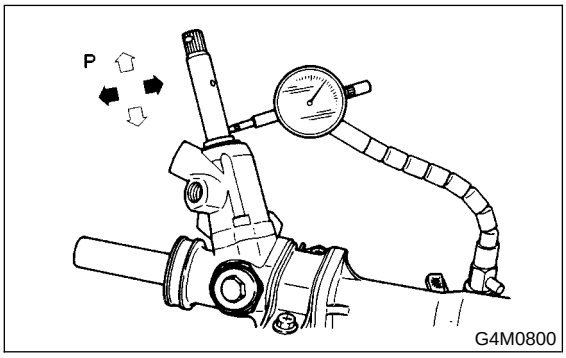


4. INPUT SHAFT PLAY S601276A1004

In radial direction:

Service limit
0.18 mm (0.0071 in) or less

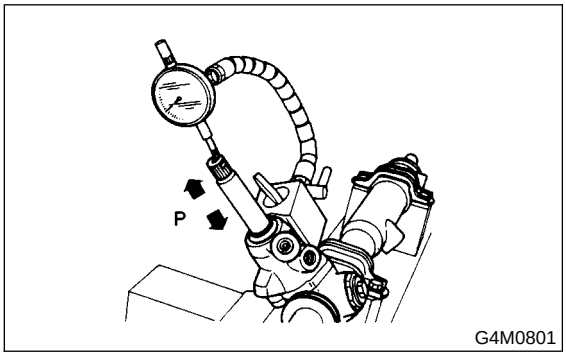
On condition
P: 98 N (10 kgf, 22 lb)



In axial direction:

Service limit
0.27 mm (0.0106 in) or less

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



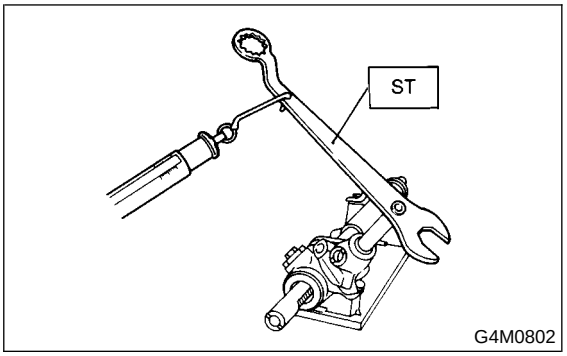
5. TURNING RESISTANCE OF GEARBOX

S601276A1005

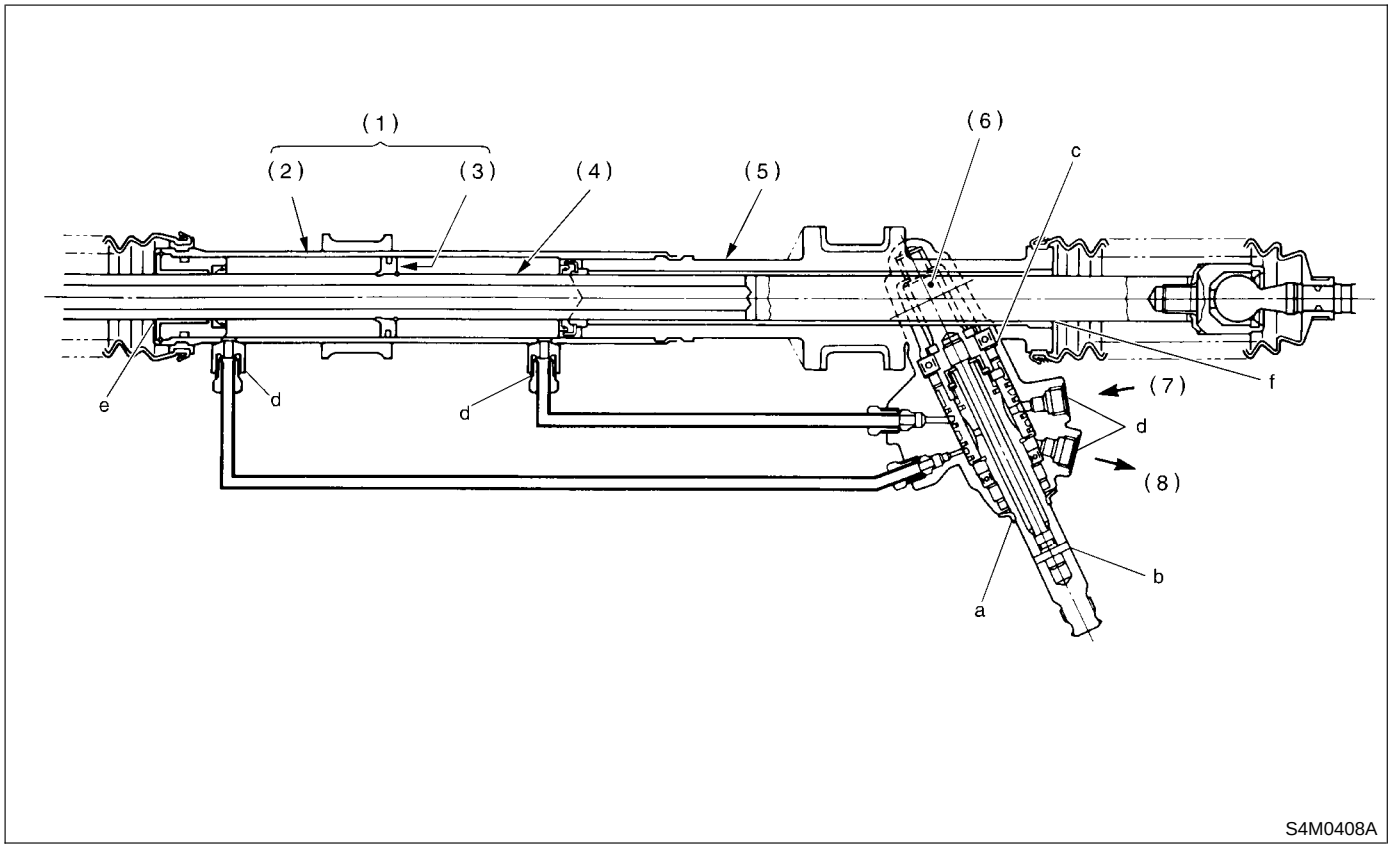
Using ST, measure gearbox turning resistance.
ST 926230000 SPANNER

Service limit:
Straight-ahead position within 30 mm (1.18 in) from rack center
Less than 11.18 N (1.14 kgf, 2.51 lb)
Maximum allowable resistance
15.79 N (1.61 kgf, 3.55 lb) or less

Difference between left and right sliding resistance:
Less than 20%



6. OIL LEAKING S601276A1006



(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack shaft
(5) Gearbox
(6) Pinion shaft
(7) From pump
(8) To tank

NOTE:
If gearbox is dismounted without confirming where the leak is, it must be mounted again to locate the leak point.

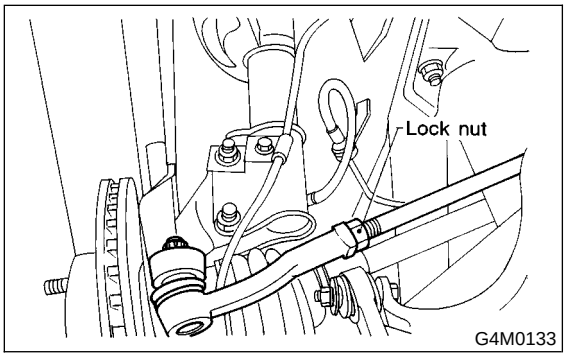
1) Even if the location of the leak can be easily found by observing the leaking condition, it is necessary to thoroughly remove the oil from the suspected portion and turn the steering wheel from lock to lock about 30 to 40 times with engine running, then make comparison of the suspected portion between immediately after and several hours after this operation.
2) Inspect leakage from “a”.
The oil seal is damaged. Replace valve assembly with a new one.
3) Inspect leakage from “b”.
The torsion bar O-ring is damaged. Replace valve assembly with a new one.
4) Inspect leakage from “c”.
The oil seal is damaged. Replace valve assembly with a new one.
5) Inspect leakage from “d”.
The pipe is damaged. Replace the faulty pipe or O-ring.
6) If leak is other than a, b, c, or d, and if oil is leaking from the gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove oil from the surrounding portions. Then, turn the steering wheel from lock to lock 30 to 40 times with the engine running, then make comparison of the leaked portion immediately after and several hours after this operation.
(1) Inspect leakage from “e”.
The cylinder seal is damaged. Replace rack bushing with a new one.
(2) Inspect leakage from “f”.
There are two possible causes. Take following step first. Remove the pipe assembly B from the valve housing, and close the circuit with ST.
ST 926420000 PLUG

CAUTION:
● If leakage from "f" is noted again:
The oil seal of pinion and valve assembly is damaged. Replace pinion and valve assembly with a new one. Or replace the oil seal and the parts that are damaged during disassembly with new ones.
● If oil stops leaking from "f":
The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

F: ADJUSTMENT S601276A01

1) Adjust front toe.

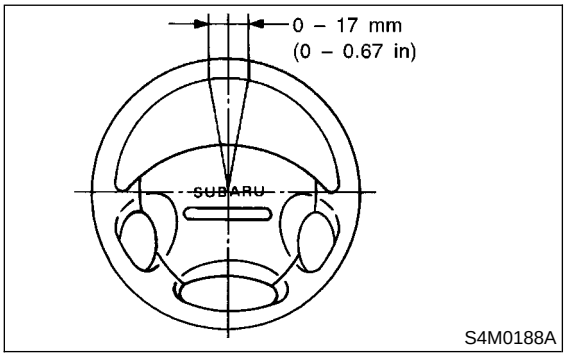
Standard of front toe:
IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)



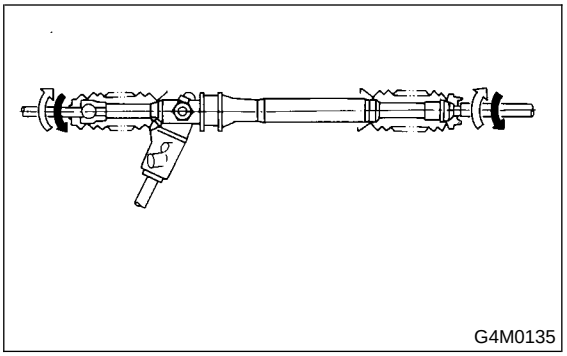
2) Adjust steering angle of wheels.

Standard of steering angle:
Inner wheel: 37.4°±1.5°
Outer wheel: 32.5°±1.5°

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



4) If 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 same direction by the same amount.

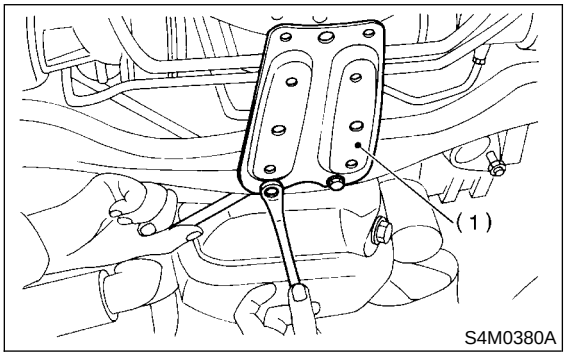


7. Pipe Assembly S601277

A: REMOVAL S601277A18

1. NON-TURBO MODEL S601277A1803

1) Set the vehicle on the lift.
2) Disconnect battery minus terminal.
3) Lift vehicle and remove jack-up plate.

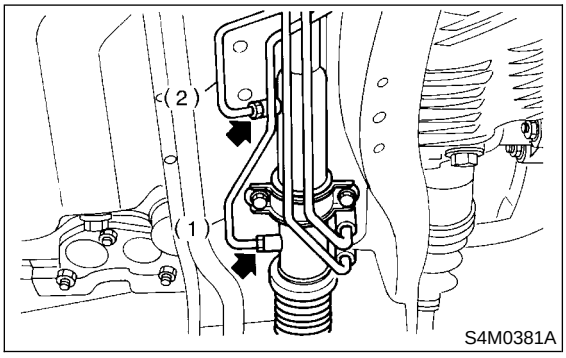


(1) Jack-up plate

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

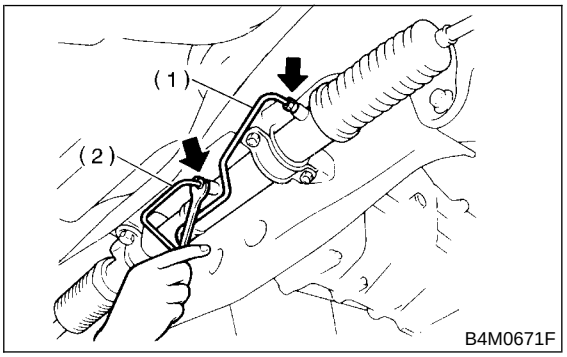
CAUTION:
Improper removal and installation of parts often causes fluid leak trouble. To prevent this, clean the surrounding portions before disassembly and reassembly, and pay special attention to keep dirt and other foreign matter from mating surfaces.

