SECTION PS
POWER STEERING SYSTEM

CONTENTS

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

NGS0002J

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

Precautions for Steering System

NGS0002K

- In case of removing steering gear assembly, make the final tightening with grounded and unloaded vehicle condition, and then check wheel alignment.
- Observe the following precautions when disassembling.
  - Before disassembly, thoroughly clean the outside of the unit.
  - Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
  - For easier and proper assembly, place disassembled parts in order on a parts rack.
  - Use nylon cloth or paper towels to clean the parts; common shop rags can leave lint that might interfere with their operation.
  - Do not reuse non-reusable parts.
  - Before assembling, apply the specified grease to the directed parts.

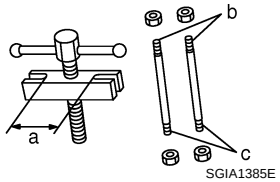
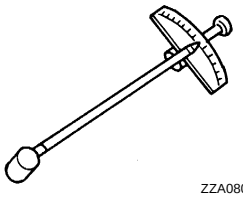
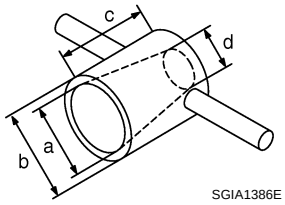
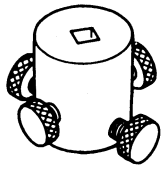
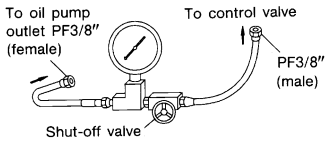
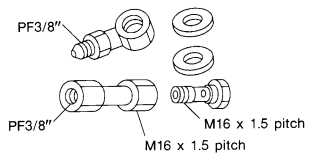
PREPARATION

PFP:00002

Special Service Tools

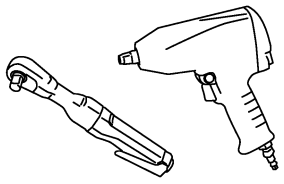
NGS00040

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name		Description
ST27180001 (J-25726-A) Steering wheel puller a: 29 mm (1.14 in) b: M10 × 1.25P c: M8 × 1.25P	 SGIA1385E	Removing steering wheel
ST3127S000 (J-25765-A)	 ZZA0806D	● Inspecting sliding torque ● Inspecting steering torque ● Inspecting rotating torque for ball joint
KV48104400 (—) Teflon ring correcting tool a: 50 mm (1.97 in) b: 58 mm (2.28 in) c: 100 mm (3.94 in) d: 36 mm (1.42 in)	 SGIA1386E	Installing rack Teflon ring
KV48103400 (—) Torque adapter	 ZZA0824D	Inspecting pinon rotating torque
KV48103500 (J-26357 and J-26357-10) Pressure gauge	 S-NT547	Measuring power steering oil pump relief pressure
KV48102500 (J-33914) Pressure gauge adapter	 S-NT542	Measuring power steering oil pump relief pressure

Commercial Service Tools

NGS00041

Tool name	Description
Power tool  PBIC0190E	Loosening nuts and bolts

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

NVH Troubleshooting Chart

NGS0002M

Use the chart below to help you find the cause of the symptom. If necessary, repair or replace these parts.

			Reference page	PS-6	PS-7	PS-20	PS-20	PS-20	PS-6	PS-8	PS-9	EM-14	—	—	—	PS-12	PS-11	PS-15	NVH in PR section	NVH in RFD section	NVH in FAX, RAX, FSU and RSU section	NVH in WT section	NVH in WT section	NVH in RAX section	NVH in BR section
			Possible cause and SUSPECTED PARTS	Fluid level	Air in hydraulic system	Outer socket ball joint swinging force	Outer socket ball joint rotating torque	Outer socket ball joint end play	Steering gear fluid leakage	Steering wheel play	Steering gear rack sliding force	Drive belt looseness	Improper steering wheel	Improper installation or looseness or tilt lock lever	Mounting rubber deterioration	Steering column deformation or damage	Improper installation or looseness of steering column	Steering linkage looseness	PROPELLER SHAFT	DIFFERENTIAL	AXLE AND SUSPENSION	TIRES	ROAD WHEEL	DRIVE SHAFT	BRAKES
Symptom	STEERING	Noise		×	×	×	×	×	×	×	×	×							×	×	×	×	×	×	×
		Shake											×	×	×				×		×	×	×	×	×
		Vibration											×	×	×	×	×		×		×	×		×	
		Shimmy											×	×	×			×			×	×	×		×
		Judder													×			×			×	×	×		×

×: Applicable

POWER STEERING FLUID

PFP:KLF20

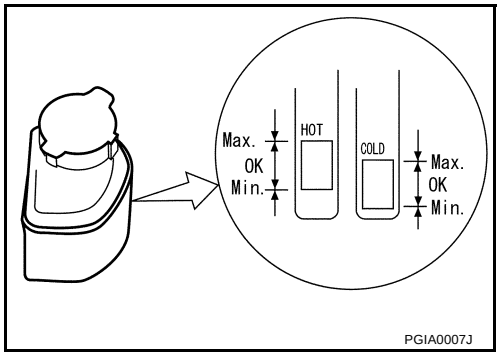
Checking Fluid Level

NGS00042

1. Check fluid level with engine stopped.
2. Make sure that fluid level is between MIN and MAX.
3. Fluid levels at HOT and COLD are different. Do not confuse them.

   HOT : Fluid temperature 50 - 80 °C (122 - 176°F)

   COLD : Fluid temperature 0 - 30°C (32 - 86°F)



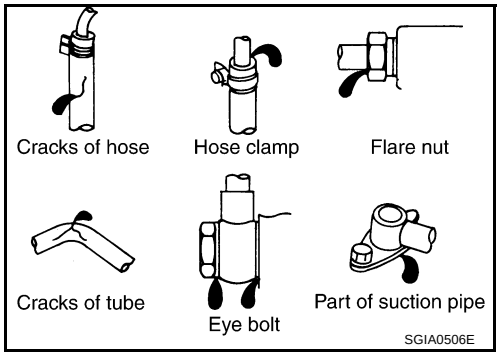
CAUTION:

- **The fluid level should not exceed the MAX line. Excessive fluid will cause fluid leakage from the cap.**
- **Never reuse drained power steering fluid.**
- **Recommended fluid is Genuine Nissan PSF or equivalent.**

Checking Fluid Leakage

NGS00043

1. Check hydraulic connections for fluid leakage, cracks, damage, looseness, or wear.
2. Run engine until the fluid temperature reaches 50 to 80° C (122 to 176°F) in reservoir tank, and keep engine speed idle.
3. Turn steering wheel several times from full left stop to full right stop.
4. Hold steering wheel at each lock position for five seconds and carefully, check for fluid leakage.



CAUTION:

Never hold the steering wheel in a locked position for more than 10 seconds. (There is the possibility that power steering oil pump may be damaged.)

5. If fluid leakage at connections is noticed, then loosen flare nut and then retighten. Do not overtighten connector as this can damage O-ring, washer and connector.
6. If fluid leakage from power steering oil pump is noticed, check power steering oil pump. Refer to PS-28, "Disassembly and Assembly" .
7. Check steering gear boots for accumulation of fluid indicating from steering gear.

Air Bleeding Hydraulic System

NGS00044

1. Turn steering wheel several times from full left stop to full right stop with engine off.

   CAUTION:

   - **Turn steering wheel while filling reservoir tank with fluid so as not to lower fluid level below the MIN line.**
   - **When air bleeding is incomplete, the following phenomena occur. Although a fluid sound can be heard from the gear and pump when turning the steering wheel all the way or slowly, this is not a malfunction.**
     - **Bubbles are created in reservoir tank.**
     - **Clicking noise can be heard from power steering oil pump.**
     - **Excessive buzzing in the power steering oil pump.**
2. Start engine and hold steering wheel at each lock position for 3 seconds at idle to check for fluid leakage.
3. Repeat step 2 above several times at approximately 3 second intervals.

   CAUTION:

   Never hold the steering wheel in a locked position for more than 10 seconds. (There is the possibility that power steering oil pump may be damaged.)
4. Check fluid for bubbles and while contamination.
5. Stop engine if bubbles and white contamination do not drain out. Perform step 2 and 3 above after waiting until bubbles and white contamination drain out.
6. Stop the engine, and then check fluid level.

STEERING WHEEL

PFP:48430

On-Vehicle Service

NGS000CM

CONDITION OF INSTALLATION

1. Check installation conditions of steering gear assembly, front suspension assembly, axle and steering column assembly.
2. Check if movement exists when steering wheel is moved up and down, to the left and right and to the axial direction.

Steering wheel axial end play : 0 mm (0 in)

3. Check the following items when steering wheel axial end play is out of the standard.

a. Check the mounting nut and bolt of steering column assembly. Refer to PS-11, "COMPONENT" .

b. Check steering column. Refer to PS-12, "INSPECTION AFTER REMOVAL" .

4. Check steering gear assembly mounting bolts and nut for looseness. Refer to PS-15, "COMPONENT" .

STEERING WHEEL PLAY

1. Turn steering wheel so that front wheels come to the straight-ahead position. Start engine and lightly turn steering wheel to the left and right until front wheels start to move. Measure steering wheel movement on the outer circumference.

Steering wheel play : 0 - 35 mm (0 - 1.38 in)

2. Check the following items when steering wheel play is out of the standard.

a. Check backlash for each joint of steering column.

b. Check installation condition of steering gear assembly.

NEUTRAL POSITION ON STEERING WHEEL

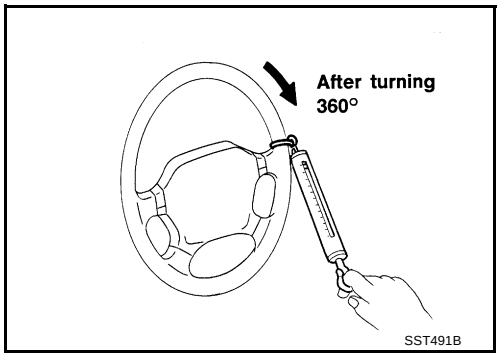
1. Make sure that steering gear assembly, steering column assembly and steering wheel are installed in the correct position.
2. Perform neutral position inspection after wheel alignment. Refer to FSU-5, "Wheel Alignment Inspection" .
3. Set vehicle to the straight-ahead position and confirm steering wheel is in the neutral position.
4. Loosen outer socket lock nut and turn inner socket to left and right equally to make fine adjustments if steering wheel is not in the neutral position.

STEERING WHEEL TURNING FORCE

1. Park vehicle on a level and dry surface, set parking brake.
2. Tires need to be inflated normal pressure.
3. Start engine.
4. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 50 to 80°C (122 to 176°F).]
5. Check steering wheel turning force when steering wheel has been turned 360° from neutral position.

Steering wheel turning force:

36 N (3.6 kg, 8.0 lb) or less

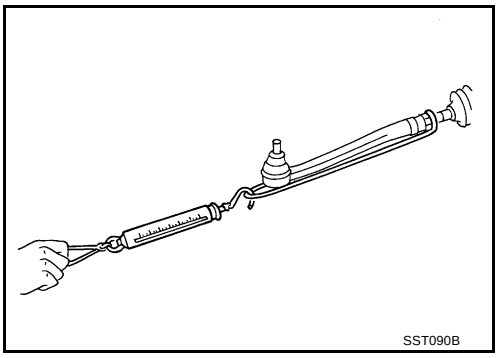


6. Check the following items when steering wheel turning force is more than the standard.

a. Check relief oil pressure of power steering oil pump. Refer to PS-26, "RELIEF OIL PRESSURE" .

RACK SLIDING FORCE

1. Start engine.
2. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 50 to 80°C (122 to 176°F).]
3. Disconnect lower joint and steering knuckle from steering gear assembly. Refer to PS-11, "COMPONENT" .
4. While pulling outer socket slowly in ±11.5 mm (±0.453 in) range from neutral position, make sure rack sliding force is within specification.



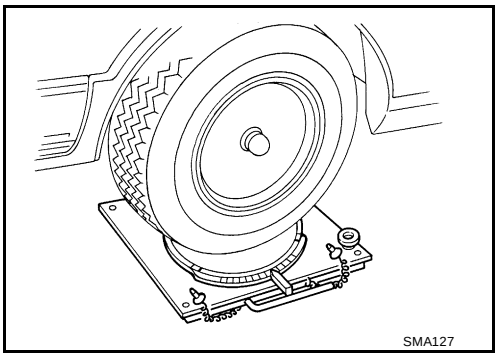
Rack sliding force:

255 - 294 N (26.1 - 29.9 kg, 57.4 - 66.0 lb)

5. If rack sliding force is not within specification, overhaul steering gear assembly. Refer to PS-17, "Disassembly and Assembly" .