LHD model



(1) Pipe A
(2) Pipe B

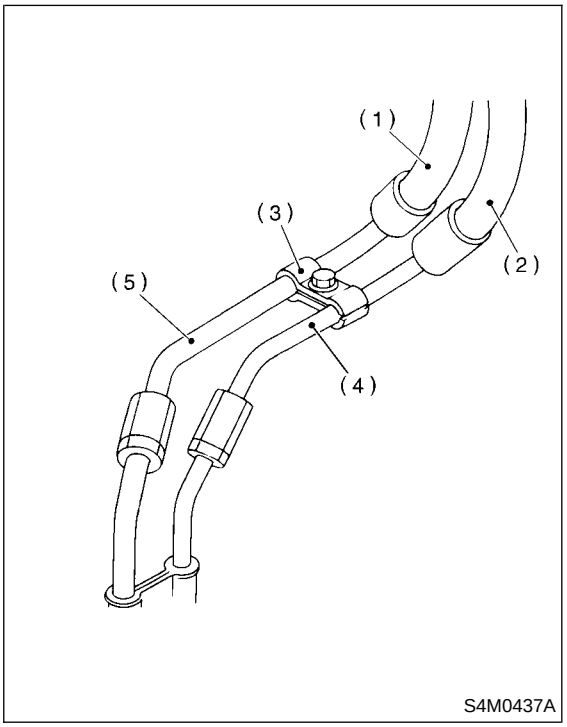
RHD model



(1) Pipe A
(2) Pipe B

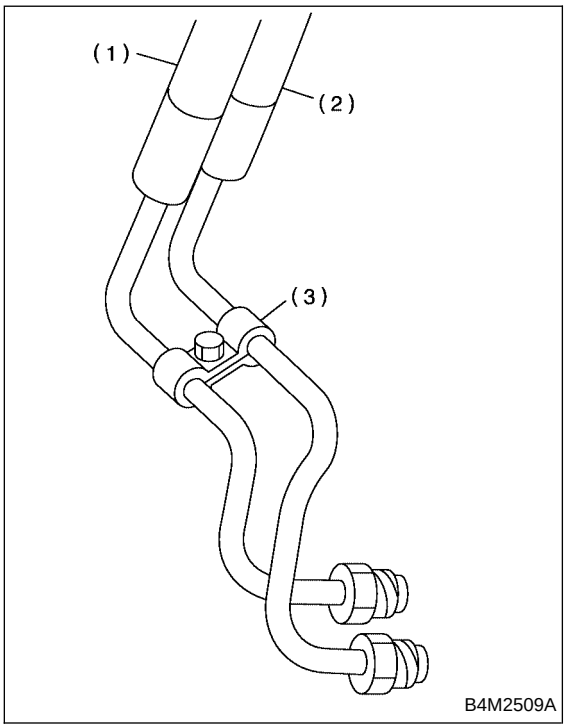
5) Remove clamp E from pipes.

LHD model



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

RHD model



6) Disconnect pipe C·D.

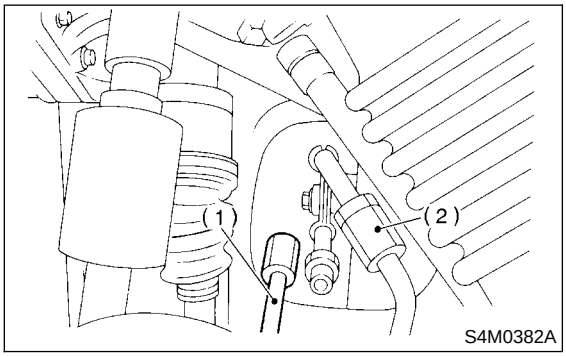
(1) LHD model

Disconnect pipe C·D from pipe (on the gearbox side).

CAUTION:

● When disconnecting pipe C·D, use two wrenches to prevent deformities.

● Be careful to keep pipe connections free from foreign matter.



(1) Pipe C
(2) Pipe D

(2) RHD model

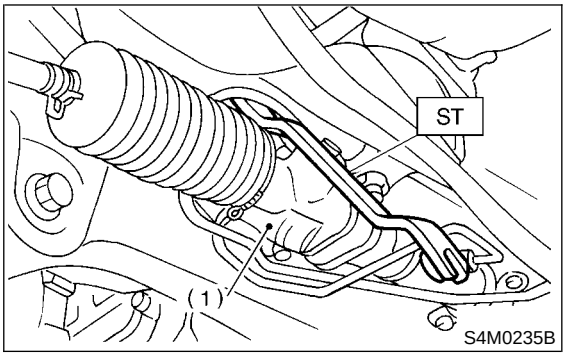
Using ST, remove flare nuts from control valve of gearbox assembly, and then disconnect pipe.

ST 34099AC050 GEARBOX SPANNER

CAUTION:

● When disconnecting pipes, use two wrenches to prevent deformities.

● Be careful to keep pipe connections free from foreign matter.



(1) Steering gearbox

7) Lower the vehicle.

8) Remove intake duct and cleaner case. <Ref. IN(SOHC)-8, INSTALLATION, Air Intake Duct.> and <Ref. IN(SOHC)-7, Air Cleaner Case.>

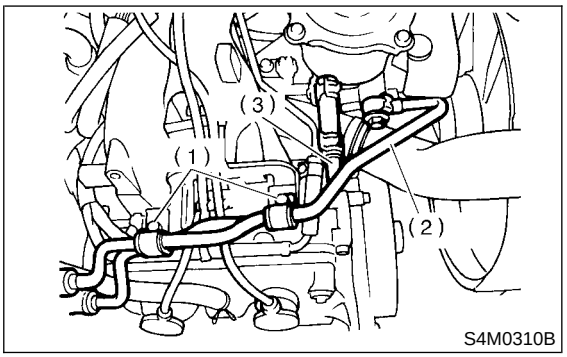
9) Remove bolt A.

10) Disconnect pipe C from oil pump. Disconnect pipe D from return hose.

CAUTION:

● Do not allow fluid from the hose end to come into contact with pulley belt.

● To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.

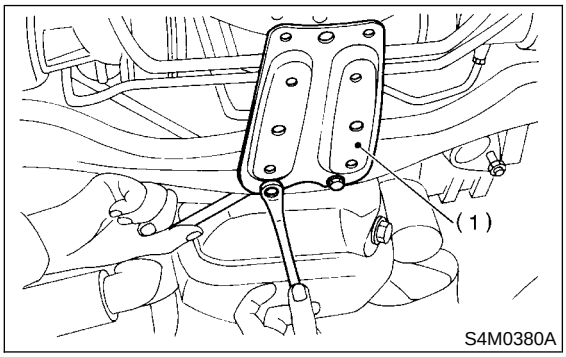


(1) Bolt A
(2) Pipe C
(3) Pipe D

2. TURBO MODEL *S601277A1804*

1) Set the vehicle on the lift.
2) Disconnect battery minus terminal.

3) Lift vehicle and remove jack-up plate.

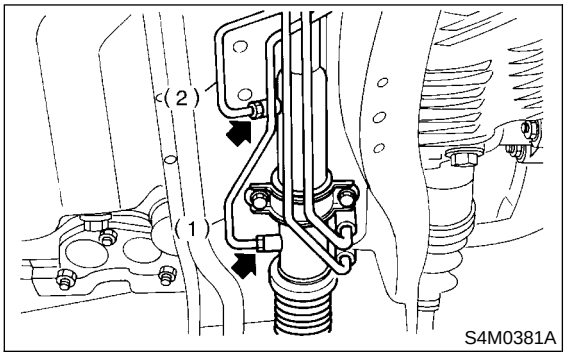


(1) Jack-up plate

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

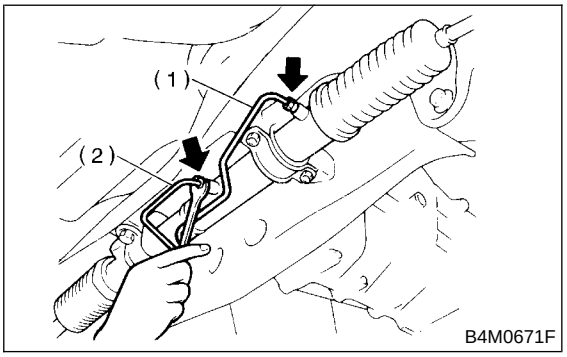
CAUTION:
Improper removal and installation of parts often causes fluid leak trouble. To prevent this, clean the surrounding portions before disassembly and reassembly, and pay special attention to keep dirt and other foreign matter from mating surfaces.

LHD model



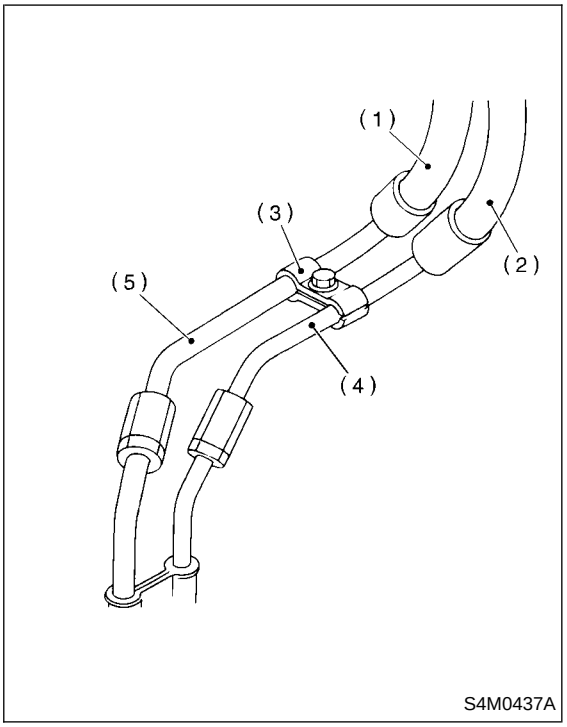
(1) Pipe A
(2) Pipe B

RHD model



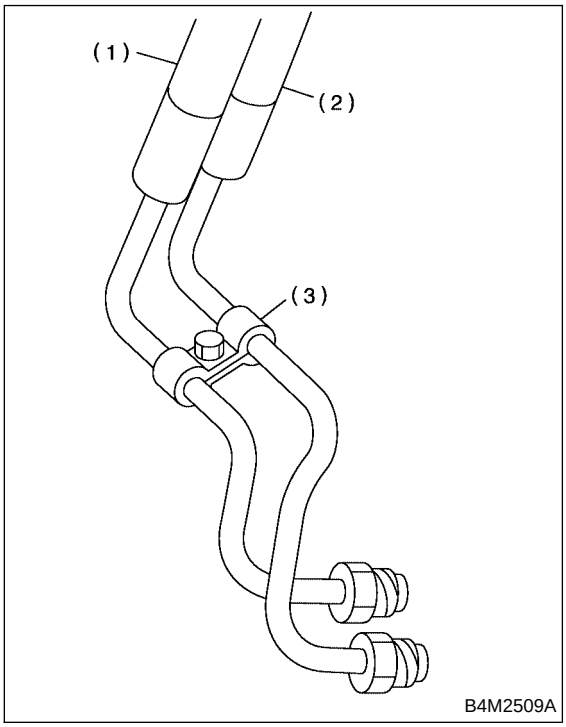
(1) Pipe A
(2) Pipe B

5) Remove clamp E from pipes.
LHD model



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

RHD model



6) Disconnect pipe C·D.

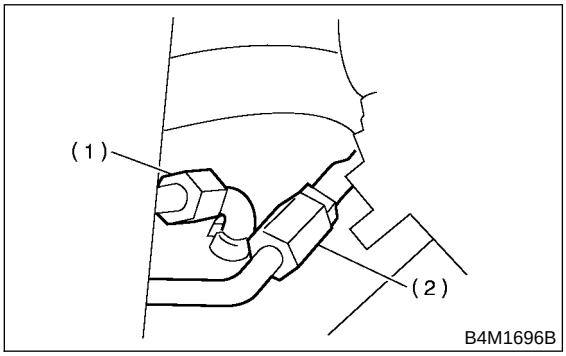
(1) LHD model

Disconnect pipe C·D from pipe (on the gearbox side).

CAUTION:

● When disconnecting pipe C·D, use two wrenches to prevent deformities.

● Be careful to keep pipe connections free from foreign matter.



(1) Pipe C
(2) Pipe D

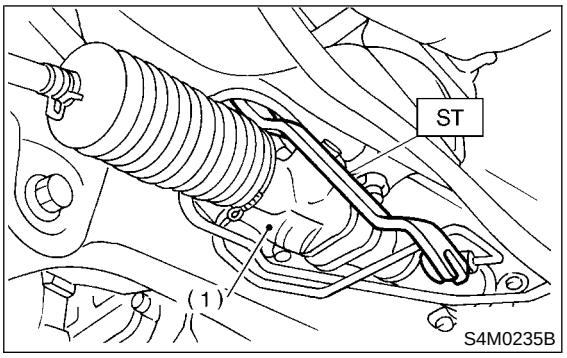
(2) RHD model

Using ST, remove flare nuts from control valve of gearbox assembly, and then disconnect pipe.
ST 34099AC050 GEARBOX SPANNER

CAUTION:

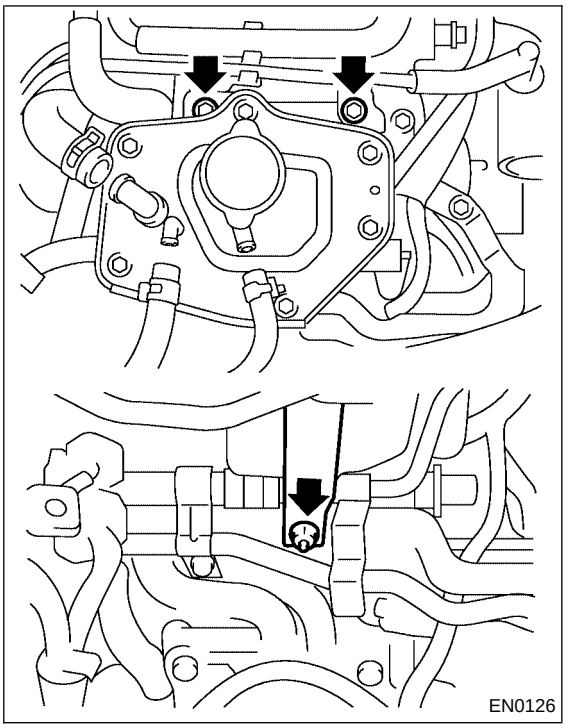
● When disconnecting pipes, use two wrenches to prevent deformities.

● Be careful to keep pipe connections free from foreign matter.