FRONT WHEEL TURNING ANGLE

1. Check toe-in. Refer to FSU-17, "Wheel Alignment (Unladen*)" .
2. Place front wheels on turning radius gauges and rear wheels on stands so that vehicle can be level. Check the maximum inner and outer wheel turning angles for LH and RH road wheels.



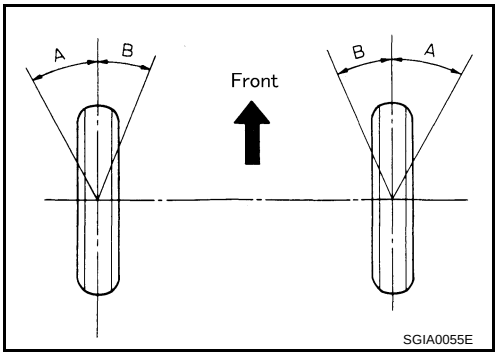
3. Start engine and run at idle, turn steering wheel all the way right and left, measure the turning angle.

Inner wheel (Angle: A)

Minimum	**: 39°45′ (39.75°)**
Nominal	**: 42°45′ (42.75°)**
Maximum	**: 43°45′ (43.75°)**

Outer wheel (Angle: B)

Nominal	**: 33°50′ (33.83°)**

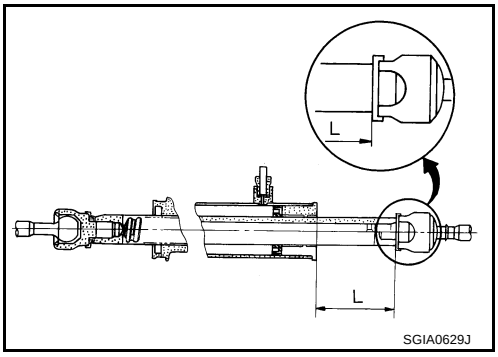


4. Check the following items when turning angle is out of the standard.

a. Check rack stroke.

Rack stroke “L”

Except for RAS models	**: 68.5 mm (2.697 in)**
RAS models	**: 66.0 mm (2.598 in)**



b. Disassemble steering gear assembly to check the cause that rack stroke is outside of the standard. Refer to PS-17, "Disassembly and Assembly" .

c. Steering angles are not adjustable. Check steering gear assembly, steering column assembly and front suspension components for wear or damage if any of the turning angles are different from the specified value. Replace any of them, if any non-standard condition exists.

Removal and Installation

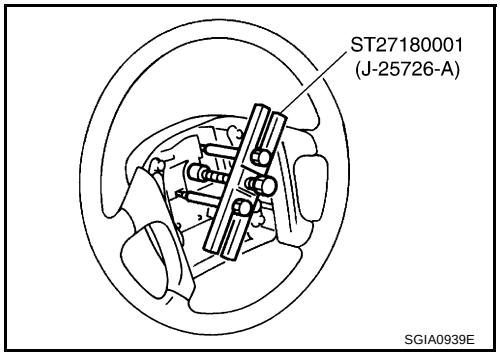
NGS0002R

REMOVAL

NOTE:

When reconnecting spiral cable, fix cable with a tape so that fixing case and rotating part keep aligned. This will omit neutral position alignment procedure during spiral cable installation.

1. Set vehicle to the straight-ahead position.
2. Remove driver air bag module. Refer to SRS-40, "DRIVER AIR BAG MODULE" .
3. Remove steering wheel lock nut after steering is locked.
4. Remove steering wheel with the steering wheel puller (SST).



INSTALLATION

Note the following, and installation is the reverse order of removal.

- When installing the steering wheel, tighten lock nut to the specified torque.

Steering wheel lock nut : 34.3 N·m (3.5 kg-m, 25 ft-lb)

CAUTION:

Check the spiral cable neutral position after replacing or rotating spiral cable. Refer to SRS-43, "INSTALLATION" .

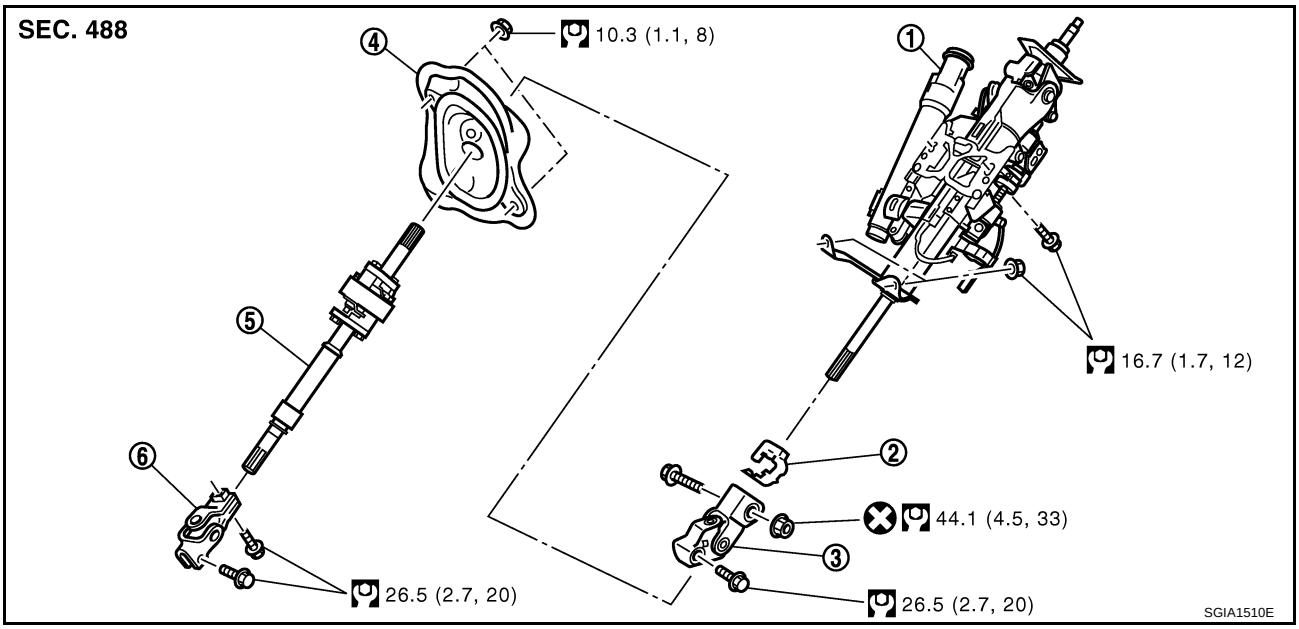
STEERING COLUMN

PFP:48810

Removal and Installation

NGS0002S

COMPONENT



1. Steering column assembly
2. Collar
3. Upper joint
4. Hole cover
5. Lower shaft
6. Lower joint

Refer to GI-9, "Components" , for the symbols in the figure.

REMOVAL

Lower Shaft and Hall Cover

1. Set vehicle to the straight ahead-direction.
2. Remove fixing bolt at lower-side of lower joint.
3. Loosen fixing bolt at lower shaft-side of upper joint.
4. Remove collar, mounting bolt and nut at steering column assembly-side of upper joint.
5. Remove hole cover mounting nuts, and remove upper joint, lower joint, lower shaft and hall cover from vehicle.

   CAUTION:
   Never move the steering gear assembly and steering wheel.
6. Remove lower shaft from hole cover.

Steering Column

1. Set vehicle to the straight ahead-direction.
2. Remove driver air bag module. Refer to SRS-40, "DRIVER AIR BAG MODULE" .
3. Remove steering wheel. Refer to PS-10, "Removal and Installation" .
4. Remove column cover, steering lock escutcheon, and driver-side instrument lower driver panel. Refer to IP-10, "INSTRUMENT PANEL ASSEMBLY" .
5. Remove combination switch. Refer to DI-23, "Removal and Installation for Combination Meter" .
6. Remove spiral cable. Refer to SRS-43, "Removal and Installation" .
7. Loosen fixing bolt at lower shaft-side of upper joint.
8. Remove collar, mounting bolt and nut at steering column-side of upper joint. Then remove upper joint from steering column assembly.

   CAUTION:
   Never move the steering gear assembly and steering wheel.
9. Disconnect harness connector from each switch on steering column shaft, then separate vehicle side harness from it.
10. Remove steering column assembly from vehicle.

CAUTION:

- **Never give axial impact to the steering column assembly during removal.**
- **Never move the steering gear assembly when removing the steering column assembly.**

INSPECTION AFTER REMOVAL

Steering Column

- Check if there is something wrong with jacket tube of steering column assembly and collar etc. And then if they are damaged, replace with new one.
- If vehicle has a minor collision, check column length "L_1 , L_2 " as shown in the figure. Then if it is out of the specified value, replace with new one.

  Steering column length "L_1 "

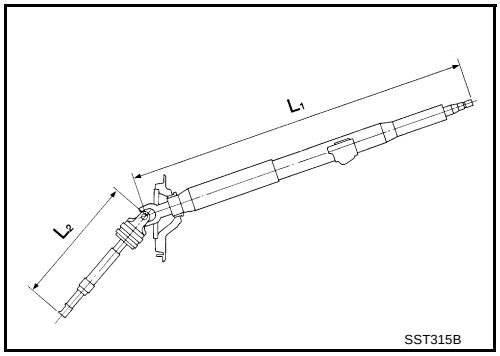
  Minimum : 628 mm (24.72 in)

  Neutral : 643 mm (25.31 in)

  Maximum : 658 mm (25.91 in)

  Steering column lower shaft length "L_2 "

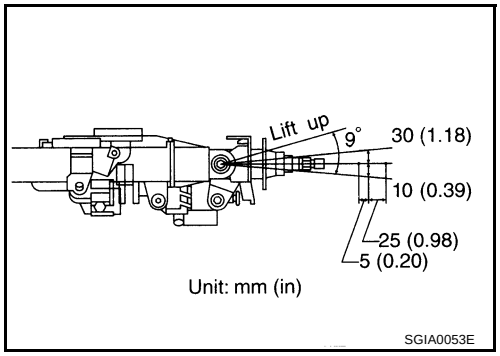
  : 346.8 mm (13.65 in)



- Check tilt device and its operation range. Ranges of operation are shown in the figure.

  CAUTION:

  Never give axial impact to the steering column assembly during installation.



INSTALLATION

Steering Column

Note the following, and installation is the reverse order of removal.

- Refer to PS-11, "COMPONENT" about each tightening torque.
- Adjust neutral position of spiral cable. Refer to SRS-43, "INSTALLATION" .
- Check if steering wheel operation can turn to the end of the left and right smoothly.

Lower Joint and Hall Cover

Note the following, and installation is the reverse order of removal.

- Refer to PS-11, "COMPONENT" about each tightening torque.
- When installing steering column assembly to steering member, install mounting nuts from front side of vehicle with tilt neutral position.

  CAUTION:

  Never give axial impact to the steering column assembly during installation.

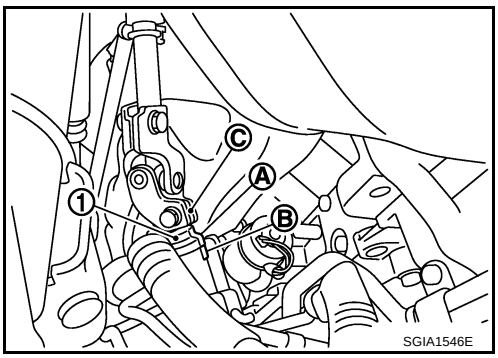
- When installing lower shaft to steering gear assembly, follow the procedure listed below.

– Set rack of steering gear in the neutral position.

NOTE:

To get the neutral position of rack, turn gear sub-assembly and measure the distance of inner socket, and then measure the intermediate position of the distance.

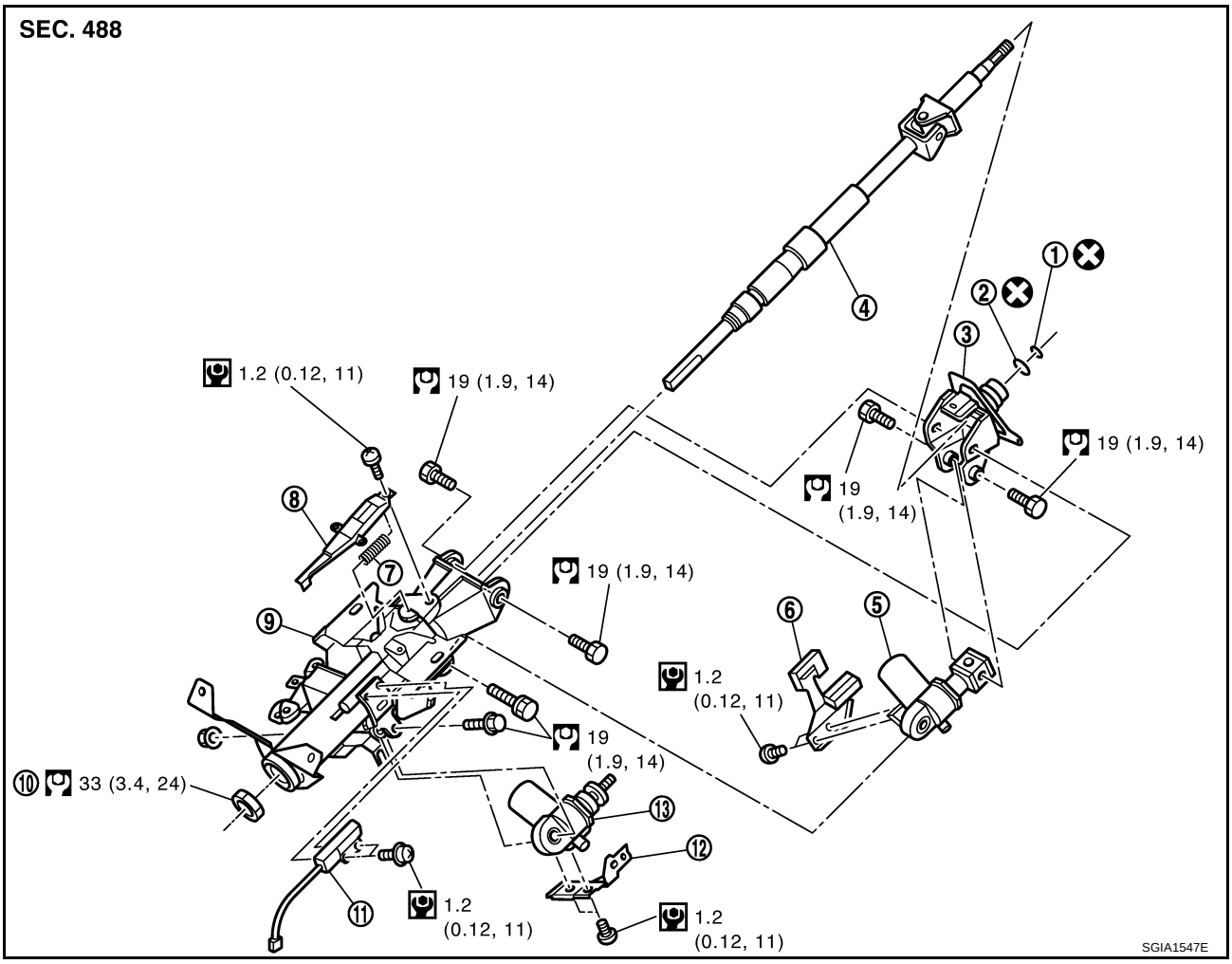
- Align rear cover cap (1) projection (A) with the marking position (B) of gear housing assembly.
- Install slit part of lower shaft (C) aligning with the projection (A) of rear cover cap (1). Make sure that the slit part of lower shaft (C) is aligned with both the projection (A) of rear cover cap (1) and the marking position (B) of gear housing assembly.



Disassembly and Assembly

NGS0002T

COMPONENT



1. Snap ring
2. O-ring
3. Upper jacket tube
4. Steering column upper shaft
5. Tilt motor
6. Tilt sensor
7. Spring
8. Tilt lever
9. Jacket tube
10. Mounting nut
11. Telescopic sensor
12. Bracket
13. Telescopic motor

Refer to GI-9, "Components" , for the symbols in the figure.

DISASSEMBLY

Steering Column

1. Remove tilt motor and sensor from jacket tube.
2. Remove telescopic motor and sensor from jacket tube.
3. Remove snap ring from steering column upper shaft.
4. Remove upper jacket tube.
5. Remove mounting nuts, and remove steering column upper shaft from jacket tube.

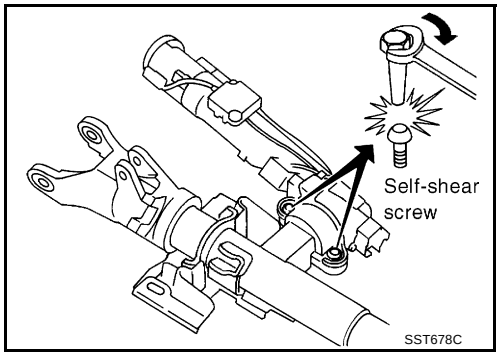
Steering Lock

1. Break self-shear type screws with a drill or other appropriate tool.

ASSEMBLY

Note the following, and assembly is the reverse order of disassembly.

- Refer to PS-13, "COMPONENT" about each tightening torque.
- Install new self-shear type screws and then cut off self-shear type screw heads.



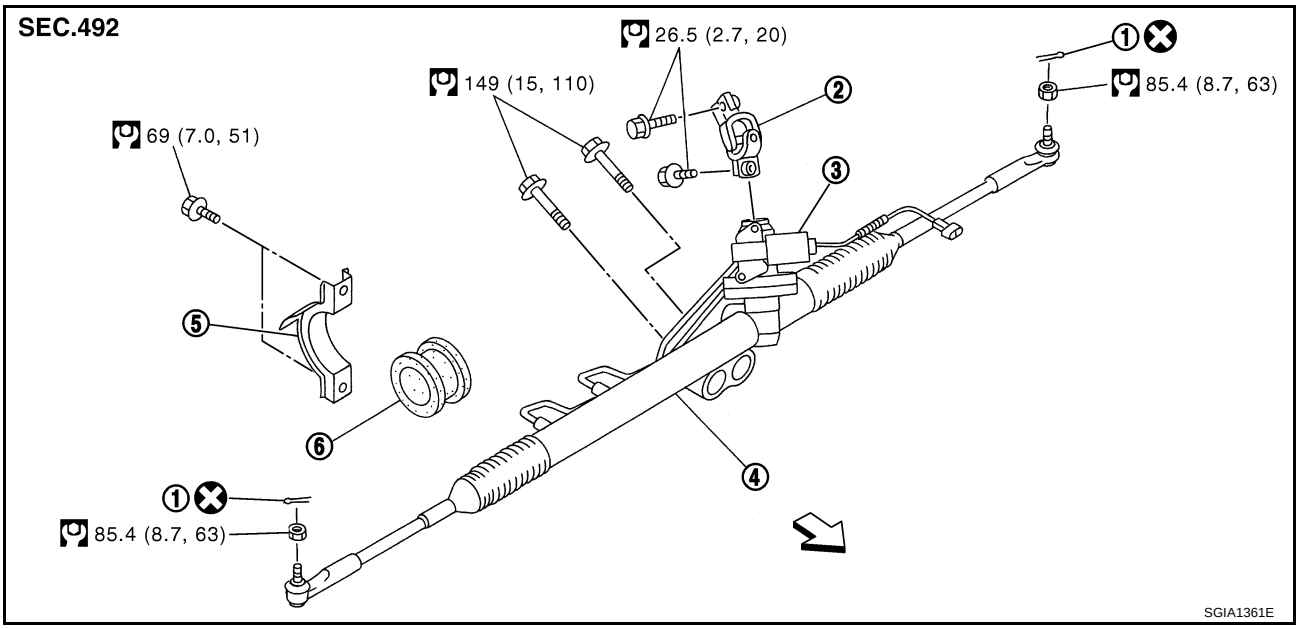
POWER STEERING GEAR

PFP:49001

Removal and Installation

NGS0002U

COMPONENT

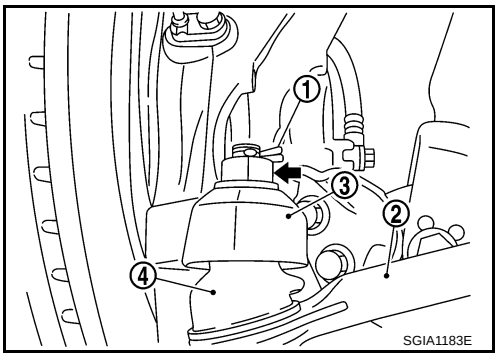


1. Cotter pin
2. Lower joint
3. Power steering solenoid valve
4. Steering gear assembly
5. Rack mounting bracket
6. Rack mounting insulator

Refer to GI-9, "Components" , for the symbols in the figure.

REMOVAL

1. Set wheels in the straight-ahead position.
2. Remove tires from vehicle with power tool.
3. Remove undercover with power tool.
4. Remove cotter pin (1), and then loosen the nut.
5. Remove steering outer socket (2) from steering knuckle (3) so as not to damage ball joint boot (4) using the ball joint remover [suitable tool].



CAUTION:

Temporarily tighten the nut to prevent damage to threads and to prevent the ball joint remover [suitable tool] from suddenly coming off.

6. Remove high pressure hose and suction hose from steering gear assembly, then drain fluid from pipings.
7. Remove fixing bolt on lower side of lower joint.

CAUTION:

Spiral cable may snap due to steering operation if steering column is separated from steering gear assembly. Therefore fix steering wheel with a string to avoid turns.

8. Loosen fixing bolt on upper side of lower joint.
9. Disconnect power steering solenoid valve connector.
10. Remove mounting bolts of steering gear assembly with power tool, and then remove rack mounting bracket, rack mounting insulator.
11. Remove steering gear assembly from vehicle.

INSTALLATION

Note the following, and install is the reverse order of removal.

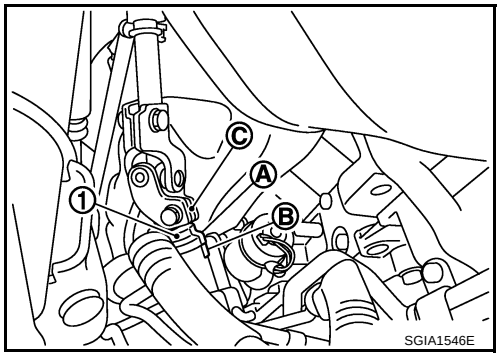
- Refer to PS-15, "COMPONENT" about each tightening torque.
- When installing lower shaft to steering gear assembly, follow the procedure listed below.

– Set rack of steering gear in the neutral position.

NOTE:
To get the neutral position of rack, turn gear sub-assembly and measure the distance of inner socket, and then measure the intermediate position of the distance.

– Align rear cover cap (1) projection (A) with the marking position (B) of gear housing assembly.

– Install slit part of lower shaft (C) aligning with the projection (A) of rear cover cap (1). Make sure that the slit part of lower shaft (C) is aligned with both the projection (A) of rear cover cap (1) and the marking position (B) of gear housing assembly.