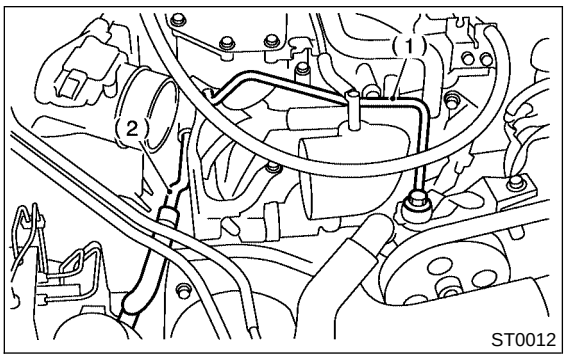
(1) Steering gearbox

7) Lower the vehicle.
8) Remove intake duct.
9) Remove bolt A.
(1) Remove air intake duct, air cleaner upper cover and air intake boot.
<Ref. to IN(DOHC TURBO)-8, REMOVAL, Air Intake Duct.> and <Ref. to IN(DOHC TURBO)-9, REMOVAL, Intake Duct.>
(2) Remove two bolts fixing pipe C and D.
(3) Remove coolant filler tank.



(4) Disconnect pipe C from oil pump. Disconnect pipe D from return hose.

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



(1) Pipe C
(2) Pipe D

B: INSTALLATION S601277A11

1. NON-TURBO MODEL S601277A1103

1) Tighten bolt A.

CAUTION:
Visually check that hose between tank and pipe D is free from bending or twisting.

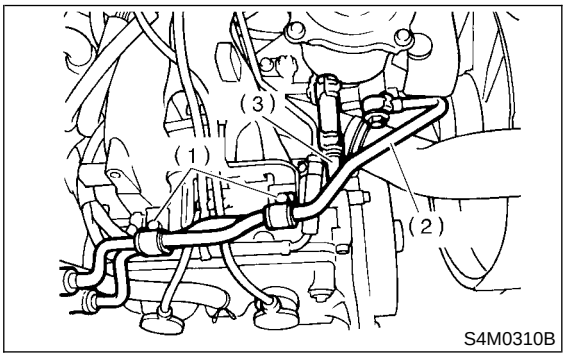
(1) Connect pipe D to oil tank.
(2) Connect pipe C or pressure hose to oil pump.

CAUTION:
Use a new gasket.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

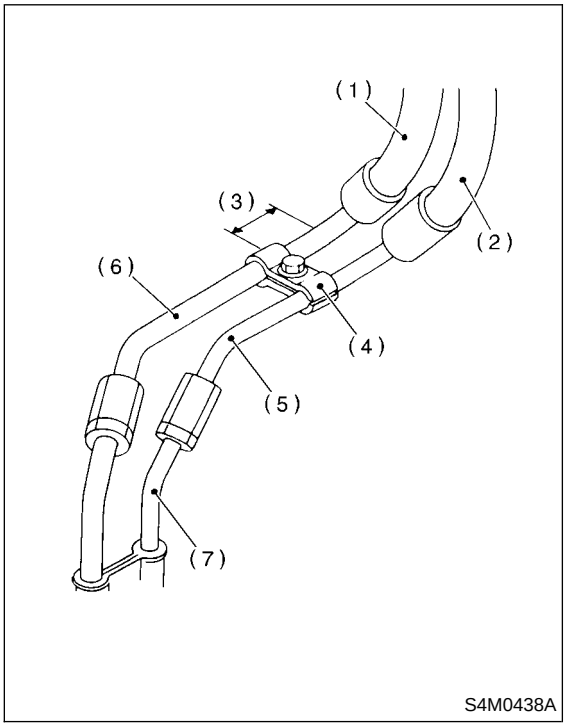
(3) Tighten bolt A.

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



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

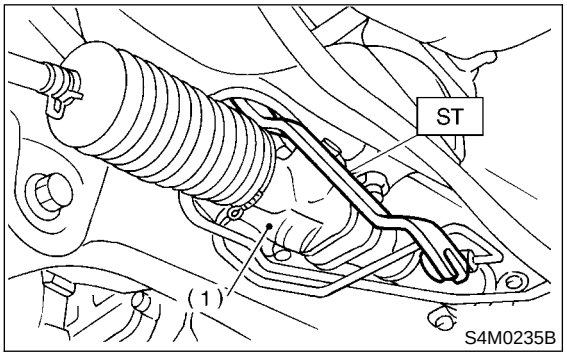
2) Temporarily connect pipes C and D. (LHD model)



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

3) Using ST, remove flare nuts from control valve of gearbox assembly, and disconnect upper and lower hoses.
ST 34099AC050 GEARBOX SPANNER

CAUTION:
● Always disconnect hoses B and A in that order.
● Be careful not to damage the hoses during removal.

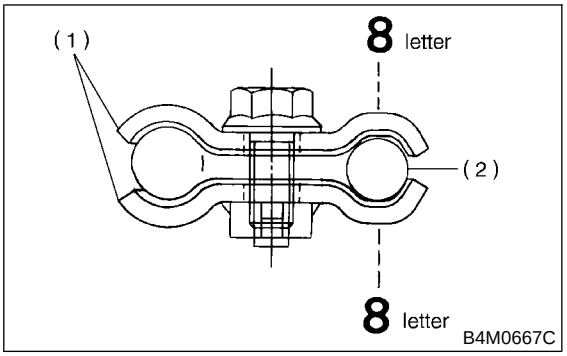


(1) Steering gearbox

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

CAUTION:
Ensure that the letter "8" on each clamp are diagonally opposite each other as shown in figure.

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



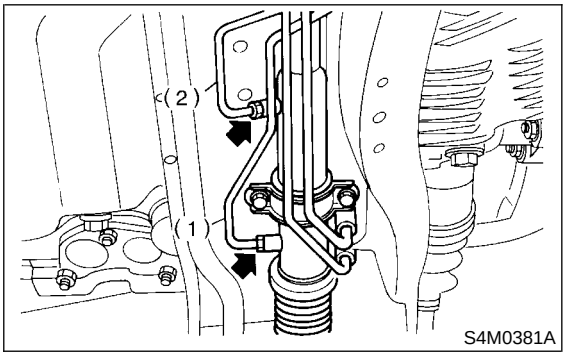
(1) Clamp E
(2) Pipe C

5) Tighten joint nut.

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

6) Connect pipe A and B.
(1) LHD model
Connect pipes A and B to four pipe joints of gearbox. Connect upper pipe B first, and lower pipe A second.

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



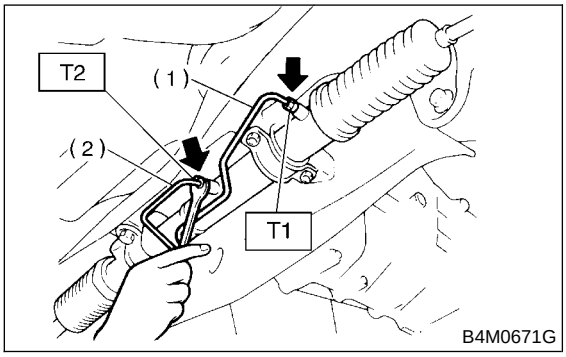
(1) Pipe A
(2) Pipe B

(2) RHD model

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

Tightening torque:

T1: 20 N·m (2.0 kgf-m, 14.5 ft-lb)
T2: 24 N·m (2.4 kgf-m, 17.4 ft-lb)

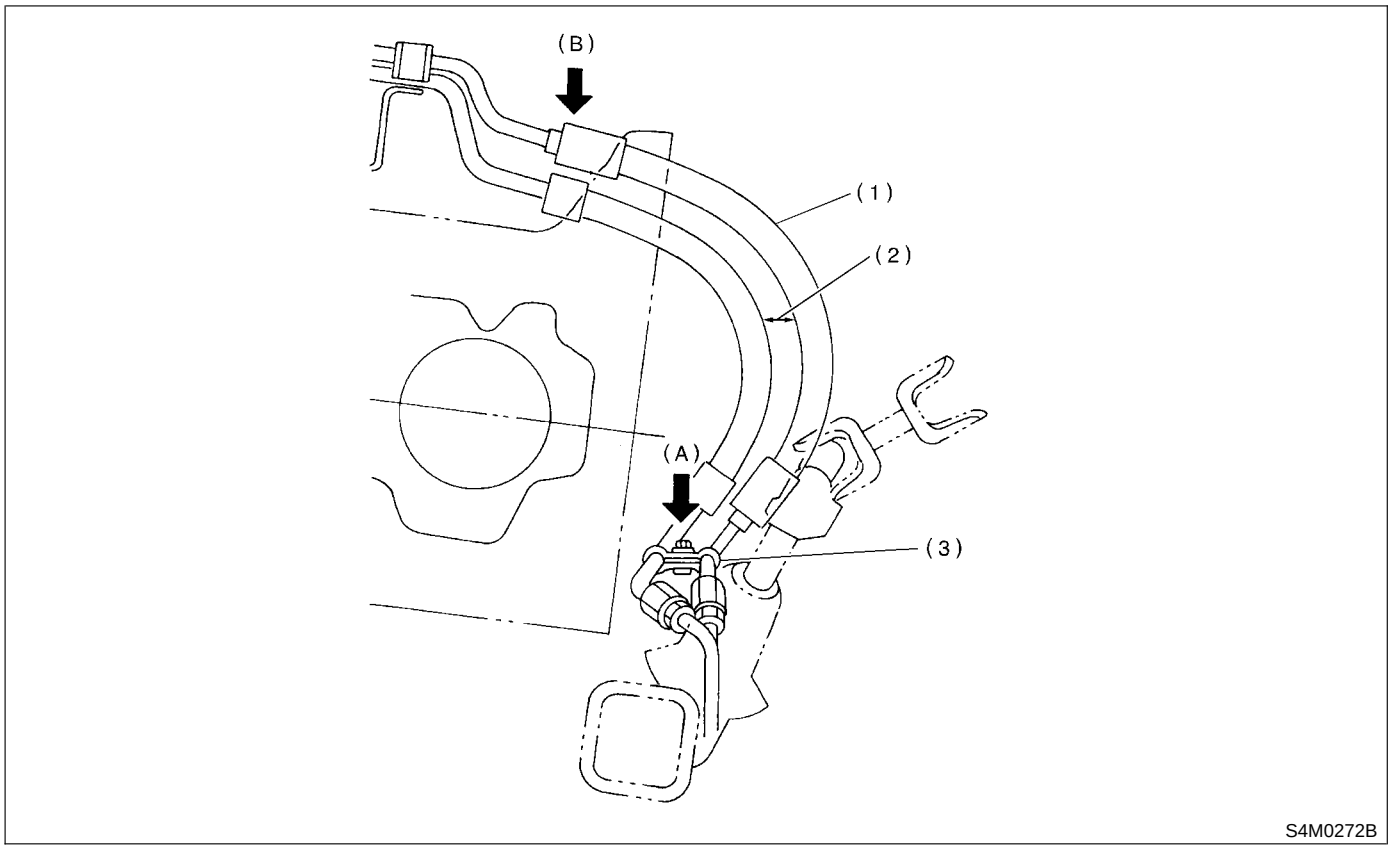


(1) Pipe A
(2) Pipe B

7) Install jack-up plate.
8) Connect battery ground terminal.
9) Feed the specified fluid.

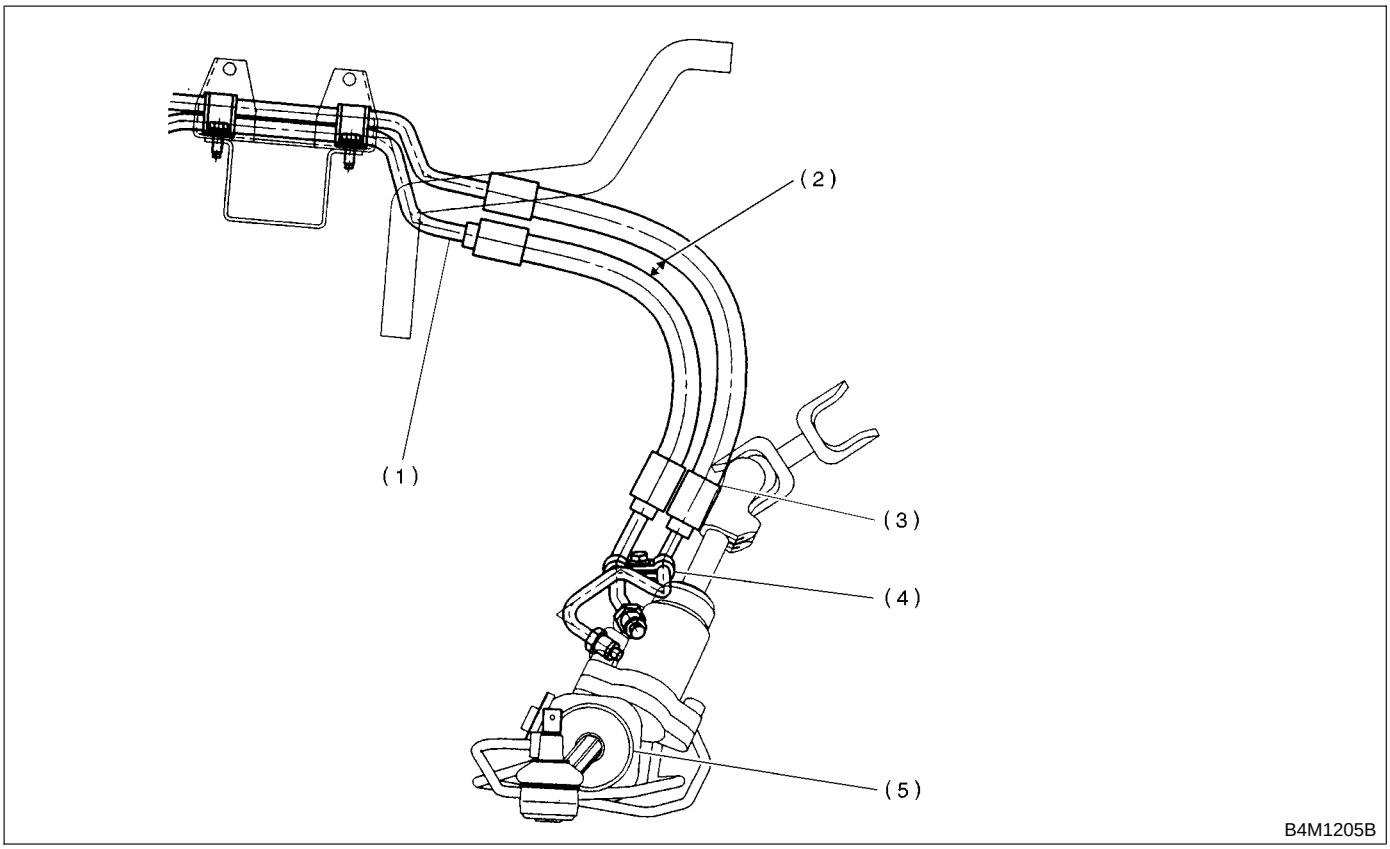
NOTE:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

LHD model



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

RHD model



(1) Clearance between blow-by hose and pipe: 3 — 5 mm (0.12 — 0.20 in)
(2) No interference is allowed between hoses
(3) Clearance between side frame and hose: 15 mm (0.59 in) or more
(4) Clearance between crossmember and pipe: 5 — 13 mm (0.20 — 0.51 in)
(5) Steering gearbox

10) Finally check clearance between pipes and/or hoses, as shown above.
If clearance between cruise control pump and power steering hose is less than 10 mm (0.39 in), proceed as follows:

(1) Move clamped section (A) (refer to figure above.) down to a point where pipe is close to crossmember.