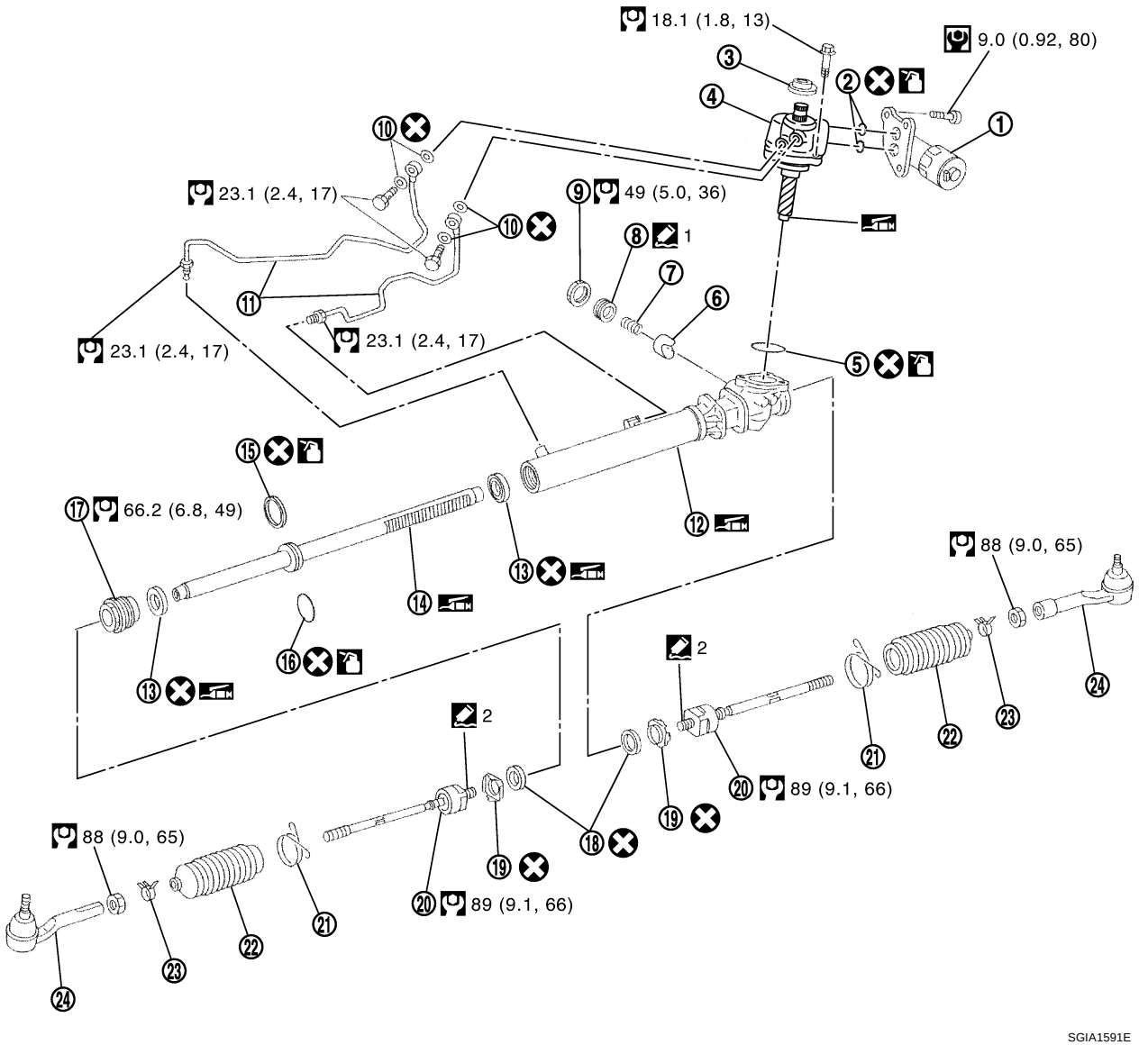
- After installation, bleed air from the steering hydraulic system. Refer to PS-7, "Air Bleeding Hydraulic System" .
- Perform final tightening of nuts and bolts on each part under unladen conditions with tires on level ground when removing steering gear assembly. Check wheel alignment. Refer to FSU-5, "Wheel Alignment Inspection" .
- Adjust neutral position of spiral cable after checking wheel alignment. Refer to SRS-43, "INSTALLATION" .

Disassembly and Assembly

NGS0002W

COMPONENT

SEC. 492



1.	Power steering solenoid valve	2.	O-ring	3.	Rear cover cap
4.	Gear sub-assembly	5.	O-ring	6.	Retainer
7.	Spring	8.	Adjusting screw	9.	Lock nut
10.	Copper washer	11.	Cylinder tube	12.	Gear housing assembly
13.	Rack oil seal	14.	Rack assembly	15.	Rack Teflon ring
16.	O-ring	17.	End cover assembly	18.	Spacer ring
19.	Lock plate	20.	Inner socket	21.	Boot clamp
22.	Boot	23.	Boot clamp	24.	Outer socket

Refer to GI-9, "Components" and the followings for the symbols in the figure.

: Apply Genuine Nissan PSF or equivalent.

1: Apply Genuine High Strength Thread Locking Sealant or equivalent. Refer to GI-45, "Recommended Chemical Products and Sealants" .

2: Apply Genuine Silicone RTV or equivalent. Refer to GI-45, "Recommended Chemical Products and Sealants" .

DISASSEMBLY

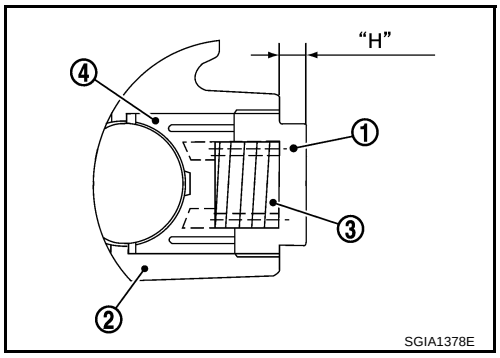
CAUTION:

- **Disassemble and assemble steering gear by securing the mounting area in a vise using copper plates.**
- **Clean steering gear with kerosene before disassembling. Be careful to avoid splashing or applying any kerosene over connector of discharge port or return port.**

1. Remove power steering solenoid valve.

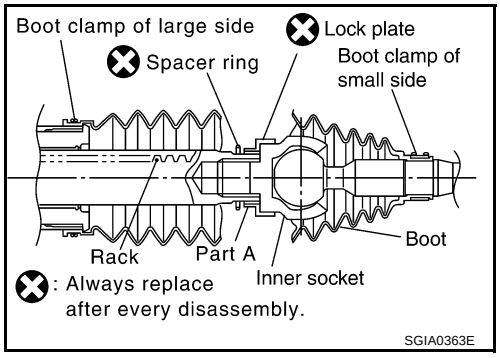
   CAUTION:
   Never attempt to disassemble power steering solenoid valve.
2. Remove cylinder tubes from gear housing assembly.
3. Remove rear cover cap from gear sub-assembly.
4. Measure adjusting screw (1) of height “H” from gear housing assembly (2), then loosen lock nut.
5. Remove adjust screw (1), spring (3) and retainer (4) from gear housing assembly (2).
6. Remove mounting bolts of gear sub-assembly, then remove gear sub-assembly from gear housing assembly.

   CAUTION:
   Never overhaul gear sub-assembly because it is non overhaul part. If there is something wrong with gear sub-assembly, change it to new one.



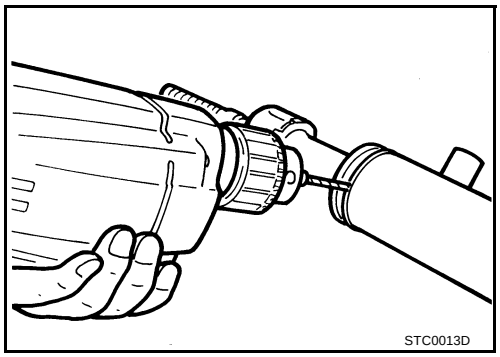
7. Remove O-ring from gear housing assembly.
8. Loosen lock nut of outer socket, and remove outer socket.
9. Remove boot clamps of the small side and the large side, then remove boots.

   CAUTION:
   When removing boots, be careful not to damage inner socket and gear housing assembly. If they are damaged, change them to avoid oil leaks.

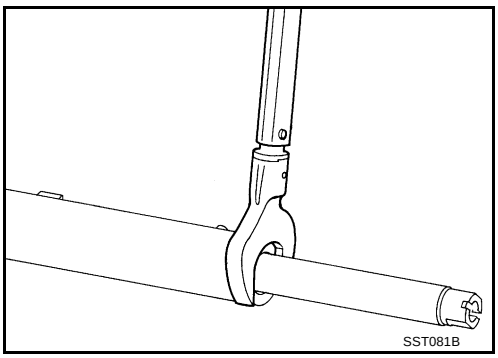


10. Move spacer ring to rack assembly side, raise clinching part (at two points of part A) of lock plate and loosen inner socket, then remove inner socket from rack assembly.

    CAUTION:
    When removing lock plate, be careful not to damage the surface of rack assembly. If damaged rack assembly surface will cause an oil leak. Therefore, if the rack assembly surface is damaged, replace rack assembly.
11. Drill out the clinching part of gear housing assembly (end cover assembly side) outer rim with a 3 mm (0.12 in) drill bit. [Drill for approximately 1.5 mm (0.059 in) depth.]



12. Remove end cover assembly with a 45 mm (1.77 in) open head (suitable tool).



CAUTION:

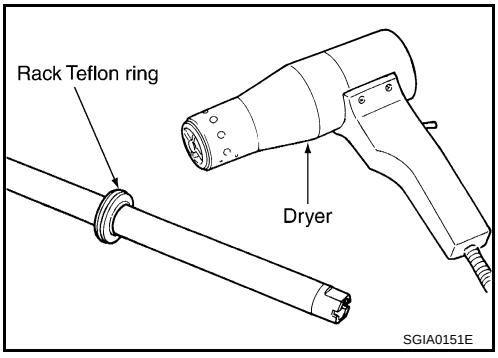
- **Never damage the rack assembly surface when removing.**
- **Rack assembly must be replaced if damaged because it may cause fluid leakage.**

13. Pull rack assembly together with rack oil seal (outer side) out from gear housing assembly.

CAUTION:

- **Never damage the cylinder inner wall when removing the rack assembly.**
- **Gear housing assembly must be replaced if damaged because it may cause fluid leakage.**

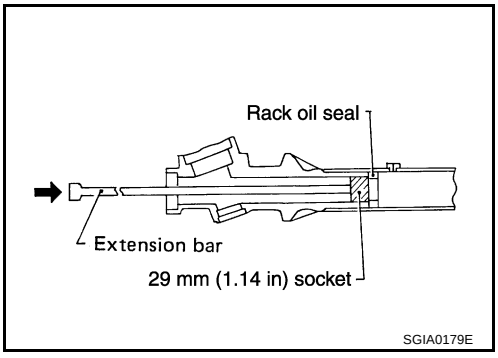
14. Heat rack Teflon ring to approximately 40°C (104°F) with a dryer, then remove it and O-ring from rack.



CAUTION:

Never damage the rack assembly. Rack assembly must be replaced if damaged because it may cause fluid leakage.

15. Push rack oil seal inside with a 29 mm (1.14 in) socket and an extension bar to push out rack oil seal (inner side) from gear housing assembly.



CAUTION:

- **Never damage the gear housing assembly and cylinder inner wall.**
- **Gear housing assembly must be replaced if damaged because it may cause fluid leakage.**

INSPECTION AFTER DISASSEMBLY

Boot

Check boot for cracks and deformation. Replace it, if there are.

Rack

Check rack for damage and wear. Replace it, if there are.

Gear Sub-Assembly

- Check pinion gear for damage and wear. Replace gear sub-assembly, if necessary.
- Check bearing while rotating it. Replace gear sub-assembly if bearing ball race was dented, worn, or damaged.

Gear Housing Assembly

Check gear housing assembly for damage and scratches (inner wall). Replace it, if necessary.

Outer Socket and Inner Socket

Swing torque

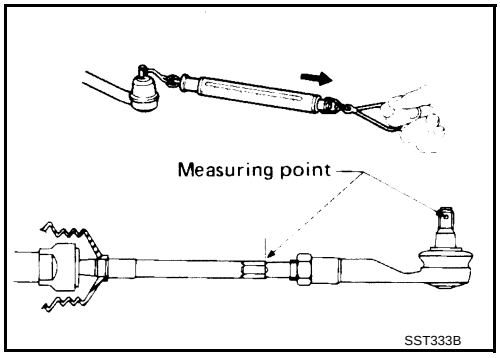
- Hook a spring balance at the point shown in the figure and pull the spring balance. Make sure that the spring balance reads the specified value when ball stud and inner socket start to move. Replace outer socket and steering gear assembly if they are outside the standard.

Outer socket:

4.81 – 45.7 N (0.50 – 4.6 kg, 1.09 – 10.2 lb)

Inner socket:

8.9 – 64 N (0.91 – 6.5 kg, 2.00 – 14.3 lb)



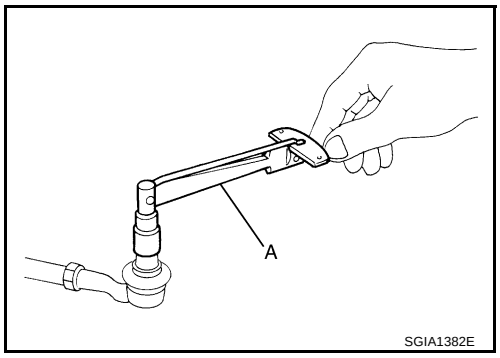
Rotating torque

- Make sure that the reading is within the following specified range using Tool. Replace outer socket if the reading is outside the specified value.

Tool number A: ST3127S000 (—)

Outer socket:

0.3 – 2.9 N·m (0.03 – 0.29 kg-m, 3 - 25 in-lb)

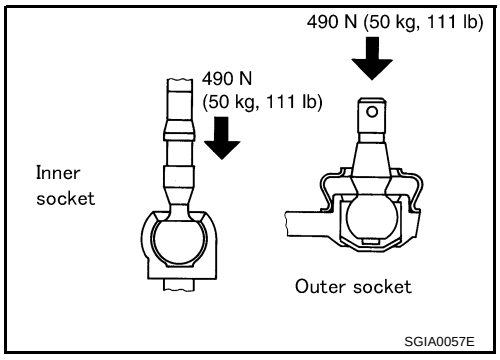


Axial end play

- Apply an axial load of 490 N (50 kg, 111 lb) to ball stud using a dial gauge. Measure amount of stud movement, and then make sure that the value is within the following specified range. Replace outer socket and inner socket if the measured value is outside the standard.