Pipe-to-crossmember clearance:
10 mm (0.39 in), min.

(2) Check that clearance between cruise control pump and power steering hose is at least 10 mm (0.39 in). If it is not, bend section (B) down until a clearance of at least 10 mm (0.39 in) is obtained.

2. TURBO MODEL S601277A1104

1) Tighten bolt A.

CAUTION:
Visually check that hose between tank and pipe D is free from bending or twisting.

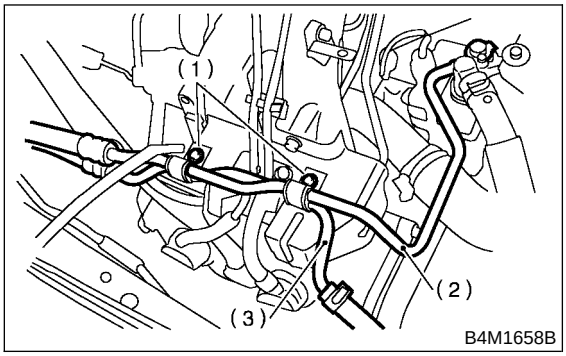
(1) Connect pipe D to oil tank.
(2) Connect pipe C or pressure hose to oil pump.

CAUTION:
Use a new gasket.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

(3) Tighten bolt A.

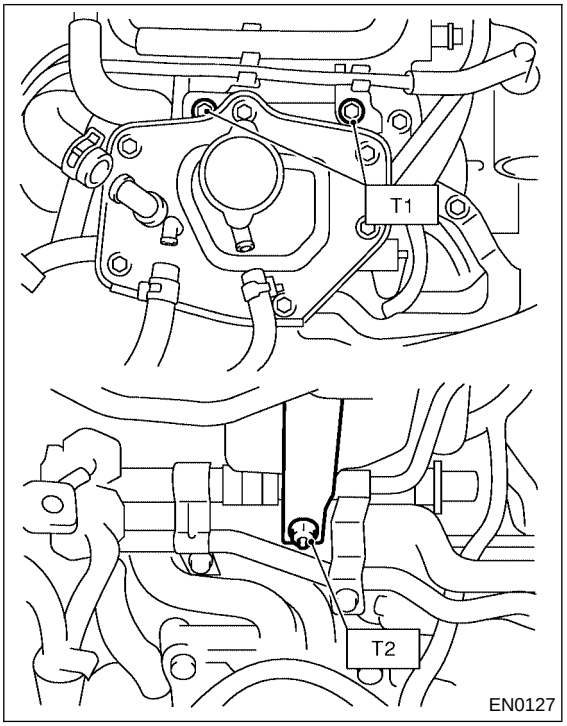
Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



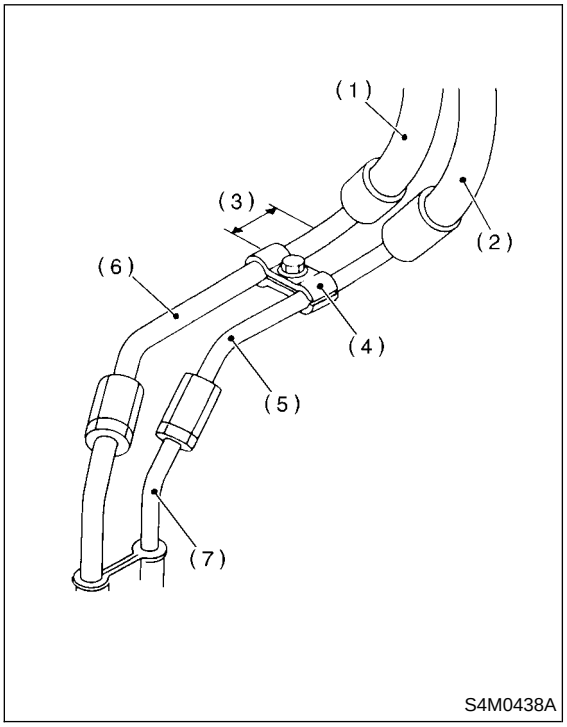
(1) Bolt A
(2) Pipe C
(3) Pipe D

2) Install coolant filler tank. (Turbo model)

Tightening torque:
T1: 19 N·m (1.9 kgf-m, 13.7 ft-lb)
T2: 21 N·m (2.1 kgf-m, 15.2 ft-lb)

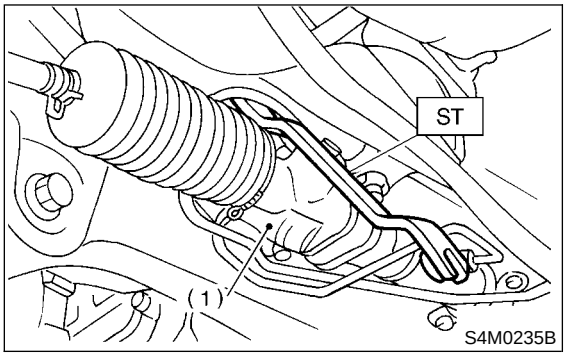


3) Temporarily connect pipes C and D. (LHD model)



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

4) Using ST, temporarily connect pipes to control valve of gearbox. (RHD model)
ST 34099AC050 GEARBOX SPANNER

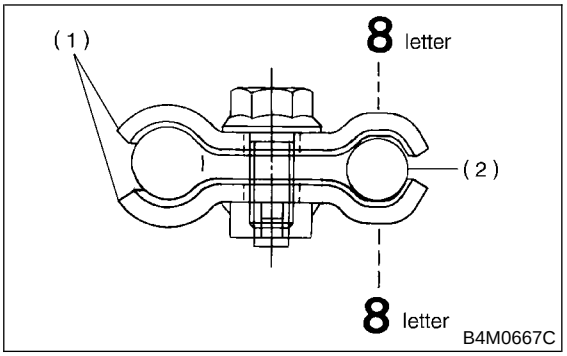


(1) Steering gearbox

5) Temporarily install clamp E on pipes C and D, and tighten clamp E firmly.

CAUTION:
Ensure that the letter "8" on each clamp are diagonally opposite each other as shown in figure.

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



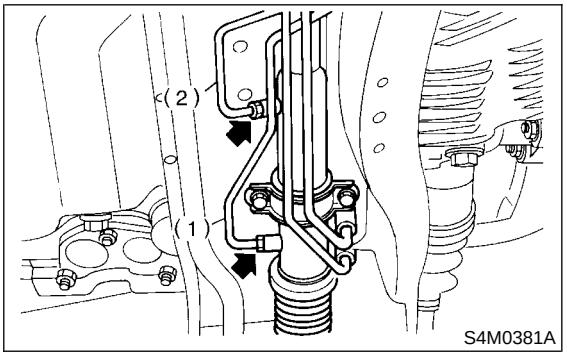
(1) Clamp E
(2) Pipe C

6) Tighten joint nut.

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

7) Connect pipe A and B.
(1) LHD model
Connect pipes A and B to four pipe joints of gearbox. Connect upper pipe B first, and lower pipe A second.

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



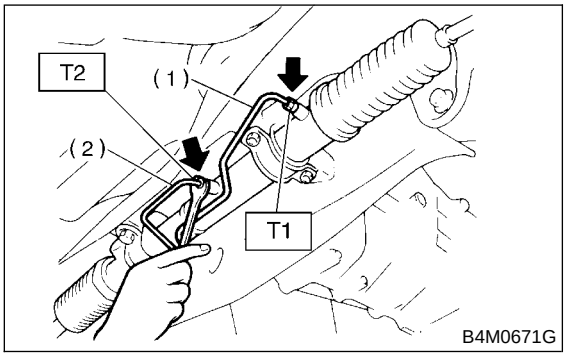
(1) Pipe A
(2) Pipe B

(2) RHD model

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

Tightening torque:

T1: 20 N·m (2.0 kgf-m, 14.5 ft-lb)
T2: 24 N·m (2.4 kgf-m, 17.4 ft-lb)

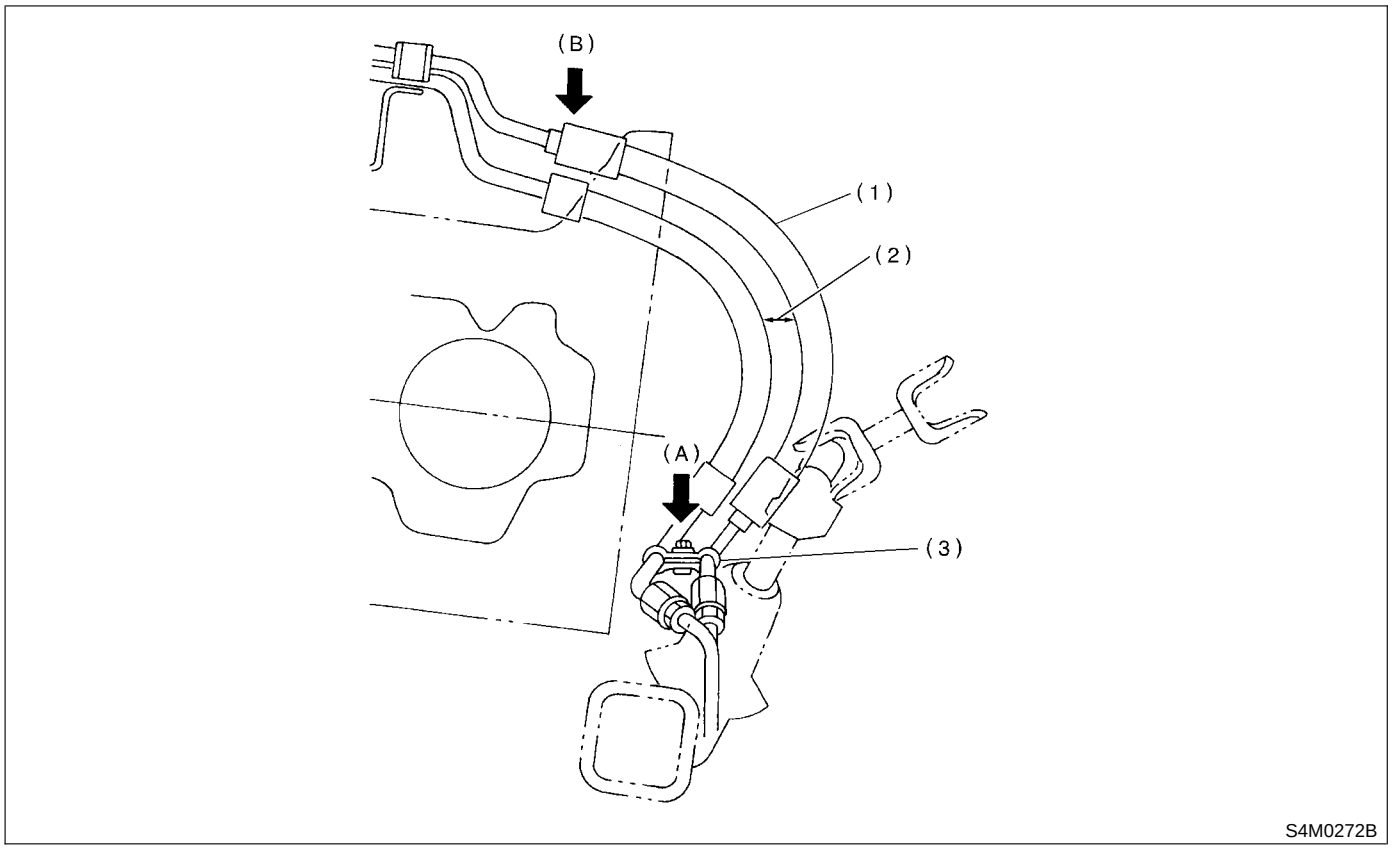


(1) Pipe A
(2) Pipe B

8) Install jack-up plate.
9) Connect battery ground terminal.
10) Feed the specified fluid.

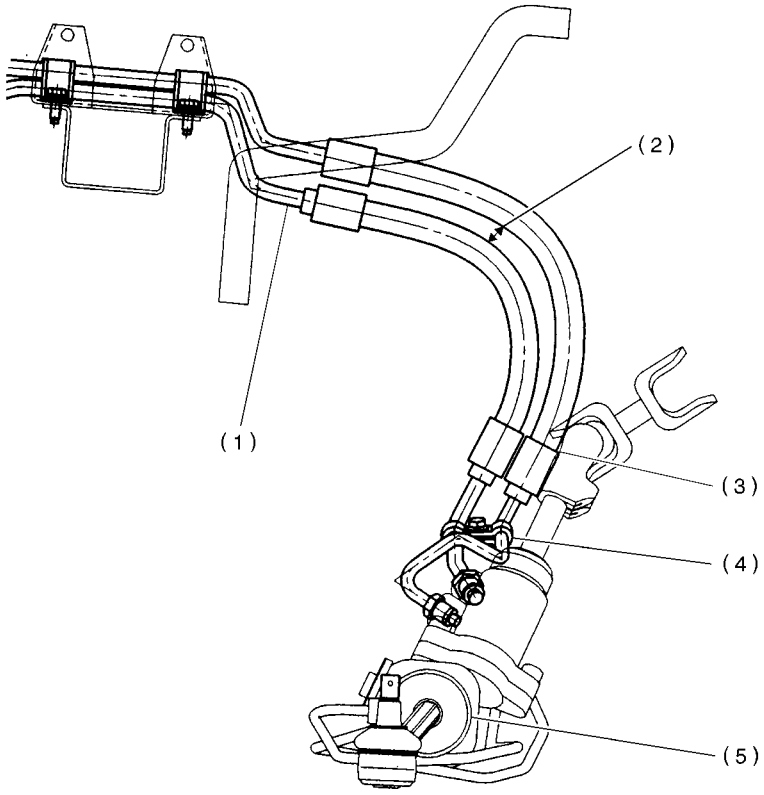
NOTE:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

LHD model



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

RHD model



(1) Clearance between blow-by hose and pipe: 3 — 5 mm (0.12 — 0.20 in)
(2) No interference is allowed between hoses
(3) Clearance between side frame and hose: 15 mm (0.59 in) or more
(4) Clearance between crossmember and pipe: 5 — 13 mm (0.20 — 0.51 in)
(5) Steering gearbox

11) Finally check clearance between pipes and/or hoses, as shown above.
If clearance between cruise control pump and power steering hose is less than 10 mm (0.39 in), proceed as follows:

(1) Move clamped section (A) (refer to figure above.) down to a point where pipe is close to crossmember.

Pipe-to-crossmember clearance:
10 mm (0.39 in), min.

(2) Check that clearance between cruise control pump and power steering hose is at least 10 mm (0.39 in). If it is not, bend section (B) down until a clearance of at least 10 mm (0.39 in) is obtained.

C: INSPECTION S601277A10

Check all disassembled parts for wear, damage or other abnormalities. Repair or replace faulty parts as required.

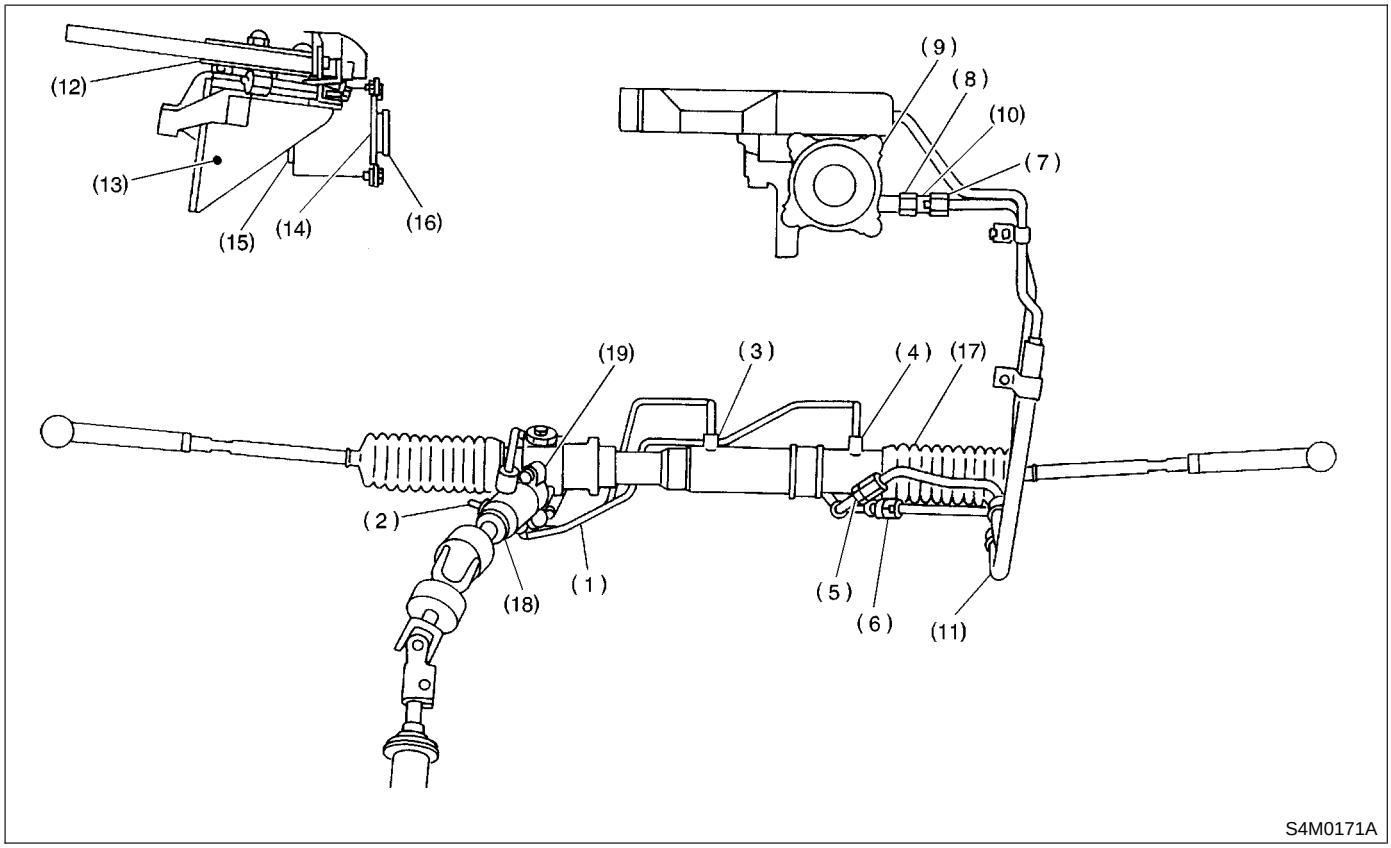
Part name	Inspection	Remedy
Pipe	• O-ring fitting surface for damage • Nut for damage • Pipe for damage	Replace with new one.
Clamp B	• Clamps for weak clamping force	Replace with new one.
Clamp C		
Clamp E		
Hose	• Flared surface for damage • Flare nut for damage • Outer surface for cracks • Outer surface for wear • Clip for damage • End coupling or adapter for degradation	Replace with new one.

CAUTION:
Although 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. It is very important to keep the hoses free from before mentioned fluids and to wipe out immediately when the hoses are adhered with the fluids.
Since resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses 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 area and/or a driving condition in which many steering operations are required in short time.
Particularly continuous work of relief valve over 5 seconds causes to reduce service lives of the hoses, the oil pump, the fluid, etc. due to over heat.
So, avoid to keep this kind of condition when servicing as well as driving.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct customers.
	Malfunction of relief valve	Replace oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace defective parts.
	Improper stop position of pitching stopper	Replace defective parts.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customer.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, brake fluid, engine oil, electrolyte adhere on the hose surface	Replace. Pay attention on service work.
	Too many times use in extremely cold weather	Replace. Instruct customers.

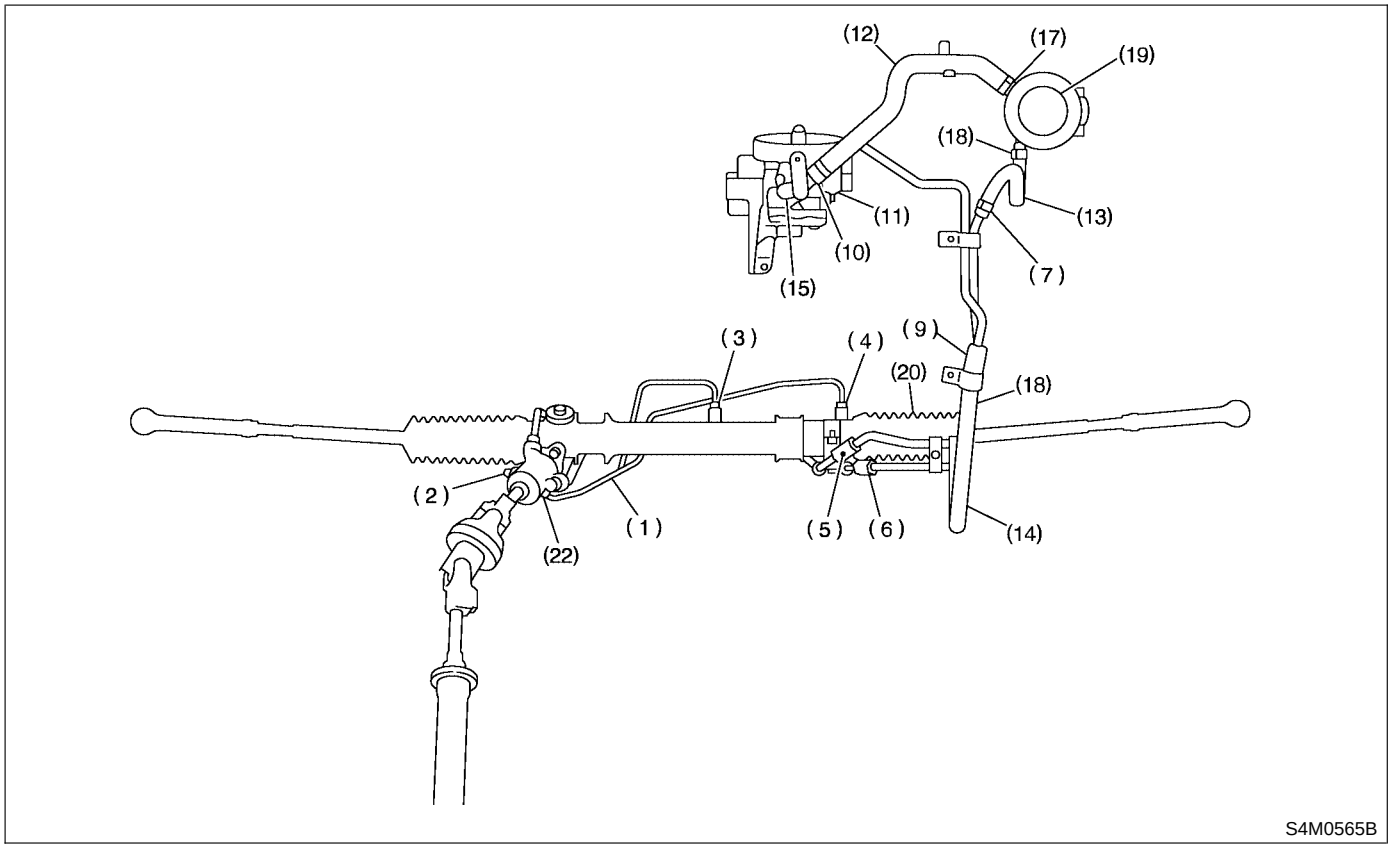
CAUTION:
It is likely that although one judges fluid leakage, there is actually no leakage. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.

Non-turbo model



Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (9) in figure	Insufficient tightening of flare nut, catching dirt or the like, damage to flare or flare nut or eye bolt	Loosen and retighten, if ineffective, replace.
	Poor insertion of hose, poor clamping	Retighten or replace clamp.
	Damaged O-ring or gasket	Replace O-ring or gasket pipe or hose with new one, if ineffective, replace gear-box also.
Leakage from hose (10) and (11) in figure	Crack or damage in hose	Replace with a new one.
	Crack or damage in hose hardware	Replace with a new one.
Leakage from surrounding of cast iron portion of oil pump (12) and (13) in figure	Damaged O-ring	Replace oil pump.
	Damaged gasket	Replace oil pump.
Leakage from oil tank (14) and (15) in figure	Crack in oil tank, (14)	Replace oil tank.
	Damaged O-ring, (15)	Replace O-ring.
Leakage from filler neck (16)	Damaged cap packing	Replace cap.
	Crack in root of filler neck	Replace oil tank.
	High fluid level *1	Adjust fluid level.
Leakage from surrounding of power cylinder of gearbox (17) in figure	Damaged oil seal	Replace oil seal.
Leakage from control valve of gear-box (18) and (19) in figure	Damaged packing or oil seal	Replace problem parts.
	Damage in control valve	Replace control valve.

Turbo model



Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (11) in figure	Insufficient tightening of flare nut, catching dirt or the like, damage to flare or flare nut or eye bolt	Loosen and retighten, if ineffective, replace.
	Poor insertion of hose, poor clamping	Retighten or replace clamp.
	Damaged O-ring or gasket	Replace O-ring or gasket pipe or hose with new one, if ineffective, replace gear-box also.
Leakage from hose (12), (13) and (14) in figure	Crack or damage in hose	Replace with a new one.
	Crack or damage in hose hardware	Replace with a new one.
Leakage from surrounding of cast iron portion of oil pump (15) and (16) in figure	Damaged O-ring	Replace oil pump.
	Damaged gasket	Replace oil pump.
Leakage from oil tank (17) and (18) in figure	Crack in oil tank	Replace oil tank.
Leakage from filler neck (19)	Damaged cap packing	Replace cap.
	Crack in root of filler neck	Replace oil tank.
	High fluid level *1	Adjust fluid level.
Leakage from surrounding of power cylinder of gearbox (20) in figure	Damaged oil seal	Replace oil seal.
Leakage from control valve of gear-box (21) and (22) in figure	Damaged packing or oil seal	Replace problem parts.
	Damage in control valve	Replace control valve.