Outer socket : 0.5 mm (0.02 in) or less

Inner socket : 0.2 mm (0.008 in) or less



ASSEMBLY

CAUTION:

Assemble steering gear assembly by securing the mounting area in a vise using copper plates.

1. Apply Genuine Nissan PSF or equivalent to O-ring. Put an O-ring into rack Teflon ring.

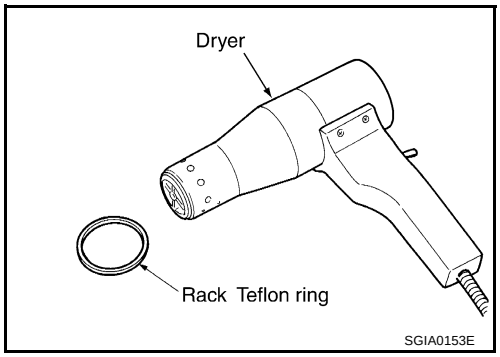
   CAUTION:

   Never reuse the O-ring.

2. Heat rack Teflon ring to approximately 40°C (104°F) with a dryer. Assemble it to mounting groove of rack assembly.

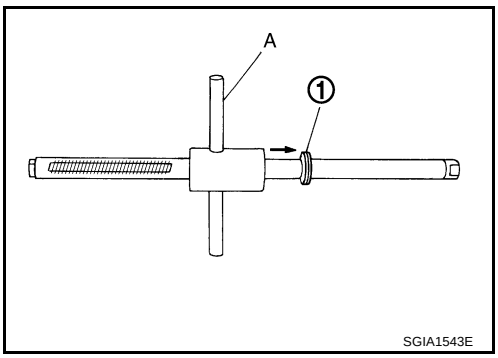
   CAUTION:

   Never reuse the rack Teflon ring.



3. Install the Tool “A” from tooth side of rack to fit rack Teflon ring (1) on rack. Compress the ring with tool.

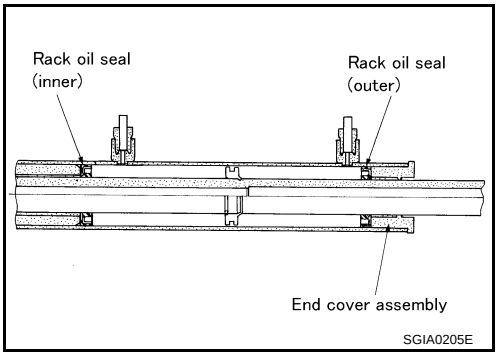
Tool number A: KV48104400 (—)



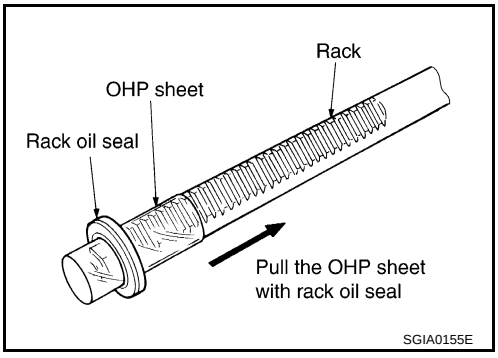
4. Apply multi-purpose grease to rack oil seal. And install rack oil seal in the following procedure. Then assemble rack assembly to gear housing assembly.

CAUTION:

- **Never reuse the rack oil seal.**
- **Install rack oil seal in a direction so that the lip of inner oil seal and the lip of outer oil seal face each other.**
- **Never damage the retainer sliding surface by the rack assembly. Replace the gear housing assembly if damaged.**
- **Never damage the gear housing assembly inner wall by the rack assembly. Gear housing assembly must be replaced if damaged because it may cause fluid leakage.**

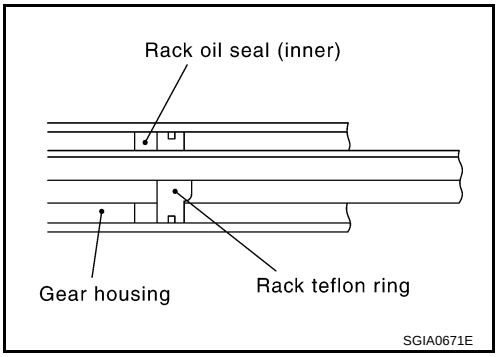


a. Wrap an OHP sheet [approximately 70 mm (2.76 in) × 100 mm (3.94 in).] Around rack assembly teeth to avoid damaging rack oil seal (inner). Install rack oil seal over sheet. Then, pull oil seal along with OHP sheet until they pass rack assembly teeth, and remove OHP sheet.



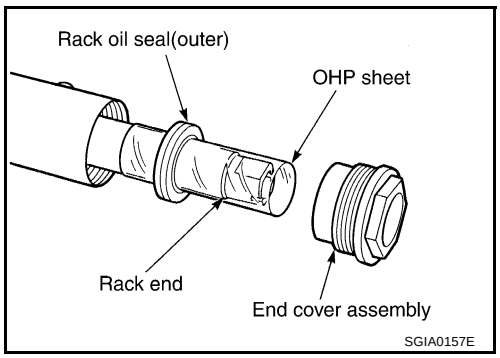
b. Insert rack oil seal (inner) into rack assembly piston (rack Teflon ring).

c. Push retainer to adjusting screw side by hand, and move the rack assembly inside the gear housing assembly so that the rack oil seal (inner) can be pressed against the gear housing assembly.



d. Wrap an OHP sheet [approximately 70 mm (2.76 in) × 100 mm (3.94 in).] Around the edge to avoid damaging rack oil seal (outer). Install rack oil seal over sheet. Then, pull oil seal along with OHP sheet until they pass rack edge, and remove OHP sheet.

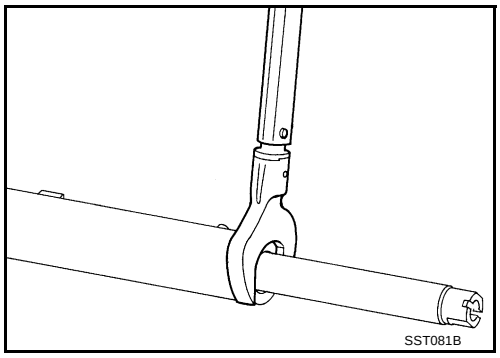
e. Install end cover assembly to rack edge, and move rack oil seal (outer) until it contacts with gear housing assembly.



5. Tighten end cover assembly to specified torque using a 45 mm (1.77 in) open head (suitable tool). Refer to PS-17, "COMPONENT" .

CAUTION:

- **Never damage the rack assembly.**
- **Replace it if damaged because it may cause fluid leakage.**



6. Crimp gear housing assembly at one point using a punch as shown in the figure so as to prevent end cover assembly from getting loose after tightening end cover assembly.

7. Apply Genuine Nissan PSF or equivalent to O-ring, then install O-ring to gear housing assembly.

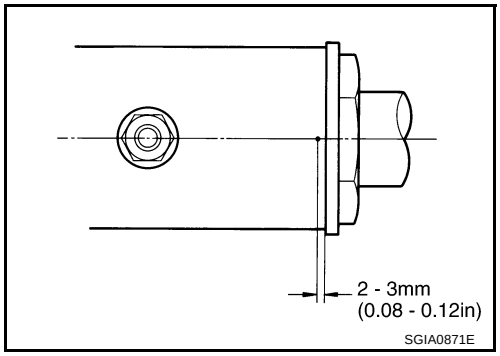
CAUTION:

Never reuse the O-ring.

8. Install gear sub-assembly to gear housing assembly.

CAUTION:

In order to protect the oil seal from any damage, insert gear sub-assembly out straightly.



9. Install inner socket to rack assembly with the following procedure.

a. Attach lock plate to rack assembly.

CAUTION:

Never reuse the lock plate.

b. Attach spacer ring to rack assembly.

CAUTION:

Never reuse the spacer ring.

c. Install inner socket to lock plate.

d. Apply thread sealant into the thread of inner socket.

- **Use Genuine Silicone RTV or equivalent. Refer to GI-45, "Recommended Chemical Products and Sealants" .**

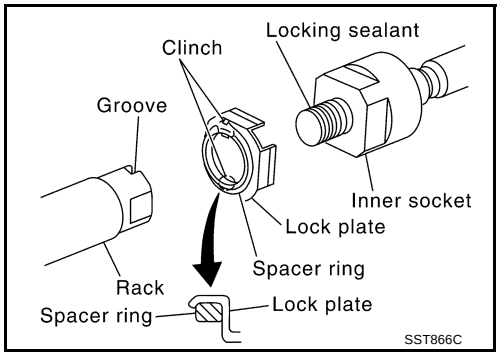
e. Screw inner socket into rack assembly and tighten at the specified torque. Refer to PS-17, "COMPONENT" .

f. Caulk lock plate at two points on rack groove.

g. Install spacer ring to lock plate as shown in the figure.

CAUTION:

When installing spacer ring, avoid damaging it.

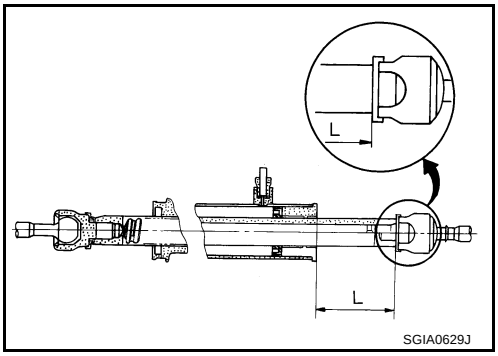


10. Decide on the neutral position for the rack.

Rack stroke “L”

Except for RAS models : 68.5 mm (2.697 in)

RAS models : 66.0 mm (2.598 in)



11. Install rear cover cap to gear sub-assembly.

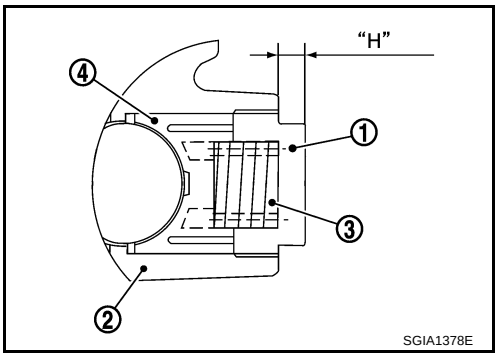
CAUTION:

Make sure that the projection of rear cover cap is aligned with the marking position of gear housing assembly.

12. Apply multi-purpose grease to retainer (4), then install retainer (4), spring (3) and adjusting screw (1) to gear housing assembly (2).

13. Apply thread locking sealant into the thread of adjusting screw (1) to the adjusting screw height “H” from gear housing assembly (2). The adjusting screw height “H” is the same as it was measured in the overhaul in advance.

- **Use Genuine High Strength Thread Locking Sealant or equivalent. Refer to** **GI-45, "Recommended Chemical Products and Sealants"** **.**



14. With adjusting screw held in place, tighten lock nut to the specified torque.

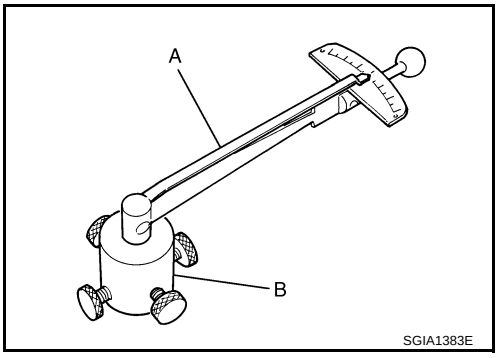
15. Rotate pinion ten times throughout the full stroke of rack assembly so that parts get to fit each other.

16. Adjust pinion rotating torque with the following procedure.

a. Measure pinion rotating torque within ±180° of neutral position of the rack assembly using Tools. Stop the gear at the point where highest torque is read.

Tool number A: ST3127S000 (J-25765-A)

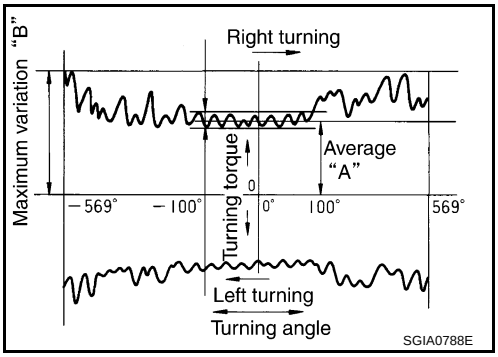
B: KV48103400 (—)



b. After loosening adjusting screw once, tighten it again with torque of 4.9 – 5.9 N·m (0.5 – 0.6 kg-m, 44 – 52 in-lb). After that loosen it within 20° to 40°.

c. With adjusting screw held in place, tighten lock nut to specified torque.

d. Measure pinion rotating torque using Tools to make sure that the measured value is within the standard. Readjust if the value is outside the standard. Replace steering gear assembly if the value is outside the standard after readjusting or adjusting screw rotating torque is 5 N·m (0.51 kg- m, 44 in-lb) or less.