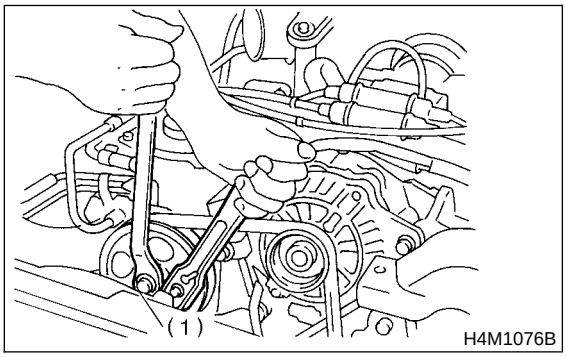
NOTE:
Fluid level is specified at optimum position (range) for ordinary use. Accordingly, if the vehicle is used often under hard conditions such as on very rough roads or in mountainous areas, fluid may bleed out from cap air vent hole. This is not a problem. If a customer complains strongly and is not likely to be satisfied with the leakage, lower the fluid level to the extent that fluid will not bleed out under the conditions described, and have the customer check the fluid level and its quality more frequency than usual.

8. Oil Pump S601070

A: REMOVAL S601070A18

1. NON-TURBO MODEL S601070A1804

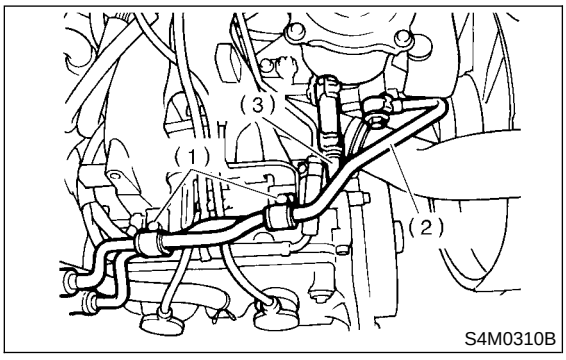
1) Remove ground cable from battery.
2) Drain the working fluid about 0.3 ℓ (0.3 US qt, 0.3 Imp qt) from oil tank.
3) Remove pulley belt cover bracket.
4) Loosen oil pump pulley nut, then remove bolts which secure alternator.



(1) Oil pump pulley nut

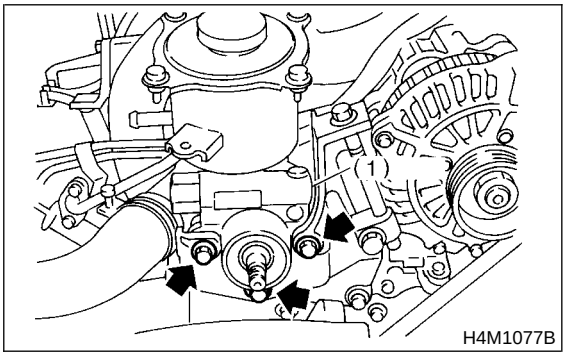
5) Loosen pulley belt(s).
6) Remove the nut and detach oil pump pulley.
7) Disconnect pipe C from oil pump. Disconnect pipe D from oil tank.

CAUTION:
● Do not allow fluid from the hose end to come into contact with pulley belt.
● To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.
● Except when only oil tank needs to be inspected, detach oil tank and oil pump as a unit. Then separate one from the other on a work bench to prevent oil from spilling on any part of the engine.



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

8) Remove three bolts from the front side of oil pump and detach the pump.



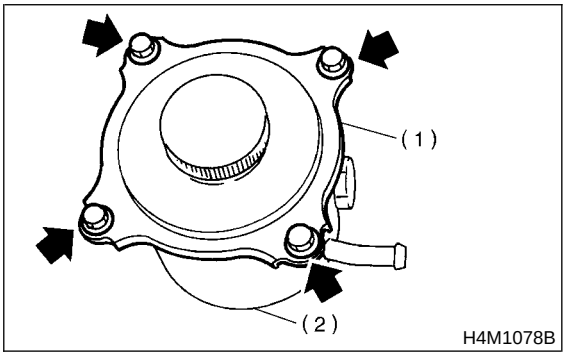
(1) Oil pump

9) Remove three bolts from the lower side of bracket and detach the bracket.

CAUTION:
The bracket does not need to be removed unless it is damaged.

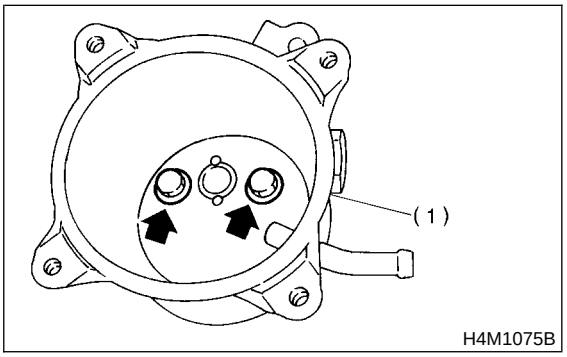
10) Place oil pump in a vise, and remove upper shell and baffle from lower shell.

CAUTION:
Do not clamp oil pump too hard; otherwise oil pump may be dented.



(1) Upper shell
(2) Lower shell

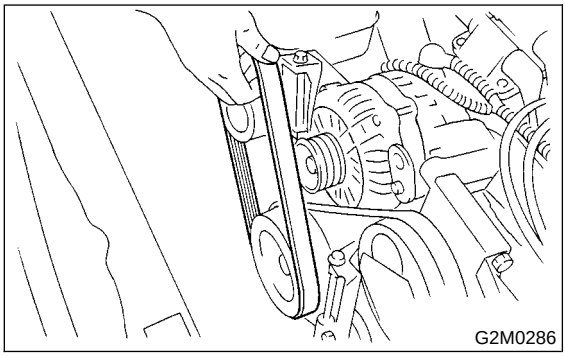
11) Remove lower shell from oil pump.



(1) Lower shell

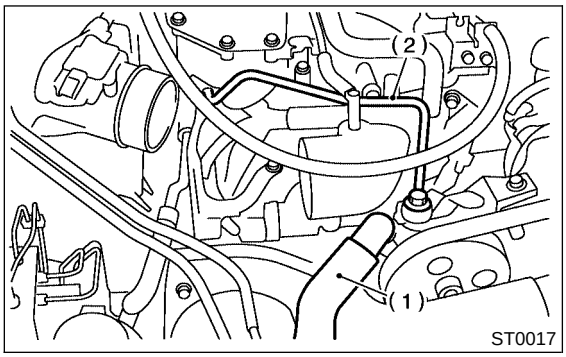
2. TURBO MODEL S601070A1805

1) Remove ground terminal from battery.
2) Remove intake duct. <Ref. to IN(DOHC TURBO)-8, REMOVAL, Air Intake Duct.>
3) Remove pulley belt cover.
4) Loosen lock bolt and slider bolt and remove power steering pump drive V-belt.


G2M0286

5) Disconnect connector from power steering pressure switch.
6) Remove intake boot and air cleaner upper. <Ref. to IN(DOHC TURBO)-7, REMOVAL, Air Cleaner.>
7) Disconnect pipe C and suction hose from oil pump.

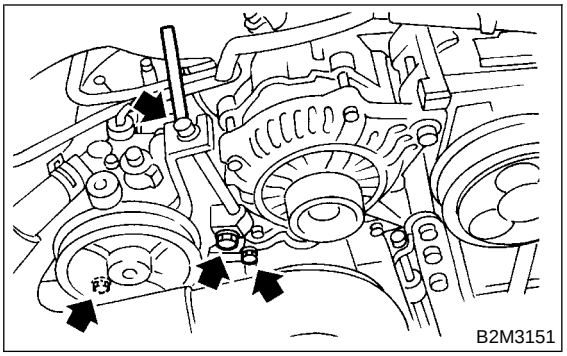
CAUTION:
● Do not allow fluid from the hose end to come into contact with pulley belt.
● To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



ST0017

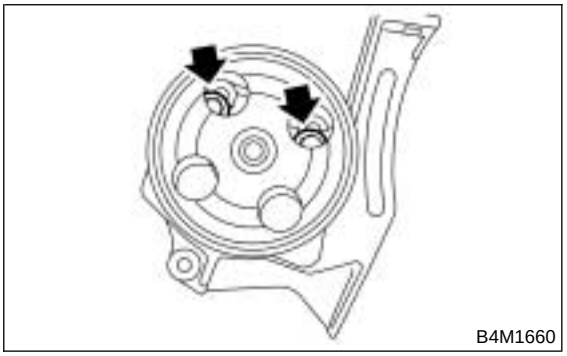
(1) Suction hose
(2) Pipe C

8) Remove bolts which install power steering pump bracket.

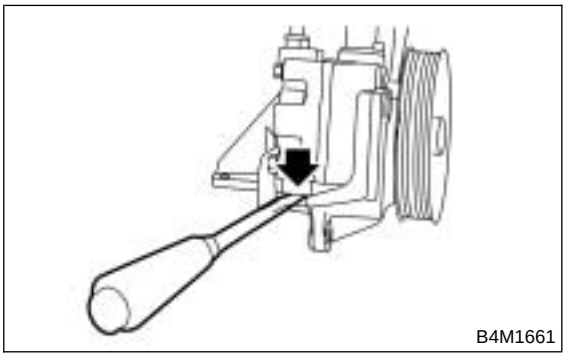

B2M3151

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

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


B4M1660

10) Remove bolt from the rear side of oil pump.
11) Disassemble oil pump and bracket by inserting a screwdriver as shown in the figure.


B4M1661

B: INSTALLATION S601070A11

1. NON-TURBO MODEL S601070A1104

1) Install bracket on engine.

Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)

2) Install oil pump on oil tank as follows outside the vehicle:

NOTE:
Prior to installation, make sure that all oil is removed from oil pump, oil tank and pipe.

3) Place oil pump in a vise and install stay to oil pump.

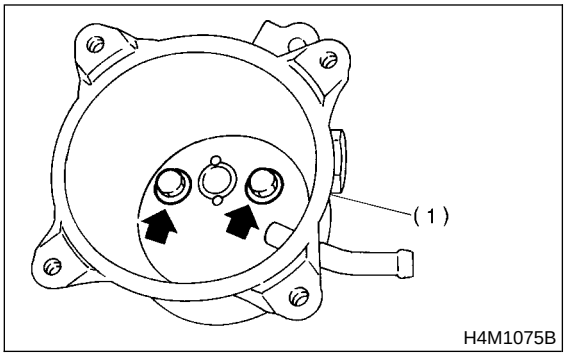
CAUTION:
Do not place oil pump directly in vise; use soft pads and hold oil pump lightly to protect it.

Tightening torque:
15.7 N·m (1.60 kgf-m, 11.6 ft-lb)

4) Install lower shell to oil pump.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

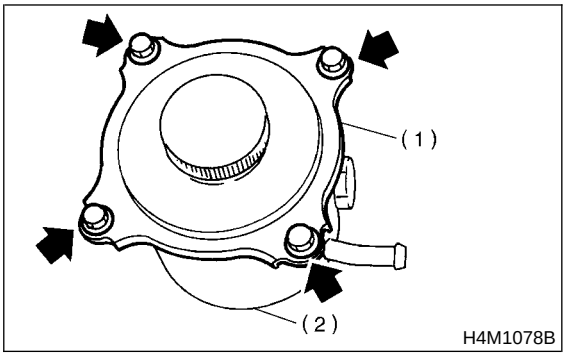
CAUTION:
Be sure to use a new seal washer.



(1) Lower shell

5) Install upper shell and baffle to lower shell.

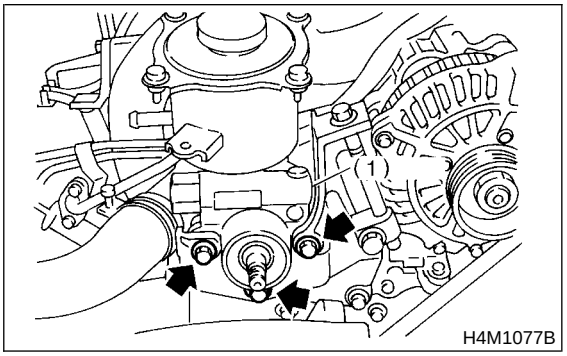
Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



(1) Upper shell
(2) Lower shell

6) Install oil pump, previously assembled to oil tank, on bracket.

Tightening torque:
18 N·m (1.8kgf-m, 13.0 ft-lb)



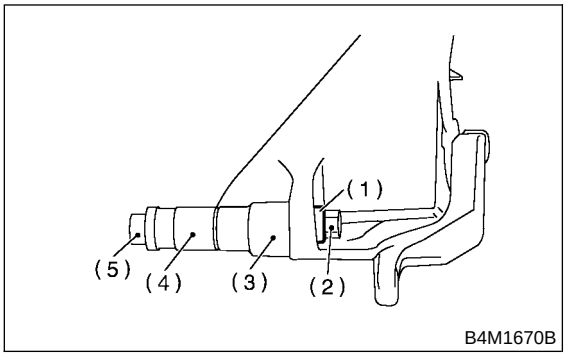
(1) Oil pump

7) Install in the reverse order of removal.
8) Inspect pulley belt tension. <Ref. to ME(SOHC)-43, INSPECTION, V-belt.>
9) Feed the specified power steering fluid. <Ref. to PS-101, Power Steering Fluid.>

2. TURBO MODEL S601070A1105

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

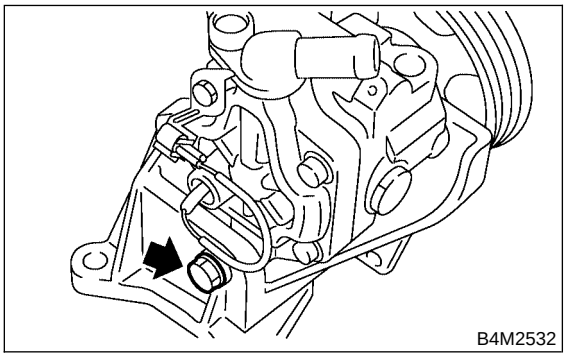
CAUTION:
Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



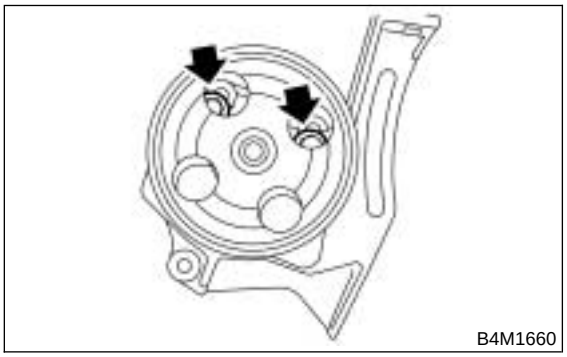
(1) Bush
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

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

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

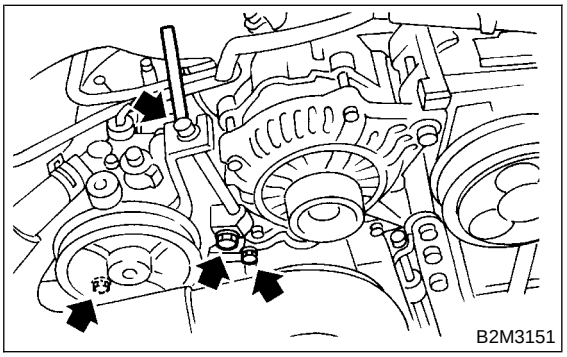


Tightening torque:
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)



2) Tighten bolt which install power steering pump bracket.