Pinion rotating torque

Rotating torque:

0.79 – 1.27 N·m (0.08 – 0.12 kg-m, 7 – 11 in-lb)

Maximum variation “B”:

1.86 N·m (0.19 kg-m, 16 in-lb)

Around neutral position (within±100°) fluctuation

Maximum variation “A”:

0.39 N·m (0.04 kg-m, 3 in-lb)

Around neutral position (without±100°) fluctuation

Average “A”:

0.58 N·m (0.06 kg-m, 5 in-lb)

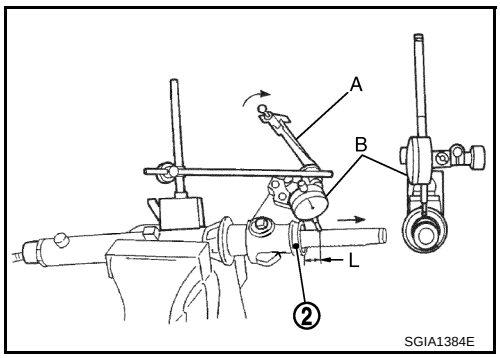
e. Turn pinion fully to the end of the left with inner socket to gear housing assembly.

f. Install dial indicator (B) at 5mm (L) from the edge of housing (2), and tooth point.

g. Measure vertical movement of rack assembly when pinion is turned counterclockwise with torque of 4.9 N·m (0.5 kg-m, 43 in-lb), using Tool.

Tool number : ST3127S000 (—)

Vertical movement : 0.265 mm (0.0104 in)



- If reading is outside of the specification, readjust screw angle with adjusting screw.

CAUTION:

If reading is still out side of specification, or if the rotating torque of adjusting screw is less than 5 N·m (0.51 kg-m, 44 in-lb), replace the steering gear assembly.

17. Install large side of boot to gear housing assembly.
18. Install small side of boot to the mounting groove of inner socket boot.
19. Install boot clamp to the small side of boot.
20. Install boot clamp to the large side of boot with the following procedure.

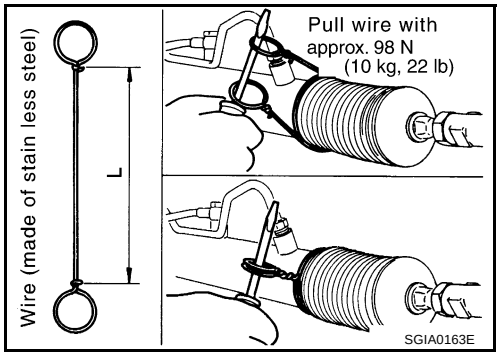
CAUTION:

Never reuse the boot clamp.

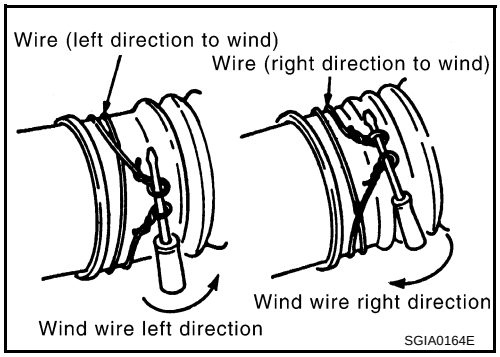
a. Tighten large side of RH/LH boot with boot clamp (stainless steel wire).

Wire length "L" : 370 mm (14.57 in)

b. After wrapping clamp around boot groove for two turns, insert screwdriver in loop on both ends of wire. Twist 4 to 4.5 turns while pulling with a force of approx. 98 N (10 kg, 22.1 lb).

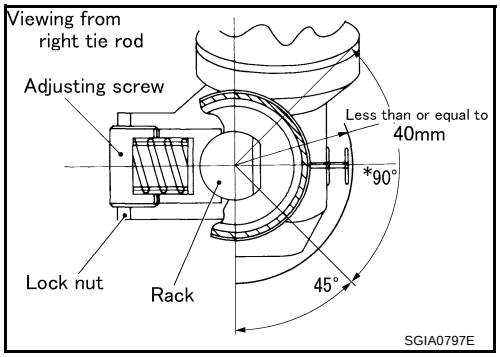


c. Twist boot clamp as shown in the figure, pay attention to relationship between winding and twisting directions.



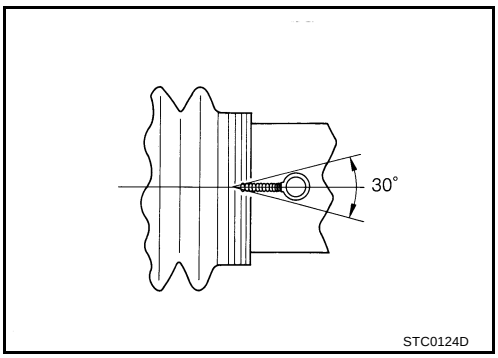
d. Twisted point should face front of vehicle (* marked portion) with steering gear assembly installed on vehicle (to prevent interference with other parts).

Wire length "L" : 40 mm (1.57 in) or less



e. Bent cut end of the wire toward rack axial as shown in the figure after twisting the wire 4 to 4.5 turns so that cut end does not contact with boot.

CAUTION:
Keep gap from cylinder tube 5 mm (0.20 in) or more.



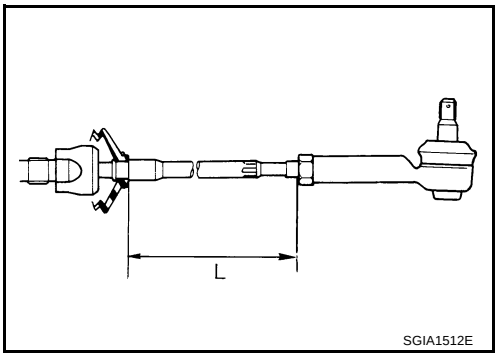
21. Install cylinder tubes to gear housing assembly. Tighten the bolts to the specified torque. Refer to PS-17, "COMPONENT" .

CAUTION:
Never reuse the copper washer.

22. Adjust inner socket to standard length “L”, and then tighten lock nut to the specified torque. Refer to PS-17, "COMPONENT" . Check length of inner socket “L” again after tightening lock nut. Make sure that the length is the standard.

Inner socket length “L” : 160 mm (6.30 in)

CAUTION:
Adjust toe-in after this procedure. Length achieved after toe-in adjustment is not necessary the above value.



POWER STEERING OIL PUMP

PFP:49110

On-Vehicle Service

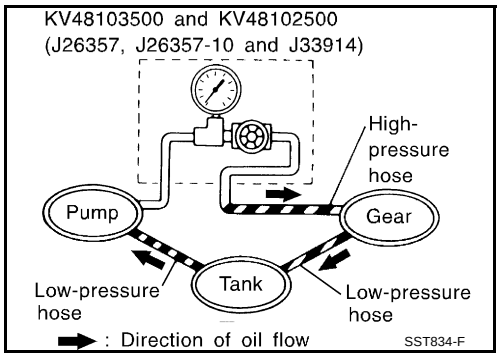
NGS000CL

RELIEF OIL PRESSURE

CAUTION:

Before starting work, confirm belt tension is proper.

1. Connect pressure gauge (SST) and pressure gauge adapter (SST) between power steering oil pump discharge connector and high pressure hose. Bleed air from the hydraulic circuit while opening valve fully. Refer to PS-7, "Air Bleeding Hydraulic System" .



2. Start engine. Allow engine to run until tank temperature reaches 50 to 80°C (122 to 176°F).

   CAUTION:

   - **Warm up engine with shut-off valve fully opened. If engine is started with shut-off valve closed, fluid pressure in power steering pump increases to maximum. This will raise fluid temperature excessively.**
   - **Be careful not to contact hose with belt when engine is started.**

3. Fully close the pressure gauge (SST) valve with engine at idle and measure the relief oil pressure.

   Relief oil pressure:

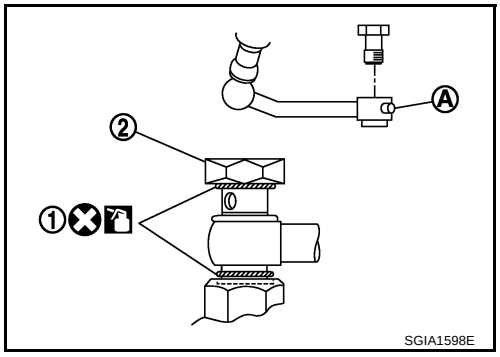
   8,500 - 9,300 kPa (88 - 94 kg/cm^2 , 1,251 - 1,337 psi)

   CAUTION:

   Never keep valve closed for 10 seconds or longer.

4. Open the valve slowly after measuring. Repair power steering oil pump is the relief oil pressure is outside the standard. Refer to PS-28, "Disassembly and Assembly" .

5. Apply Genuine Nissan PSF or equivalent to around O-ring (1), then install eye-bolt (2). Install eye-bolt (2) with eye-joint (assembled to high pressure hose) protrusion (A) facing with pump side cutout, and then tighten it to the specified torque after tightening by hand. Refer to PS-27, "COMPONENTS" .

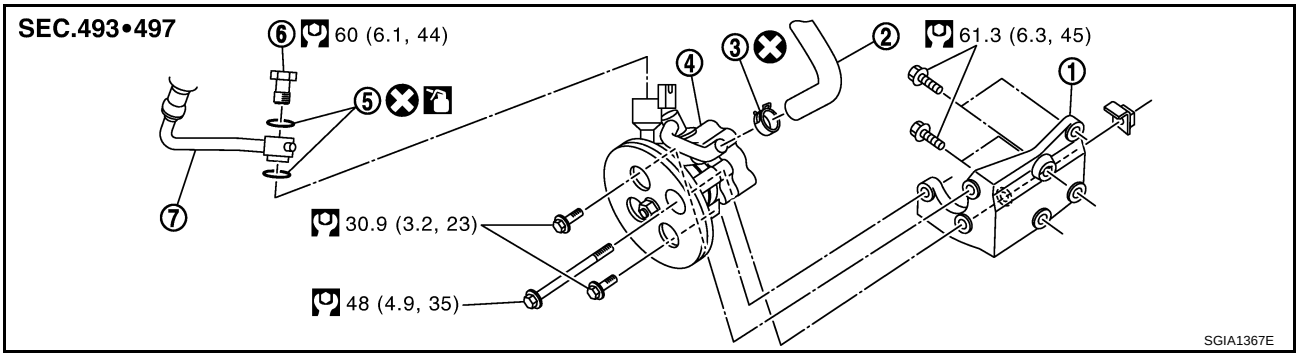


6. After inspection, disconnect the pressure gauge (SST) from hydraulic circuit, then add fluid and bleed air. Refer to PS-7, "Air Bleeding Hydraulic System" .

Removal and Installation

NGS0002Y

COMPONENTS



1. Oil pump bracket
2. Suction hose
3. Clamp
4. Oil pump assembly
5. O-ring
6. Eye-bolt
7. High pressure hose

Refer to GI-9, "Components" and the followings for the symbols in the figure.

: Apply Genuine Nissan PSF or equivalent.

REMOVAL

1. Drain power steering fluid from reservoir tank.
2. Remove undercover from vehicle with a power tool.
3. Loosen drive belt. Refer to EM-15, "Power Steering Oil Pump Belt" .
4. Remove drive belt from pulley of oil pump.
5. Remove eye-bolt, high pressure hose and suction hose.
6. Remove oil pump mounting bolts, and then remove oil pump assembly.

INSTALLATION

Note the following, and Installation is the reverse order of removal.

- Refer to PS-27, "COMPONENTS" about each tightening torque.
- Install eye-bolt, high pressure hose and suction hose. Refer to PS-27, "COMPONENTS" .
- Perform the following procedure after installing.

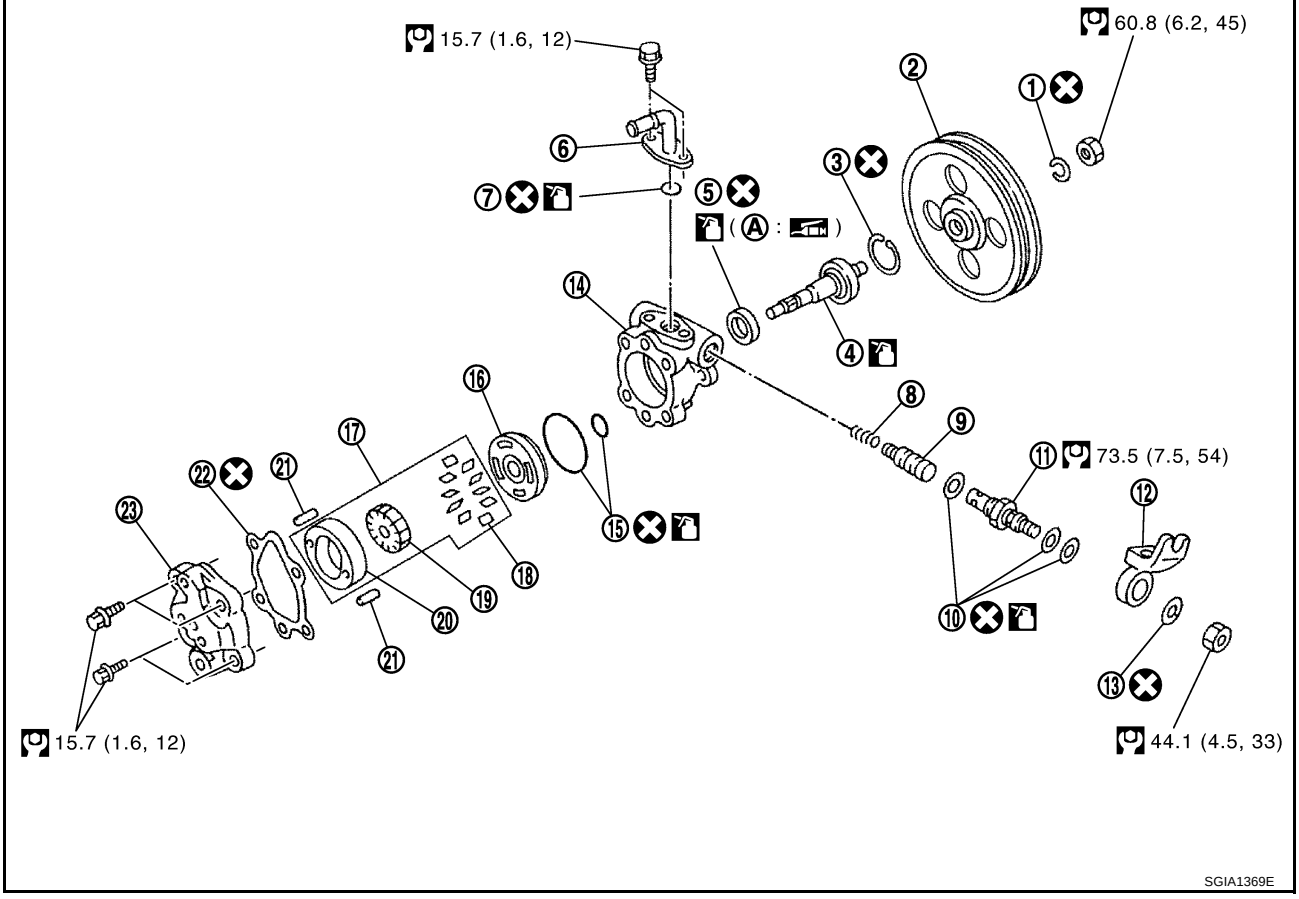
– Drive belt. Refer to EM-14, "Checking Drive Belts" .
– Bleed air. Refer to PS-7, "Air Bleeding Hydraulic System" .

Disassembly and Assembly

NGS0002Z

COMPONENT

SEC.490



1. Spring washer
2. Pulley
3. Snap ring
4. Drive shaft assembly
5. Oil seal
6. Suction pipe
7. O-ring
8. Spring
9. Flow control valve
10. O-ring
11. Connector bolt
12. Joint
13. Washer
14. Body assembly
15. O-ring
16. Side plate
17. Cartridge
18. Vane
19. Rotor
20. Cam ring
21. Dowel pin
22. Gasket
23. Rear cover

A: Oil seal lip

Refer to GI-9, "Components" and the followings for the symbols in the figure.

: Apply Genuine Nissan PSF or equivalent.

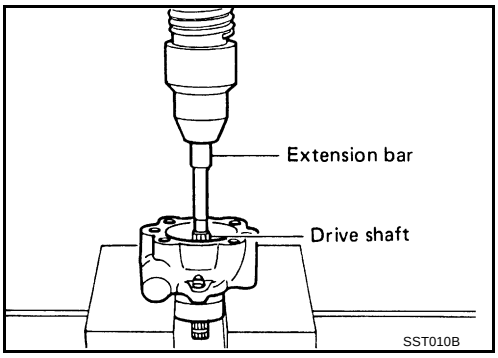
DISASSEMBLY

NOTE:
Secure oil pump in a vise if necessary.

CAUTION:
When retaining the drive shaft in a vise, always use the copper or aluminum plates between vise and shaft.

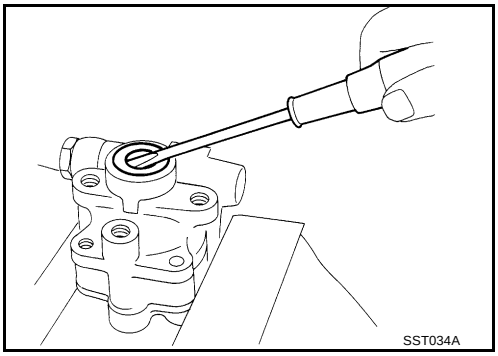
1. Remove rear cover mounting bolts and then remove rear cover from body assembly.
2. Remove gasket from body assembly.
3. Remove dowel pin, cartridge and side plate from body assembly.
4. Remove pulley mounting nut and then remove pulley from drive shaft.
5. Remove bracket mounting bolts and then remove bracket from body assembly.
6. Remove snap ring from drive shaft assembly and press out it.

   CAUTION:
   When removing the snap ring, be careful not to damage the drive shaft assembly.



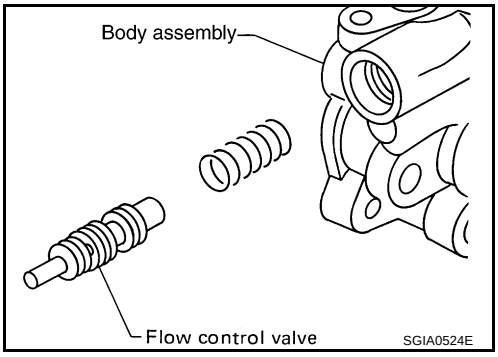
7. Remove oil seal from body assembly using a flat-bladed screwdriver.

   CAUTION:
   Never damage the body assembly.
8. Remove O-ring from body assembly.



9. Loosen lock nut and remove washer, O-ring, joint then remove connector bolt, O-ring and pull out flow control valve and spring from body assembly.

   CAUTION:
   Be careful not to drop and deform the flow control valve.
10. Remove suction pipe from body assembly.
11. Remove O-ring for suction pipe.



INSPECTION AFTER DISASSEMBLY

Body Assembly and Rear Cover Inspection

Check body assembly and the inside of rear cover for damage. If any damage is found, replace with new part for rear cover, and replace with new power steering pump assembly for body assembly.

Cartridge Assembly Inspection

Check cam ring, side plate, rotor and vane for damage. If any damage is found, replace cartridge assembly with new one.

Side Plate Inspection

Check side plate for damage. Replace side plate if there are.

Flow Control Valve Inspection

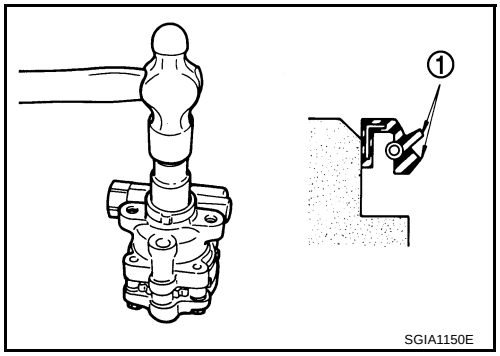
Check flow control valve and spring for damage. Replace if there are.

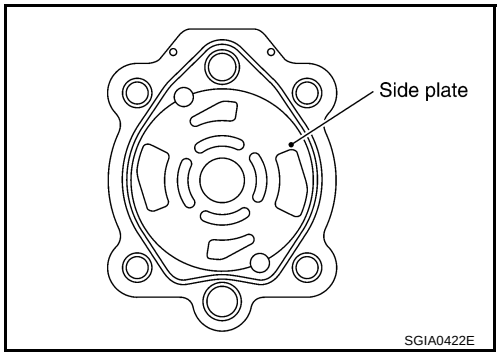
ASSEMBLY

NOTE:
Secure oil pump in a vise if necessary.

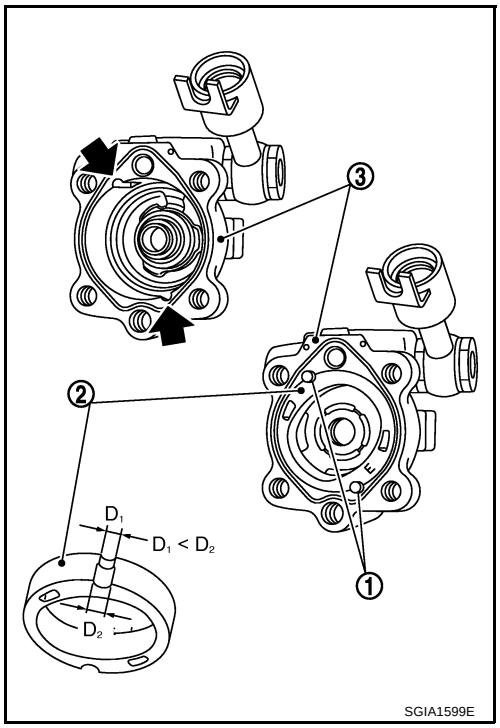
CAUTION:
Use copper plates when securing in a vise.

1. Apply multi purpose grease to oil seal lips (1). Apply Genuine Nissan PSF or equivalent to around oil seal, and then install oil seal to body assembly.
   CAUTION:
   Never reuse the oil seal
2. Apply Genuine Nissan PSF or equivalent to drive shaft, and press drive shaft into body assembly, then install snap ring.
   CAUTION:
   Never reuse the snap ring.
3. Apply Genuine Nissan PSF or equivalent to O-ring, and install O-ring into body assembly.
   CAUTION:
   Never reuse the O-ring.
4. Install side plate to body assembly.



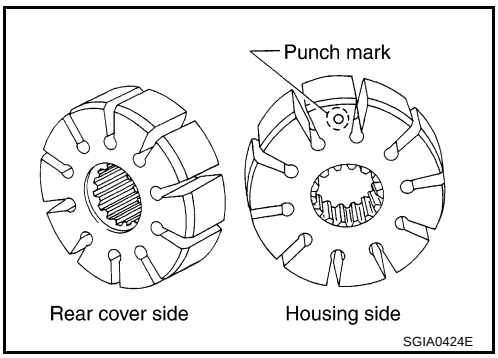


5. Install dowel pin (1) into dowel pin hole (➡), and install cam ring (2) pointing it's D1 side toward the body assembly (3) side as shown in the figure.
   CAUTION:
   - **When installing the cam-ring, turn carved face with a letter “E” of it to the rear cover.**
   - **Never confuse the assembling direction of the cam ring. If cam ring is installed facing the incorrect direction, it may cause pump operation malfunction.**



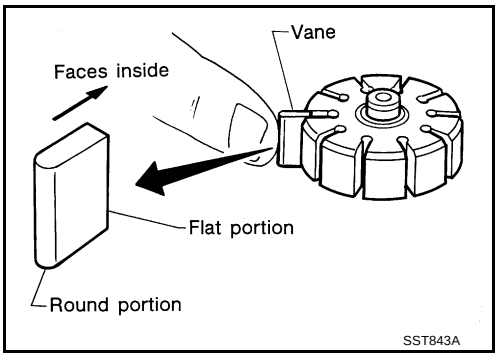
6. Install rotor to body assembly.

CAUTION:
When installing the rotor, turn punch mark face on rotor to body assembly.



7. Install vane to rotor with facing the round portion outside.
8. Check if drive shaft assembly turns smoothly.
9. Install gasket to body assembly.

CAUTION:
Never reuse the gasket.