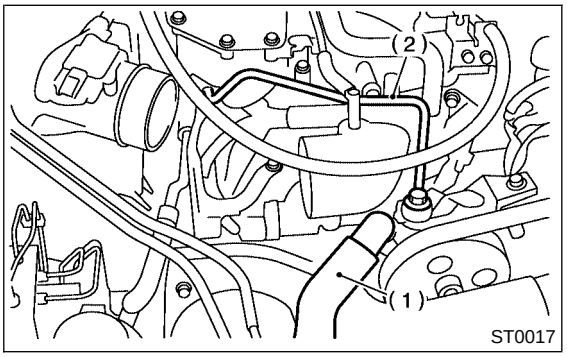
Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)



3) Interconnect pipes C and suction hose.

Tightening torque:
Joint nut
39.2 N·m (4 kgf-m, 28.9 ft-lb)

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



(1) Suction hose
(2) Pipe C

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

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

8) Install pulley belt cover.
9) Install air intake boot.
10) Connect ground terminal of battery.
11) Feed the specified power steering fluid. <Ref. to PS-101, Power Steering Fluid.>

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

C: INSPECTION S601070A10

1. BASIC INSPECTION S601070A1002

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

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

2. SERVICE LIMIT S601070A1001

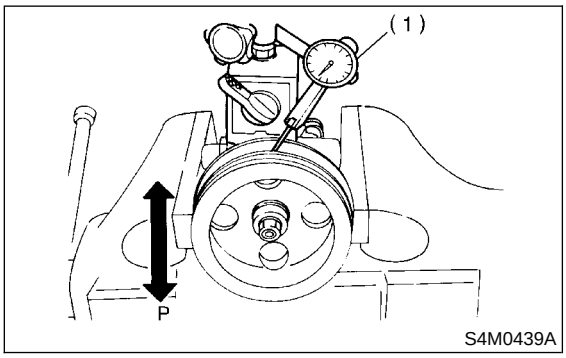
Make a measurement as follows. If it exceeds the specified service limit, replace the parts with new ones.

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

1) Play of pulley shaft

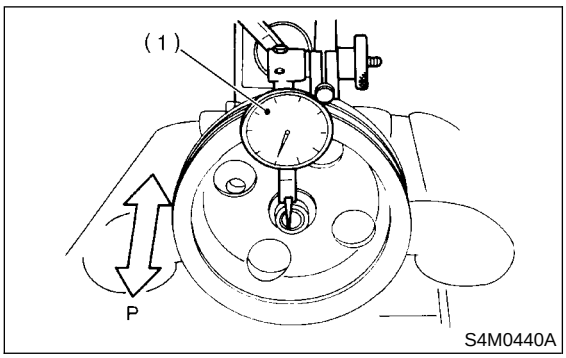
On condition:
P: 9.8 N (1.0 kgf, 2.2 lb)

Service limit:
Radial play (Direction ⟷)
0.4 mm (0.016 in) or less



(1) Dial indicator

Axial play (Direction ⟺)
Non-turbo model:
0.9 mm (0.035 in) or less
Turbo model:
0.6 mm (0.024 in) or less

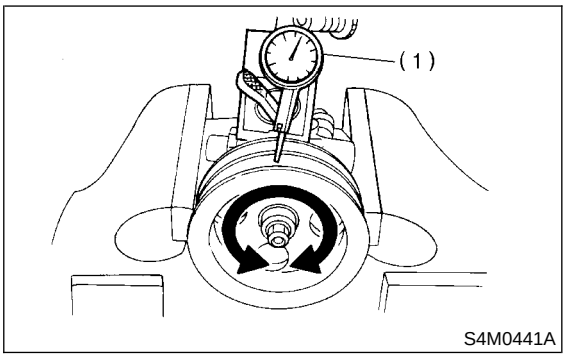


(1) Dial indicator

2) Ditch deflection of pulley

Service limit:
1.0 mm (0.039 in) or less

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

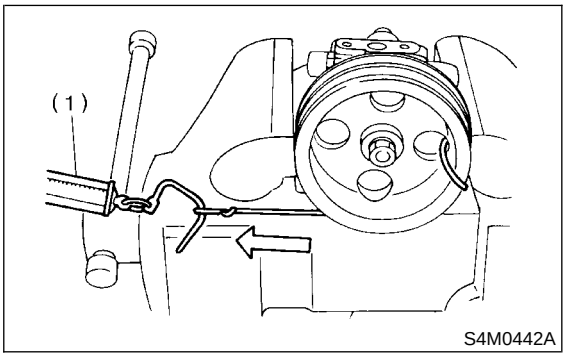


(1) Dial indicator

3) Resistance to rotation of pulley

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

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



(1) Spring balance

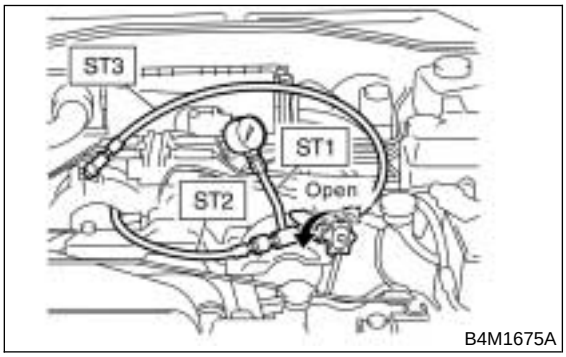
3. HYDRAULIC PRESSURE S601070A1003

CAUTION:
● Be sure to complete all items aforementioned in "INSPECTION", prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-103 INSPECTION, General Diagnostic Table.>
● Do not leave the valve of pressure gauge closed or hold the steering wheel at stop end for 5 seconds or more in any case, as the oil pump may be damaged due to long keep of these conditions.
● Put cotton cloth waste at a place where fluid drops before pressure gauge is installed. Wipe off split fluid thoroughly after the measurement.

NOTE:
Keep engine idling during the measurement.

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

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

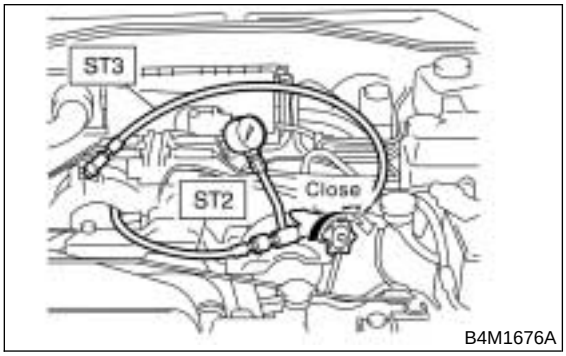


Service limit:
981 kPa (10 kg/cm^2, 142 psi) or less

   (6) If it is not within the specified value, replace the troubled part caused by the following symptoms; pipe or hose clogged, leaks from fluid line, and mix of foreign objects in fluid line.

2) Measure relief pressure.
   (1) Using STs, measure relief pressure.
   (2) Close valve.
   (3) Measure relief pressure.

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

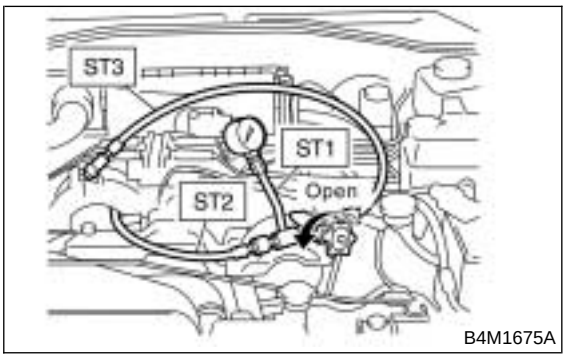


Service limit:
Non-turbo model:
7,159 — 7,748 kPa (73 — 79 kg/cm^2, 1,038 — 1,123 psi)
Turbo model:
9,611 — 10,199 kPa (98 — 104 kg/cm^2, 1,394 — 1,479 psi)

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

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

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



Service limit:
Non-turbo model:
7,159 — 7,748 kPa (73 — 79 kg/cm^2, 1,038 — 1,123 psi)
Turbo model:
9,611 — 10,199 kPa (98 — 104 kg/cm^2, 1,394 — 1,479 psi)

   (4) If it is within the specified value, measure steering effort. <Ref. to PS-106 MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specified value, replace control valve itself or control valve and pinion as a single unit with new ones.

9. Reservoir Tank S601075

A: REMOVAL S601075A18

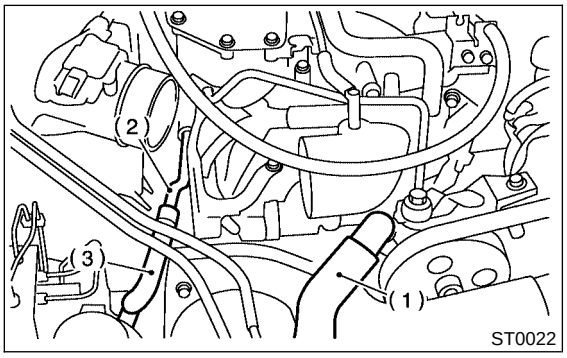
1. NON-TURBO MODEL S601075A1804

Refer to “Oil Pump” section for details of reservoir tank removal order. <Ref. to PS-93, NON-TURBO MODEL, REMOVAL, Oil Pump.>

2. TURBO MODEL S601075A1805

1) Remove air intake duct. <Ref. to IN(DOHC TURBO)-8, REMOVAL, Air Intake Duct.>
2) Drain fluid from the reservoir tank.
3) Disconnect return hose and suction hose from reservoir tank.

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



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

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

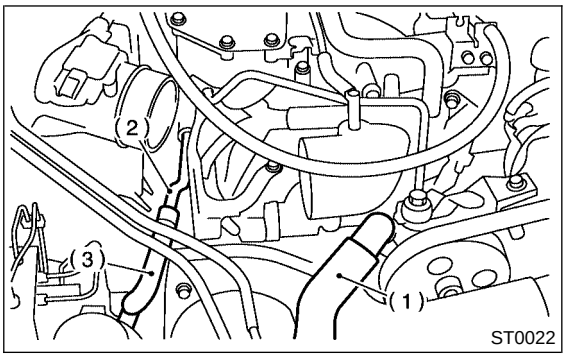
B: INSTALLATION S601075A11

1. NON-TURBO MODEL S601075A1104

Refer to “Oil Pump” section for details of reservoir tank installation order. <Ref. to PS-95, NON-TURBO MODEL, INSTALLATION, Oil Pump.>

2. TURBO MODEL S601075A1105

1) Install reservoir tank to bracket.
2) Connect return hose and suction hose to reservoir tank.



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

3) Feed the specified power steering fluid. <Ref. to PS-101, Power Steering Fluid.>

C: INSPECTION S601075A10

Check reservoir tank for cracks, breakage, or damage. If any cracks, breakage, or damage is found, replace reservoir tank.

10. Power Steering Fluid S601275

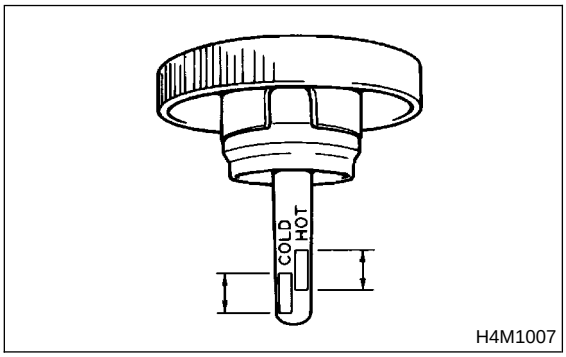
A: SPECIFICATION S601275A22

Recommended power steering fluid	Manufacturer
DEXRON IIE or III	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

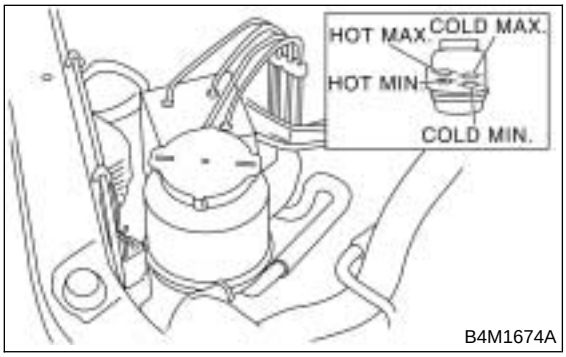
B: INSPECTION S601275A10

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

Non-turbo model

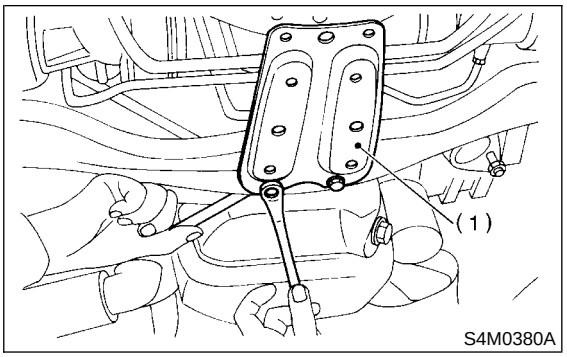


Turbo model



C: REMOVAL S601275A18

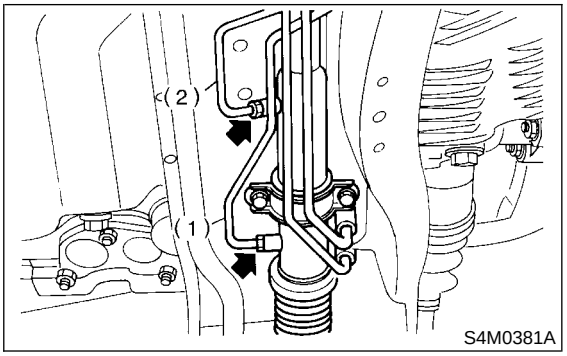
1) Set the vehicle on the lift.
2) Disconnect battery minus terminal.
3) Remove air intake duct.
4) Drain fluid from the reservoir tank.
5) Lift-up the vehicle.
6) Remove under cover.
7) Remove jack-up plate.