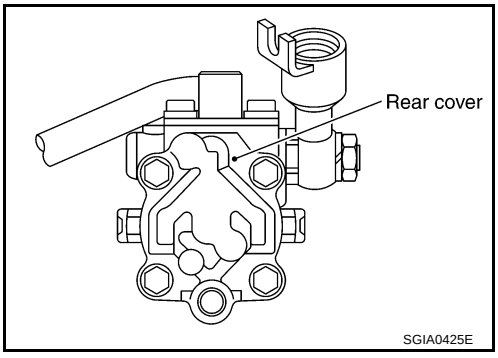
10. Install rear cover to body assembly and tighten bolts at the specified torque. Refer to PS-28, "COMPONENT" .
11. Install pulley to drive shaft assembly then tighten lock nut at the specified torque. Refer to PS-28, "COMPONENT" .
12. Install spring, flow control valve, O-ring, connector bolt, joint, washer to body assembly. Then tighten lock nut at the specified torque. Refer to PS-28, "COMPONENT" .

CAUTION:
Never reuse the O-ring.

13. Apply Genuine Nissan PSF or equivalent to O-ring and install O-ring to body assembly.

CAUTION:
Never reuse the O-ring.

14. Install suction pipe to body assembly.



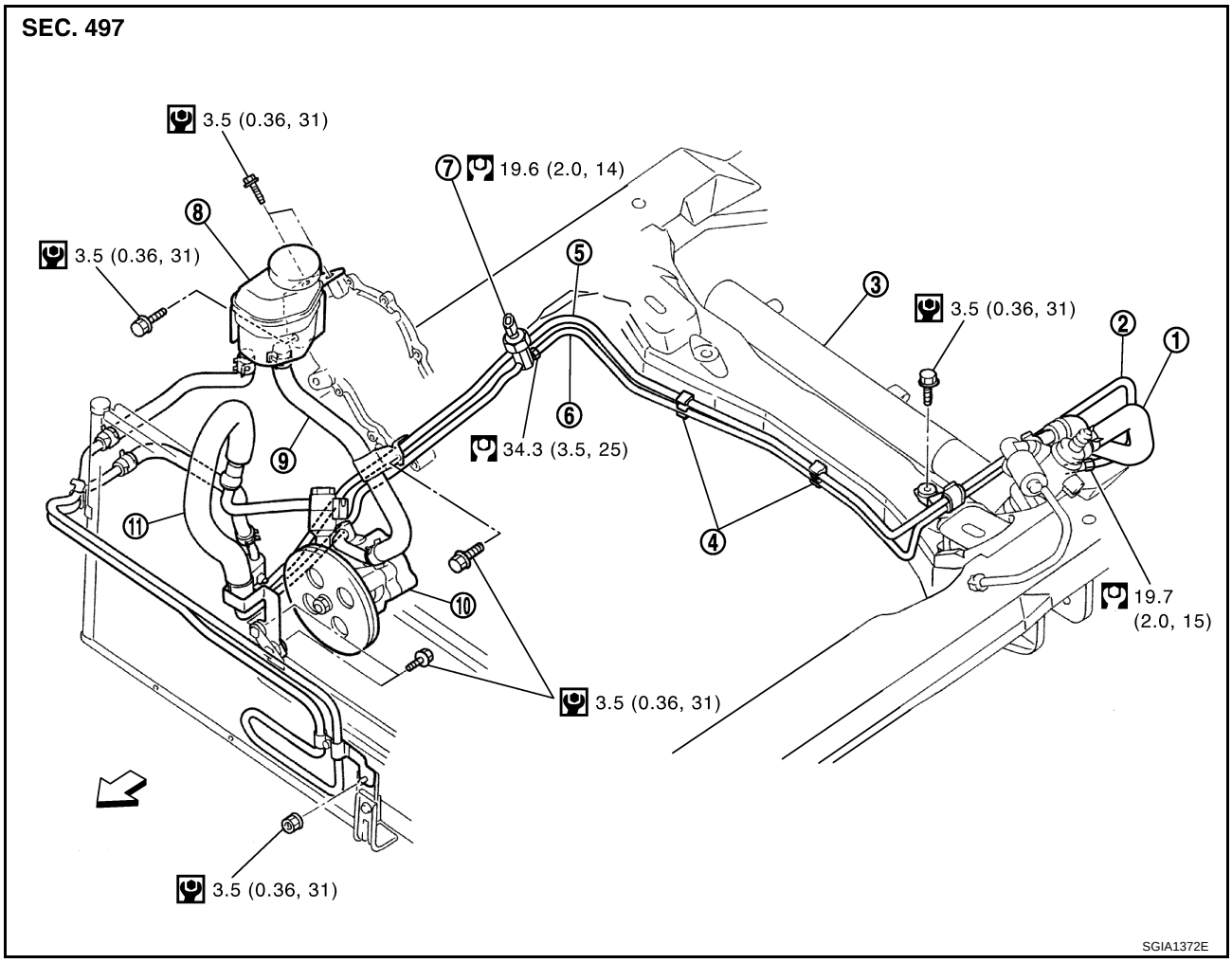
HYDRAULIC LINE

PFP:49721

Removal and Installation

NGS00031

Refer to the figure for hydraulic line removal and installation information.



1. Low pressure hose	2. High pressure pipe	3. Steering gear assembly
4. Clip	5. Low pressure pipe	6. High pressure piping
7. Pressure sensor	8. Reservoir tank	9. Suction hose
10. Oil pump assembly	11. High pressure hose	

Refer to GI-9, "Components" , for the symbols in the figure.

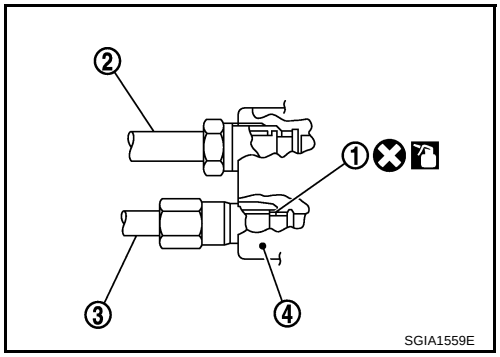
CAUTION:

- **Securely insert harness connector to pressure sensor.**
- **Never reuse the O-ring.**
- **Apply Genuine Nissan PSF or equivalent to around the O-ring (1), then install the drain port (2) and high pressure pipe (3) to the gear sup-assembly (4).**

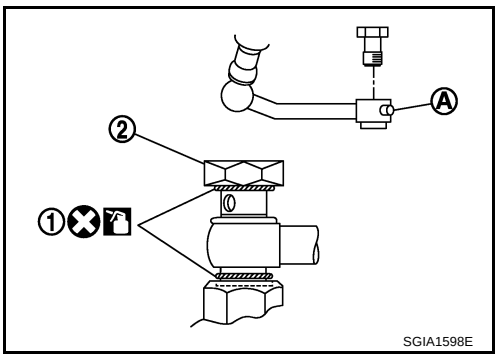
Specified torque

Drain port : 33.4 N·m (3.4kg-m, 25ft-lb)

High pressure pipe : 19.5 N·m (2.0kg-m, 14ft-lb)

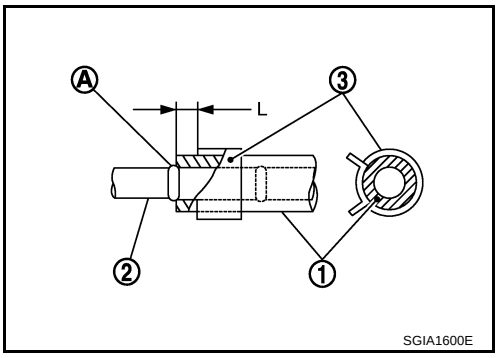


- Apply Genuine Nissan PSF or equivalent to around the O-ring (1), then install the eye-bolt (2) with the eye-joint (assembled to high pressure hose) protrusion (A) facing with pump side cutout, and then tighten it to the specified torque after tightening by hand. Refer to PS-27, "COMPONENTS" .

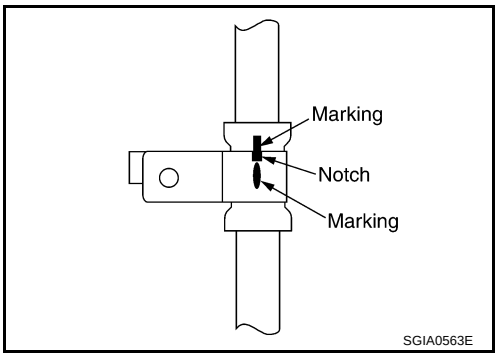


- Never apply fluid to the hose (1) and tube (2).
- Insert the hose (1) securely until it contacts the spool (A) of the tube (2).
- Install the clamp (3) to the hose (2) at dimension “L” from the edge of the hose (2).

  Dimension “L” : 3 – 8 mm (0.12 – 0.31 in)



- Confirm with mating marking that if it is in phase with the hose and clamp, then correct if needs.



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

General Specifications

NGS0004D

Applied model		VK45DE
Steering gear model		PR26AF
Fluid capacity (Approx.)	ℓ (US qt, Imp qt)	1.0 (1-1/8, 7/8)
Relief oil pressure	kPa (kg/cm^2 , psi)	8,500 - 9,300 (88 - 94, 1,251 - 1,337)

Inspection and Adjustment

NGS0004E

STEERING WHEEL AXIAL END PLAY AND PLAY

Unit: mm (in)

Item	Standard
End play of the axial direction for steering wheel	0 (0)
Steering wheel play on the outer circumference	0 - 35 (0 - 1.38)

STEERING WHEEL TURNING FORCE

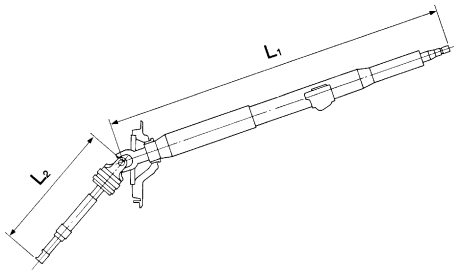
Unit: N (kg, lb)

Item	Standard
Steering wheel turning force	36 (3.6, 8.0) or less

STEERING COLUMN LENGTH

Unit: mm (in)

Item		Standard
Steering column length “L_1 ”	Minimum	628 mm (24.72 in)
	Neutral	643 mm (25.31 in)
	Maximum	658 mm (25.91 in)
Steering column length “L_2 ”		346.8 mm (13.65 in)



SST315B

STEERING ANGLE

Unit: Degree minute (Decimal degree)

Item		Standard
Inner wheel	Minimum	39°45′ (39.75°)
	Nominal	42°45′ (42.75°)
	Maximum	43°45′ (43.75°)
Outer wheel	Nominal	33°50′ (33.83°)

RACK SLIDING FORCE

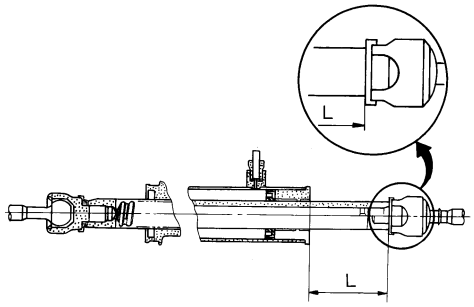
Unit: N (kg, lb)

Item	Standard
Rack sliding force	255 - 294 (26.1 - 29.9, 57.4 - 66.0)

RACK STROKE

Unit: mm (in)

Item		Standard
Rack neutral position, dimension “L”	Except for RAS models	68.5 (2.697)
	RAS models	66.0 (2.598)



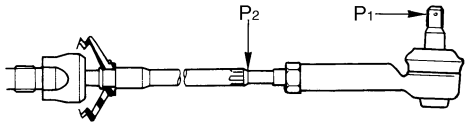
SGIA0629J

SOCKET SWING TORQUE AND ROTATING TORQUE

Swing Torque

Unit: N (kg, lb)

Item	Standard
Outer socket “P_1 ”	4.81 - 45.7 (0.50 - 4.6, 1.09 - 10.2)
Inner socket “P_2 ”	8.9 - 64 (0.91 - 6.5, 2.00 - 14.3)



SGIA1540E

Rotating Torque

Unit: N·m (kg-m, in-lb)

Item	Standard
Outer socket	0.3 - 2.9 (0.03 - 0.29, 3 - 25)

SOCKET AXIAL END PLAY

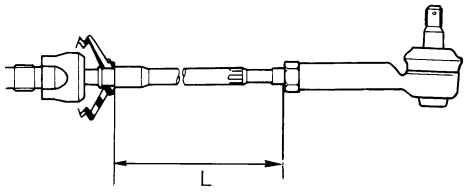
Unit: mm (in)

Item	Standard
Outer socket	0.5 (0.02) or less
Inner socket	0.2 (0.008) or less

INNER SOCKET LENGTH

Unit: mm (in)

Item	Standard
Inner socket length “L”	160 (6.30)



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