(1) Jack-up plate

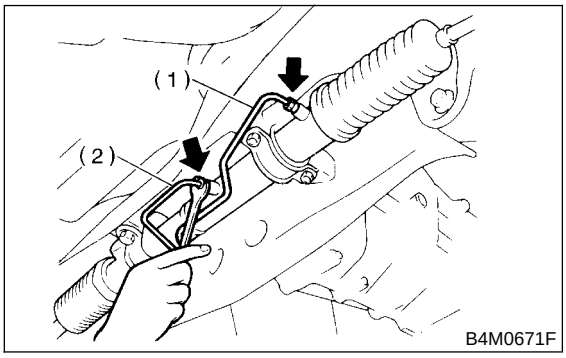
8) Disconnect one pipe joint A from center of gearbox assembly, and connect a vinyl hose to it. While turning steering wheel to the left and right, drain fluid through the hose. Similarly, drain fluid from the other pipe joint B.

LHD model



(1) Pipe A
(2) Pipe B

RHD model

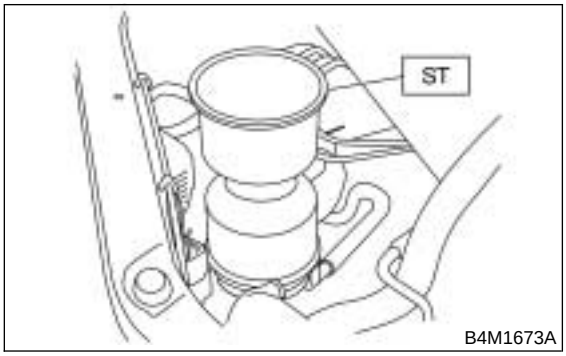


(1) Pipe A
(2) Pipe B

9) Connect pipe joint A and B.
10) When pouring power steering fluid, refer to "Installation" under "Power Steering Fluid". <Ref. to PS-102 INSTALLATION, Power Steering Fluid.>
11) Install in the reverse order of removal.

D: INSTALLATION S601275A11

1) Feed the specified fluid with its level being about 4 cm (1.6 in) lower than the mouth of tank.
2) Set ST on top of reservoir tank and fill it about half way with the specified fluid. (Turbo model)
ST 34199AE040 OIL CHARGE



3) Continue to turn steering wheel slowly from lock to lock until bubbles stop appearing in the tank while keeping the fluid at that level.
4) In case air is absorbed to deliver bubbles into piping because the fluid level is lower, leave it about half an hour and then do the step 2) all over again.
5) Start, and idle the engine.
6) Continue to turn steering wheel slowly from lock to lock again until bubbles stop appearing in the tank while keeping the fluid at that level.
It is normal that bubbles stop appearing after three times turning of steering wheel.
7) In case bubbles do not stop appearing in the tank, leave it about half an hour and then do the step 5) all over again.
8) Stop the engine, and take out safety stands after jacking up vehicle again.
Then lower the vehicle, and idle the engine.
9) Continue to turn steering wheel from lock to lock until bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).
10) In case the following happens, leave it about half an hour and then do step 8) again.
(1) The fluid level changes over 3 mm (0.12 in).
(2) Bubbles remain on the upper surface of the fluid.
(3) Grinding noise is generated from oil pump.
11) Check the fluid leakage at flare nuts after turning steering wheel from lock to lock with engine running.

CAUTION:
● Before checking, wipe off any fluid on flare nuts and piping.
● In case the fluid leaks from flare nut, it is caused by dust (or the like) and/or damage between flare and tapered seat in piping.
● So remove the flare nut, tighten again it to the specified torque after cleaning flare and tapered seat. If flare or tapered seat is damaged, replace it with a new one.

11. General Diagnostic Table

S601257

A: INSPECTION S601257A10

Trouble	Possible cause	Corrective action
• Heavy steering effort in all ranges • Heavy steering effort at stand still • Steering wheel surges when turning.	1. Pulley belt • Unequal length of pulley belts • Adhesion of oil and grease • Loose or damage of pulley belt • Poor uniformity of 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 rim • Improper tires out of specification • Improper rims out of specification • Tires not properly inflated*1	Replace or reinflate.
	3. Fluid • Low fluid level • Aeration • Dust mix • Deterioration of fluid • Poor warming-up of fluid *2	Refill, bleed air, replace or instruct customer.
	4. Idling speed • Lower idling speed • Excessive drop of idling speed at start or at turning steering wheel *3	Adjust or instruct customer.
	5. Measure hydraulic pressure. <Ref. to PS-97 INSPECTION, Oil Pump.>	Replace problem parts.
	6. Measure steering effort. <Ref. PS-103 INSPECTION, General Diagnostic Table.>	Adjust or replace.
• Vehicle leads to one side or the other. • Poor return of steering wheel to center • Steering wheel surges when turning.	1. Fluid line • Folded hose • Flattened pipe	Reform or replace.
	2. Tire and rim • Flat tire • Mix use of different tires • Mix use of different rims • Abnormal wear of tire • Unbalance of remained grooves • Unbalance of tire pressure	Fix or replace.
	3. Front alignment • Improper or unbalance caster • Improper or unbalance toe-in • Loose connection of suspension	Adjust or retighten.
	4. Others • Damaged joint assembly • Unbalanced height • One-sided weight	Replace, adjust or instruct customer.
	5. Measure steering effort. <Ref. to PS-103 INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If tires and/or rims are wider, the load to power steering system is the more. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before maximum turning angle. In this case, steering effort may be heavy. When 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 steering wheel from stop to stop several times to warm-up fluid. Then if steering effort reduces normally, there is no abnormal thing.
*3 In cold weather or with insufficient warm-up of engine, steering effort may be heavy due to excessive drop of idling when turning steering wheel. In this case, it is recommended to start the vehicle with increasing engine speed than usual. Then if steering effort reduces normally, there is no abnormal thing.

1. NOISE AND VIBRATION S601257A1001

CAUTION:
Don't keep the relief valve operated over 5 seconds at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:
● Grinding noise may be heard immediately after the engine start in extremely cold condition. 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 characteristic in extremely cold condition.
● Oil pump makes whine or growl noise slightly due to its mechanism. Even if the noise can be 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 running.
● When stopping with service brake and/or parking brake applied, power steering can be operated easily due to its light steering effort. If doing so, the disk rotates slightly and makes creaking noise. The noise is generated by creaking between the disk and pads. If the noise goes off when the brake is released, there is no abnormal function in the system.
● There may be a little vibration around the steering devices when turning steering wheel at standstill, even though the component parts are properly adjusted and have no defects.
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.
This phenomena does not indicate there is some abnormal function in the system.
The vibration can be known when steering wheel is turned repeatedly at various speeds from slow to rapid step by step with parking brake applied on concrete road and in "D" range for automatic transmission vehicle.

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	Relief valve emits operating sound when steering wheel is completely turned in either direction. (Don't keep this condition over 5 seconds.)	Normal
	Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is faulty.	Defective Replace oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check clearance. Correct if necessary. <Ref. to PS-90 INSPECTION, Pipe Assembly.>
	Loosened installation of oil pump, oil tank, pump bracket, gearbox or crossmember	Retighten.
	Loosened installation of oil pump pulley or other pulley(s)	Retighten.
	Loosened linkage or play of steering or suspension Loosened tightening of joint or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace bad parts of the gearbox or oil pump.
Knocking When turning steering wheel in both direction with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for adjusting backlash	Adjust and retighten.
	Loosened tightening or play of tie-rod, tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Vane pump aeration	Inspect and retighten fluid line connection. Refill fluid and vent air.
	Vane pump seizing	Replace oil pump.
	Pulley bearing seizing of oil pump	Replace oil pump.
	Folded hose, flat pipe	Replace.
Squeal, squeak (intermittent or continuous) While engine is running.	Maladjustment of pulley belt Damaged or charged pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Run out or soilage of V-groove surface of oil pump pulley	Clean or replace.
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix wrong part causing aeration. Replace fluid and vent air.
	Damaged pipe of gearbox	Replace pipe.
	Abnormal inside of hose or pipe Flat hose or pipe	Rectify or replace.
	Abnormal inside of oil tank	Replace.
	Removed oil tank cap	Install cap.
Whistle (continuous) While engine is running.	Abnormal pipe of gearbox or abnormal inside of hose	Replace bad parts of gearbox or hose.
Whine or growl (continuous or intermittent) While engine is running with/ without steering turned.	Loosened installation of oil pump, oil pump bracket	Retighten.
	Abnormal inside of oil pump, hose	Replace oil pump, hose, if the noise can be heard when running as well as stand still.
	Torque converter growl, air conditioner compression growl	Remove power steering pulley belt and confirm.
Creaking noise (intermittent) While engine is running with steering turned.	Abnormal inside of gearbox	Replace bad parts of gearbox.
	Abnormal bearing for steering shaft	Apply grease or replace.
	Generates when turning steering wheel with brake (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.	Too low engine speed at start	Adjust and instruct customers.
	Vane pump aeration	Fix wrong part. Vent air.
	Damaged valve in oil pump, gearbox	Replace oil pump, bad parts of gearbox.
	Looseness of play of steering, suspension parts	Retighten.

2. MEASUREMENT OF STEERING EFFORT S601257A1002

No.	Step	Check	Yes	No
1	**CHECK STEERING EFFORT.** 1) Stop the vehicle on a concrete road. 2) Start the engine. 3) Idle the engine. 4) Install spring scale on the steering wheel. 5) Pull spring scale at an right angle to the steering wheel, and measure both right and left steering wheel effort. NOTE: When turning steering more quickly than necessary from a direction to the other direction at an engine speed over 2,000 rpm, steering effort may be heavy. This is caused by flow characteristic of oil pump and is not a problem.	Is the steering effort 29.4 N (3.0 kgf, 6.6 lb) or less?	Go to step **2**.	Adjustment backlash.
2	**CHECK STEERING EFFORT.** 1) Stop the engine. 2) Pull spring scale at an right angle to the steering wheel, and measure both right and left steering wheel effort.	Is the steering effort 29.4 N (3.0 kgf, 6.6 lb) or less?	Go to step **3**.	Adjustment.
3	**CHECK STEERING WHEEL EFFORT.** 1) Remove universal joint. 2) Measure steering wheel effort.	Is the maximum force steering wheel effort 2.26 N (0.23 kgf, 0.51 lb) or less?	Go to step **4**.	Check, adjust and replace if necessary.
4	**CHECK STEERING WHEEL EFFORT.** Measure steering wheel effort.	Is the fluctuation width 1.08 N (0.11 kgf, 0.24 lb) or less?	Go to step **5**.	Check, adjust and replace if necessary.
5	**CHECK UNIVERSAL JOINT.** Measure folding torque of the joint (short yoke). <Ref. to PS-29 INSPECTION, Universal Joint.>	Is the folding torque 8.43 N (0.86 kgf, 1.90 lb) or less?	Go to step **6**.	Replace with new one.
6	**CHECK UNIVERSAL JOINT.** Measure folding torque of the joint (long yoke). <Ref. to PS-29 INSPECTION, Universal Joint.>	Is the folding torque 5.49 N (0.56 kgf, 1.23 lb) or less?	Go to step **7**.	Replace with new one.
7	**CHECK FRONT WHEEL.**	Are front wheels for unsteady revolution or rattling and brake for dragging?	Inspect, readjust and replace if necessary.	Go to step **8**.
8	**CHECK TIE-ROD ENDS.** Remove the tie-rod ends.	Are tie-rod ends of suspension for unsteady revolution or ratting?	Inspect and replace if necessary.	Go to step **9**.
9	**CHECK BALL JOINT.**	Are ball joints of suspension for unsteady revolution or ratting?	Inspect and replace if necessary.	Go to step **10**.
10	**CHECK GEARBOX.** Measure rotating of gearbox. <Ref. to PS-50 TURNING RESISTANCE OF GEAR BOX, INSPECTION, Steering Gearbox.>	Is rotating resistance is 11.18 N (1.14 kgf, 2.51 lb) or less around center position and 15.79 N (1.61 kgf, 3.55 lb) or less in all positions within 20% difference between clockwise and counterclockwise?	Go to step **11**.	Readjust backlash, and if ineffective, replace bad parts.
11	**CHECK GEARBOX.** Measure sliding of gearbox. <Ref. to PS-49 SERVICE LIMIT, INSPECTION, Steering Gearbox.>	Is rotating resistance is 304 N (31 kgf, 68 lb) or less with 20% difference between left and right direction?	Steering effort is normal.	Readjust backlash, and if ineffective, replace bad parts.